No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D1	物化	Hammer, Jort; Endo, Satoshi	Volatility and Nonspecific van der Waals Interaction Properties of Per- and Polyfluoroalkyl Substances (PFAS): Evaluation Using Hexadecane/Air Partition Coefficients	2022	Environ Sci Technol. 2022 Nov 15;56(22):15737-15745. doi: 10.1021/acs.est.2c05804. Epub 2022 Oct 14.	Per- and polyfluoroalkyl substances (PFAS) form weak van der Waals (vdW) interactions, which render this class of chemicals more volatile than nonfluorinated analogues. Here, the hexadecane/air partition coefficient (KHxd/air) values at 25 ° C, as an index of vdW interaction strength and volatility, were determined for 64 neutral PFAS using the variable phase ratio headspace and gas chromatographic retention methods. Log KHxd/air values increased linearly with increasing number of CF2 units, and the increase in log KHxd/air value per CF2 was smaller than that per CH2. Comparison of PFAS sharing the same perfluoroalkyl chain length but with different functional groups demonstrated that KHxd/air was highest for the N-alkyl perfluoroalkanesulfonamidethanols and lowest for the perfluoroalkanes and that the size of the nonfluorinated structure determines the difference in KHxd/air between PFAS groups. Two models, the quantum chemistry-based COSMOtherm model and an iterative fragment selection quantitative structure-property relationship (IFS-QSPR) model, accurately predicted the log KHxd/air values of the PFAS with root-mean-square errors of 0.55 and 0.35, respectively. COSMOtherm showed minor systematic errors for all PFAS, whereas IFS-QSPR exhibited large errors for a few PFAS groups that were outside the model applicability domain. The present data set will be useful as a benchmark of the volatilities of the various PFAS and for predicting other partition coefficient values of PFAS.		В
D2	物化	Zhang, Mengke; Suuberg, Eric M	Estimation of vapor pressures of perfluoroalkyl substances (PFAS) using COSMOtherm	2023	J Hazard Mater. 2023 Feb 5;443(Pt A):130185. doi: 10.1016/j.jhazmat.2022.130185. Epub 2022 Oct 14.	The widespread presence of per- and polyfluoroalkyl substances (PFAS) in the environment and a recognition of their possible health effects has, over the past decade, raised public concerns and led to much new research on these materials. In this field, with so many compounds of potential interest or concern, measuring the physical properties of even a small fraction of these compounds is a formidable task. The research community has turned to use of computational methods to begin to predict many useful properties, based just upon the structure of the compound. In this work, a quantum chemistry computational method (COSMO-RS) has been applied for exploring the possibility and accuracy of PFAS compound property estimation. The vapor pressures and boiling points of eleven PFAS are calculated with COSMOtherm and compared with available experimental data and literature calculation data using other packages. In the meantime, these measured results have permitted evaluation of this popular property estimation technique, which has not yet been fully validated for this class of compounds.		D
D3	物化	Le, Song-Thao; Kibbey, Tohren (G; Weber, Kela P; Glamore, William C; O'Carroll, Denis M	A group-contribution model for predicting the physicochemical behavior of PFAS components for understanding environmental fate	2021	Sci Total Environ. 2021 Apr 10;764:142882. doi: 10.1016/j.scitotenv.2020.142882. Epub 2020 Oct 14.	The factors controlling per- and polyfluoroalkyl substances (PFAS) environmental fate remains the subject of considerable debate and study. As surfactants, PFAS readily partition to interfaces, a property that controls their transport and fate. A group contribution model is developed to predict the extent to which PFAS partitions to the air-water interface. Langmuir adsorption and Szyszkowski equation parameters were fitted to literature air-water surface tension data for a range of PFAS and conventional hydrocarbon surfactants. This approach enabled the prediction of the impact of the hydrophilic head group, and other molecular components, on PFAS interfacial partitioning in instances when PFAS data are unavailable but analogous hydrocarbon surfactant data are available. The model was extended to predict a range of parameters (i.e., solubility, critical micelle concentration (CMC), K(D), K(oc) and K(ow)) that are used to predict PFAS environmental fate, including long-range PFAS transport and in multimedia models. Model predictions were consistent with laboratory and field derived parameters reported in the literature. Additionally, the proposed model can predict the impact of pH and speciation on the extent of PFAS interfacial partitioning, a potentially important feature for understanding the behaviors of some ionizable PFAS, such as fluorinated carboxylic acids. The proposed model provides a conceptually straightforward method to predict a wide range of environmental fate parameters for a wide range of PFAS. As such, the model is a powerful tool that can be used to determine parameters needed to predict PFAS environmental fate.		C
D4	物化	Ryuma Kise, Aki Fukumi, Nobutaka Shioya, Takafum Shimoaka, Masashi Sonoyama, Hideki Amii, Toshiyuki Takagi Toshiyuki Kanamori, Kazuc Eda, Takeshi Hasegawa	i Fluorous Property of a Short Perfluoroalkyl-Containing Compound Realized by Self-Assembled Monolayer Technique on a Silicon Substrate ,	2019	Bulletin of the Chemical Society of Japan, 92 巻 4 号 785- 789. doi: 10.1246/bcsj.20180356	Fluorous properties represented by water-and-oil repellency are perfluoroalkyl (Rf) compound-specific characteristics, which are widely used for surface coating of glass, electronic devices and textiles for preventing water and grease fouling. According to the stratified dipole-arrays (SDA) theory, the minimum Rf length of (CF2)7 is theoretically necessary for realizing fluorous properties. Unfortunately, however, production of compounds involving this chemical unit is strictly banned because of concerns of environmental pollution, which is a big dilemma. Here, we show that the fluorous properties can be realized by self-assembled monolayer (SAM) even with a short Rf-containing compound, since the SAM technique makes the best use of the self-aggregation property of the Rf groups, and it readily makes the molecules immobile.		1 A

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D5	グルーピ ング	Anderson, J K; Brecher, R W; Cousins, I T; DeWitt, J; Fiedler, H; Kannan, K; Kirman, C R; Lipscomb, J; Priestly, B; Schoeny, R; Seed, J; Verner, M; Hays, S M	Grouping of PFAS for human health risk assessment: Findings from an independent panel of experts	2022	Regul Toxicol Pharmacol. 2022 Oct;134:105226. doi: 10.1016/j.yrtph.2022.105226. Epub 2022 Jul 8.	An expert panel was convened to provide insight and guidance on per- and polyfluoroalkyl substances (PFAS) grouping for the purposes of protecting human health from drinking water exposures, and how risks to PFAS mixtures should be assessed. These questions were addressed through multiple rounds of blind, independent responses to charge questions, and review and comments on co-panelists responses. The experts agreed that the lack of consistent interpretations of human health risk for well-studied PFAS and the lack of information for the vast majority of PFAS present significant challenges for any mixtures risk assessment approach. Most experts agreed that "all PFAS" should not be grouped together, persistence alone is not sufficient for grouping PFAS for the purposes of assessing human health risk, and that the definition of appropriate subgroups can only be defined on a case-by-case manner. Most panelists agreed that it is inappropriate to assume equal toxicity/potency across the diverse class of PFAS. A tiered approach combining multiple lines of evidence was presented as a possible viable means for addressing PFAS that lack analytical and/or toxicological studies. Most PFAS risk assessments will need to employ assumptions that are more likely to overestimate risk than to underestimate risk, given the choice of assumptions regarding dose-response model, uncertainty factors, and exposure information.		D
D6	グルーピ ング	Buck, Robert C; Korzeniowski, Stephen H; Laganis, Evan; Adamsky, Frank	Identification and classification of commercially relevant per- and poly-fluoroalkyl substances (PFAS)	2021	Integr Environ Assess Manag. 2021 Sep;17(5):1045-1055. doi: 10.1002/ieam.4450. Epub 2021 Jun 22.	Per- and poly-fluoroalkyl substances (PFAS) are a universe of fluorinated organic substances with very different physical, chemical, and biological properties including polymers and non-polymers; solids, liquids, and gases. Commercial PFAS-based products have been used in a wide variety of industrial and consumer applications because they have unique performance properties of significant socioeconomic value. The PFAS definition has evolved and expanded over the years. Numerous lists of PFAS, some with thousands of entries, have been compiled, but none have clearly identified which of the substances are commercially relevant. This study is the first to use a bona-fide "bottom up" approach to identify how many of the 4730 PFAS substances listed in a 2018 OECD/UNEP Report are directly connected to commercial products based on input from three major global producers. This study provides new and valuable insight into the 2018 OECD/UNEP Report list of PFAS substances. The results show that 256, less than 6%, of the 4730 PFAS substances presented in the 2018 OECD/UNEP Report are commercially relevant globally. This study suggests that grouping and categorizing PFAS using fundamental classification criteria based on composition and structure can be used to identify appropriate groups of PFAS substances for risk assessment, thereby dispelling assertions that there are too many PFAS chemistries to conduct proper regulatory risk assessments for the commercially relevant substances. Integr Environ Assess Manag 2021;17:1045-1055. © 2021 The Chemours Company, Beach Edge Consulting, LLC, AGC Chemicals Americas Inc., Daikin America Inc. Integrated Environmental Assessment and Management published by Wiley Periodicals LLC on behalf of Society of Environmental Toxicology & Chemistry (SETAC).		D
D7	分析	Heo, Dong-Gyu; Lee, Dong-Cheol; Kwon, Ye-Min; Seol, Mi-Ji; Moon, Jun Sung; Chung, Seung Min; Kim, Ju- Hyun	Simultaneous determination of perfluorooctanoic acid and perfluorooctanesulfonic acid in Korean sera using LC-MS/MS	2022	J Chromatogr B Analyt Technol Biomed Life Sci. 2022 Mar 1;1192:123138. doi: 10.1016/j.jchromb.2022.123138. Epub 2022 Jan 26.	Perfluorooctanoic acid (PFOA) and perfluorooctanesulfonic acid (PFOS) are synthetic chemicals that have been used in various industries and household products. These can easily accumulate in the human body, causing adverse effects on human health. In this study, a high-performance liquid chromatography-tandem mass spectrometry method was developed and validated for the simultaneous analysis of PFOA and linear PFOS in human serum. Owing to a lack of PFOA- and PFOS-free human serum, (13)C(8)-PFOA and (13)C(8)-PFOS were used as surrogate analytes for quantification. A sensitive and selective sample preparation method was developed and optimized by combining solid-phase extraction and protein precipitation method. The lower limit of quantification was 0.05 ng/mL, and the analytical response was linear up to 10 ng/mL for both PFOA and linear PFOS. Chromatographic separation of the linear PFOS from branched isomers was achieved within 5.5 min. The method was validated at various concentrations and afforded acceptable accuracy and precision values. After validation, the method was successfully applied to evaluate the exposure levels of PFOA and linear PFOS in the Korean population. The serum concentrations of PFOA and linear PFOS was not significantly different between men and women. Therefore, a sensitive, selective, and reliable bioanalytical method was developed and validated. This method can potentially be applied to biomonitoring studies involving PFOA and linear PFOS.		-
D8	分析	Chi, Ting-Yen; Chen, Zheyuan; Kameoka, Jun	Perfluorooctanesulfonic Acid Detection Using Molecularly Imprinted Polyaniline on a Paper Substrate	2020	Sensors (Basel). 2020 Dec 19;20(24):7301. doi: 10.3390/s20247301.	Perfluorinated compounds like perfluorooctanesulfonic acid (PFOS) are synthetic water pollutants and have accumulated in environments for decades, causing a serious global health issue. Conventional assays rely on liquid chromatography and mass spectroscopy that are very expensive and complicated and thus limit the large-scale monitoring of PFOS in wastewater. To achieve low-cost and accurate detection of PFOS, we designed a paper-based sensor with molecularly imprinted polyaniline electrodes that have recognition sites specific to PFOS. The calibration curve of resistivity ratios as a function of PFOS concentrations has a linear range from 1 to 100 ppt with a coefficient of determination of 0.995. The estimated limit of detection is 1.02 ppt. We also investigated attenuated total reflectance Fourier-transform infrared spectroscopy (ATR-FTIR) and X-ray photoelectron spectroscopy (XPS) spectra of the surface of the polyaniline (PANI) electrodes to propose the potential recognition sites in polyaniline matrix and the detection mechanism. This electrical paper sensor with low cost and excellent sensitivity and selectivity provides the potential for large-scale monitoring of wastewater.		-

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D9	分析	Sunantha, Ganesan; Vasudevan, Namasivayam	A method for detecting perfluorooctanoic acid and perfluorooctane sulfonate in water samples using genetically engineered bacterial biosensor	2021	Sci Total Environ. 2021 Mar 10;759:143544. doi: 10.1016/j.scitotenv.2020.143544. Epub 2020 Nov 6.	A simple, reagent and pre-treatment (i.e. dilution, sample purification and pH adjustment) free approach based genetically engineered bacterial biosensor is developed and demonstrated for the detection of perfluorinated compounds in water samples. The bacterial biosensor was developed by integrating two genes called regulatory (defluorinase gene) and reporter gene (green fluorescence gene) through genetic engineering techniques. The as-developed bacterial biosensor was employed to detect perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS) in water samples upon induction of regulatory gene and expression of green fluorescence protein. The induced fluorescence emission by the biosensor was visualized using fluorescence microscopic images. The specificity of biosensor was evaluated with different types of organic pollutants such as chlorinated compounds, polyaromatic hydrocarbons and pesticides etc., in both presence and absence of PFOA and PFOS. The biosensor was employed to detect the perfluorinated compounds at nano gram level in both standard solutions and natural water samples like river water, wastewater and drinking water with an analysis time of 24 h. The detection of PFOA and PFOS by the developed- bacterial sensor is validated by liquid chromatography coupled with mass spectrometer. The developed biosensor has demonstrated a rapid and sensitive detection of PFOA and PFOS in various water samples.		-
D10	分析	Groffen, Thimo; Bervoets, Lieven; Jeong, Yunsun; Willems, Tim; Eens, Marcel; Prinsen, Els	A rapid method for the detection and quantification of legacy and emerging per- and polyfluoroalkyl substances (PFAS) in bird feathers using UPLC- MS/MS	2021	J Chromatogr B Analyt Technol Biomed Life Sci. 2021 May 15;1172:122653. doi: 10.1016/j.jchromb.2021.122653. Epub 2021 Mar 10.	The bioaccumulation and toxicity of per- and polyfluoroalkyl substances (PFAS) have raised scientific and public concern in recent decades, leading to regulatory measures for some PFAS (e.g. perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA)). In addition, the discovery of new PFAS alternatives in the environment has led to growing concern about the presence of numerous other PFAS that are used unrestricted. Feathers have been successfully applied as non-destructive indicators for various contaminants, mostly metals and persistent organic pollutants (POPs), whereas their suitability as an indicator for PFAS is still discussed. Previous studies on PFAS in feathers have focused primarily on perfluoroalkyl sulfonic acids (PFSAs) and perfluoroalkyl carboxylic acids (PFCAs); analytical methods for other groups of PFAS or PFAS alternatives in feathers are still lacking. Hence, this study aimed to develop a rapid, sensitive and reliable analytical method for determining a broad range of PFAS (N = 32) in feathers, using liquid chromatography-tandem mass spectrometry (LC-MS/MS). An extraction duration of 24 h was found to be sufficient to extract the majority of PFAS from the feathers. The extraction recovery of the internal standards ranged on average from 68% (PFBA) to 97% (PFOS). The spike recovery was within an acceptable range of at least 70% for most of the target analytes and the precision was often > 80%. A further extract clean-up using weak anion exchange (WAX) solid phase extraction (SPE), was proven unnecessary, as it resulted in a similar or lower spike recovery, and, as a consequence, a lower precision and higher quantification limit. The analytical method allows detection of low PFAS concentrations in a low quantity of matrix (i.e. small feathers). The developed LC-MS/MS method was validated and shown to be a fast, sensitive and reliable method for determining a broad range of legacy and emerging PFAS in feathers.		-
D11	分析	Daems, Elise; Moro, Giulia; Berghmans, Herald; Moretto, Ligia M; Dewilde, Silvia; Angelini, Alessandro; Sobott, Frank; De Wael, Karolien	Native mass spectrometry for the design and selection of protein bioreceptors for perfluorinated compounds	2021	Analyst. 2021 Mar 21;146(6):2065-2073. doi: 10.1039/d0an02005b. Epub 2021 Feb 4.	Biosensing platforms are answering the increasing demand for analytical tools for environmental monitoring of small molecules, such as per- and polyfluoroalkyl substances (PFAS). By transferring toxicological findings in bioreceptor design we can develop innovative pathways for biosensor design. Indeed, toxicological studies provide fundamental information about PFAS-biomolecule complexes that can help evaluate the applicability of the latter as bioreceptors. The toolbox of native mass spectrometry (MS) can support this evaluation, as shown by the two case studies reported in this work. The analysis of model proteins' (i.e. albumin, haemoglobin, cytochrome c and neuroglobin) interactions with well-known PFAS, such as perfluoroctanoic acid (PFOA) and perfluoroctanesulfonic acid (PFOS), demonstrated the potential of this native MS screening approach. In the first case study, untreated albumin and delipidated albumin were compared in the presence and absence of PFOA confirming that the delipidation step increases albumin affinity for PFOA without affecting protein stability. In the second case study, the applicability of our methodology to identify potential bioreceptors for PFOS/PFOA was extended to other proteins. Structurally related haemoglobin and neuroglobin revealed a 1 : 1 complex, whereas no binding was observed for cytochrome c. These studies have value as a proof-of-concept for a general application of native MS to identify bioreceptors for toxic compounds.		-

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D12	分析	Cody, Robert; Maleknia, Simin D	Coated glass capillaries as SPME devices for DART mass spectrometry	2020	Rapid Commun Mass Spectrom. 2020 Dec 15;34(23):e8946. doi: 10.1002/rcm.8946.	RATIONALE: Solid-phase microextraction (SPME) provides high-throughput sample cleanup and pre-concentration. Here we demonstrate coated glass capillaries (CGCs) as SPME devices for specific applications in direct analysis in real time (DART) mass spectrometry, referred to as "CGC-DART", for rapid screening of environmental contaminants at low parts-per-trillion detection limits and with accurate identification of analytes. METHODS: The extraction is performed in a one-step process in minutes by dipping the CGC in solutions containing the analytes, and then placing the CGC in a DART source for analysis. CGCs are disposable and relatively inexpensive in comparison with SPME devices, and can be prepared with hydrophobic, hydrophilic or mixed-mode materials similar to SPME. CGCs were prepared by adsorption coating with incubation of capillaries in saturated solutions of octadecylamine or covalent activation of silanes. RESULTS: Quantitation is shown with perfluorooctanoic acid (PFOA) at 1 ppt to 100 ppb, with the lowest detection at 500 parts-per quadrillion (ppq) in tap water. One-step extraction of contaminated groundwater from Northern Queensland, Australia, revealed perfluorooctane sulfonate (PFOS) and perfluorohexanesulfonamide as well as C4-C8 perfluoroalkyl carboxylic acids. A soil sample taken near a former military air base (New Hampshire, USA) revealed the presence of perfluorononanoic acid (PFNA) at 1 ppb and traces of perfluoroheptanoic acid. CONCLUSIONS: CGC-DART enabled one-step extraction of PFASs in minutes with mL sample volumes at low concentrations as shown for the standards and contaminated soil and water samples. DART-MS combined with Kendrick mass deficient and easily distinguished over background signal.			-
D13	分析	Mann, Madison M; Tang, James D; Berger, Bryan W	Engineering human liver fatty acid binding protein for detection of poly- and perfluoroalkyl substances	2022	Biotechnol Bioeng. 2022 Feb;119(2):513-522. doi: 10.1002/bit.27981. Epub 2021 Nov 9.	Per- and polyfluoroalkyl substances (PFAS) are a large group of synthetic fluorinated chemicals with surface active and water- repellent properties. The combination of wide-spread use in numerous consumer and industrial products and extended biological half-lives arising from strong carbon-fluorine bonds has led to significant accumulation of PFAS in humans. As most human interaction with PFAS comes from ingestion, it is important to be able to detect PFAS in drinking water as well as in agricultural water. Here we present an approach to designing a fluorescence-based biosensor for the rapid detection of PFAS based on human liver fatty acid binding protein (hLFABP). Introduction of solvatochromic fluorophores within the ligand binding pocket (L50) allowed for intrinsic detection of perfluorooctanoic acid (PFOA), perfluorooctanesulfonic acid (PFOS), and perfluorohexanesulfonic acid (PFHxS) via blue-shifts in fluorescence emission spectra. Initially, a single tryptophan mutation (L50W) was found to be able to detect PFOA with a limit of detection (LOD) of 2.8 ppm. We improved the sensitivity of the biosensor by exchanging tryptophan for the thiol reactive fluorophore, acrylodan. The acrylodan conjugated C69S/F50C hLFABP variant is capable of detecting PFOA, PFOS, and PFHxS in PBS with LODs of 112 ppb, 345 ppb, and 1.09 ppm, respectively. The protein-based sensor is also capable of detecting these contaminants at similar ranges in spiked environmental water samples, including samples containing an interfering anionic surfactant sodium dodecyl sulfate. Overall, this study demonstrates engineered hLFABP is a useful platform for detection of PFAS in environmental water samples and highlights its ease of use and versatility in field applications.			-
D14	分析	Park, Junyoung; Yang, Kyung-Ae; Choi, Yongju; Choe, Jong Kwon	Novel ssDNA aptamer-based fluorescence sensor for perfluorooctanoic acid detection in water	2022	Environ Int. 2022 Jan;158:107000. doi: 10.1016/j.envint.2021.107000. Epub 2021 Nov 24.	Per- and polyfluoroalkyl substances (PFAS) are widely detected environmental contaminants, and there is a great need for development of sensor technologies for rapid and continuous monitoring of PFAS. In this study, we have developed fluorescence based aptasensor that can possibly monitor perfluorooctanoic acid (PFOA) in water with limit of detection (LOD) of 0.17 μ M. This is first to report the successful isolation of PFAS binding ssDNA aptamers. The obtained aptamer selectively binds PFOA with dissociation constant (K(D)) of 5.5 μ M. Specific aptamer binding sites to PFOA were identified and the length of the fluorinated carbons was a key binding factor rather than the functional group. The aptamer binding to structurally similar PFAS compounds (i.e., perfluorocarboxylic acids and perfluorosulfonic acids with 4-8 carbon chains) was also investigated; the aptamer K(D) values were 6.5 and 3.3 μ M for perfluoroheptanoic acid and perfluorohexanesulfonic acid, respectively, while other analogs did not bind to the aptamer. The presence of major inorganic ions and dissolved organic matter had negligible influences on the aptamer performance (<14% at a 10 mM concentration), and the aptamer performance was also robust in real wastewater effluent conditions, with a K(D) of 7.4 μ M for PFOA. Fluorescence-based aptasensor developed in this study is adequate in monitoring PFOA levels in water contaminated with the accident spills and heavy usage of fire-fighting foams near the industrial sites and military bases. More importantly, the study opens up new capability of aptasensors to efficiently monitor the trace amount of various PFAS compounds and other fluorinated alternatives in natural and engineered water environments.			-
D15	分析	Zhang, Fang; Liang, Jiaman; Liu, Yang; Zhou, Qiuju; Hong, Yushuang; Chen, Xianping; Tan, Kejun	A highly sensitive dual-readout assay for perfluorinated compounds based CdTe quantum dots	2022	Spectrochim Acta A Mol Biomol Spectrosc. 2022 Mar 15;269:120753. doi: 10.1016/j.saa.2021.120753. Epub 2021 Dec 14.	Perfluorooctanoic acid (PFOA) and Perfluorooctane sulfonate (PFOS) are two typical perfluorinated compounds (PFCs) that poss potential ecological toxicity. In this work, a fluorescence and resonance light scattering (RLS) dual-readout strategy for the detection of PFCs at picomole level based on the water-soluble CdTe quantum dots (CdTe QDs) has been proposed. It is found that the CdTe QDs exhibit a quenching in the presence of PFCs and thus serve as useful probes for PFCs. The linear ranges are 0.032-10.0 nM with a limit of detection(LOD) of 32.02 pM for PFOA and 0.044-15.0 nM with a LOD of 43.96 pM for PFOS, respectively. Meanwhile, PFCs can form complexes with CdTe QDs in acid medium, resulting in remarkable RLS signals. The enhanced RLS intensities are in proportion to the concentrations of PFOA and PFOS, respectively. And the linear ranges are 0.048-5.0 nM with a LOD of 47.78 pM for PFOA, and 0.057-5.0 nM with a LOD of 56.72 pM for PFOS, respectively. This dual-mode detection increases the reliability of the measurement. The proposed method is simple, sensitive and cost-effective, with potential applications in environmental monitoring and assessment.			-

分野 タイトル 発行年 書誌情報 要旨 (原文) No 著者 (参考) A sensitive analytical method has been developed and validated for the determination of 16 (PFAS) in fine airborne particulate matter (PM(2.5)) using on-line solid phase extraction (SF chromatography (LC) - negative electrospray ionisation high resolution mass spectrometry (simultaneous sample clean-up from interfering matrices and lower limits of detection (LODs Kourtchev, Ivan sample into the LC system without compromising chromatographic efficiency and resolution Hellebust, Stig range 0.08-0.5 pg/mL of sample extract allowing detection of selected PFAS in aerosol parti-Heffernan, A new on-line SPE LC-HRMS method for the analysis good tolerance to the considered PM matrix. The validated method was applied for analysis of Perfluoroalkyl and Polyfluoroalkyl Substances Sci Total Environ. 2022 Aug 20;835:155496. doi: Eimear: Wenger collected at two urban locations in Ireland, i.e., Enniscorthy and Dublin. Several PFAS were o D16 分析 John: Towers. (PFAS) in PM(2.5) and its application for screening 10.1016/j.scitotenv.2022.155496. Epub 2022 Apr 26. including perfluorobutyrate (PFBA), perfluorooctanoic acid (PFOA), perfluorooctanesulfonic Sam; Diapouli atmospheric particulates from Dublin and Enniscorthy acid (L-PFBS) and perfluorononanoic acid (PFNA), as well as fluorotelomer sulfonates: 4:2 F Evangelia; Ireland indicate that some toxic PFAS, such as PFOS and PFOA, are still detected in the environmer Eleftheriadis, production and subject to restricted use in the EU and USA for more than two decades. Obs Konstantinos (4:2 FTS, 6:2 FTS and 8:2 FTS, which are used as alternatives for legacy PFOA and PFOS) in concern about their persistence in the atmosphere and impact on human health considering have similar health endpoints as PFOA and PFOS. To our knowledge, this is the first study to urban locations in Ireland and also the first study to detect 4:2 and 8:2 fluorotelomer sulfona Perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS) are emerging pollutant rapid, accurate, and selective method for determination of PFOA and PFOS in milk was esta imprinted phenolic resin (MIP-PR) as the adsorbent of dispersive filter extraction (DFE) com Ren, Jing; Lu, Novel molecularly imprinted phenolic resin-dispersive andem mass spectrometry (LC-MS/MS). MIP-PR was synthesized at room-temperature usi Yanke; Han, filter extraction for rapid determination of Food Chem. 2023 Jan 30;400:134062. doi: and perfluorononanoic acid as the monomers, cross-linkers, and virtual templates, respectiv D17 分析 2023 Yehong; Qiao, 10.1016/j.foodchem.2022.134062. Epub 2022 Sep 1. (30 s), high selectivity (imprinted factors > 3.7), and large adsorption capacity (>54.6 mg/g). perfluorooctanoic acid and perfluorooctane sulfonate Fengxia; Yan, in milk the developed MIP-PR-DFE method is fast, selective, inexpensive, and shows good purificat Hongyuan proposed MIP-PR-DFE-LC-MS/MS exhibited low limits of detection (0.006-0.022 ng/mL), hi precision (RSDs \leq 9.5 %). This study provides a new idea for the development of imprinted r compound, and a new method for sample pretreatment for monitoring of PFOA and PFOS in We developed a preconcentration method in which aerosol droplets containing enriched per Lee, Chuping generated through bubble bursting and collected. The droplets were subjected to PES analy Yang, Tzu-Ling; Rapid detection of perfluorinated sulfonic acids (PFHxS) and perfluorooctanesulfonic acid (PFOS) through surface-assisted laser desorption J Mass Spectrom. 2020 Oct 16;56(4):e4667. doi: 2020 10.1002/jms.4667. Online ahead of print. D18 分析 Yao, Yu-Zhen; Li through preconcentration by bubble bursting and spectrometry; silver nanoplates (AgNPts) were assisting materials. The method was highly e Jian-You; Huang, surface-assisted laser desorption/ionization order magnitude enhancement (5 imes 10(-13) to 1 imes 10(-11) M). Ultralow PFS concentrations Cheng-Liang PFHxS) were detected in preconcentrated tap water containing PFSs. Our method has poter in water Perfluoroethercarboxylic acids (PFECAs) have recently emerged as replacements for toxic p substances (PFAS) including perfluorooctanoic acid (PFOA) and perfluorooctanesulfonic aci many PFECAs including hexafluoropropylene oxide dimer acid (HFPO-DA, trade name GenX analysis using liquid chromatography-electrospray ionization-tandem mass spectrometry (LC often difficult to quantify. This study examined changes in ESI probe position, mobile phase goal of enhancing PFECA sensitivity. In addition, the relative contributions of existing mecha Enhanced Sensitivity for the Analysis of during ESI are discussed. Results indicated that the LC-ESI-MS/MS sensitivity for 9 PFECAs Brase, Richard A; Perfluoroethercarboxylic Acids Using LC-ESI-MS/MS J Am Soc Mass Spectrom. 2020 Oct 7;31(10):2124-2132. doi: D19 分析 2020 altering the ESI probe position. At the optimal probe position, lowering the capillary voltage f Spink, David C Effects of Probe Position, Mobile Phase Additive, and 10.1021/jasms.0c00244. Epub 2020 Aug 31. enhanced the LC-ESI-MS/MS sensitivity for PFAS analysis. For most analytes, the use of an Capillary Voltage ammonium acetate as a mobile phase additive also enhanced the analytical response. These reported and suggest that many laboratories may be conducting analyses of PFECAs under strategies outlined in this study, PFECAs can be more easily incorporated into comprehensiv we describe analytical parameters that enhance the sensitivity for some PFECAs by up to 36 ensitivity for legacy PFAS. This work not only highlights solutions to mitigate inadequate PF nsight into the mechanisms underlying PFAS ionization efficiency during LC-ESI-MS/MS.

	備考	出 対 象	ン 文 献 う	ン 文 ② ラ
polyfluorinated alkyl substances PE) coupled with liquid -) ESI-HRMS. On-line SPE allows s) by injecting a large volume of . The method provides LODs in the cles at low fg/m(3) level and showed of PFAS in ambient PM(2.5) samples observed above the detection limit, acid (PFOS), perfluorobutanesulfonic ETS, 6:2 FTS and 8:2 FTS. The results in despite being phased out from ervation of fluorotelomer sulfonates in ambient PM(2.5) samples raises a emerging evidence that they could b identify PFAS in ambient PM(2.5) at ites in atmospheric aerosol particles.			_	
ts that threaten food safety. Herein, a blished by using new molecularly blined with liquid chromatography- ing m-aminophenol, glutaraldehyde, ely, and exhibited rapid mass transfer . Compared with reported methods, ion and enrichment efficiency. The igh recoveries (94.7-109 %), and good resin adsorbents for perfluorinated food.			-	
fluorinated sulfonic acids (PFSs) are sis of perfluorohexane sulfonic acid n/ionization-time-of-flight mass efficient, with an approximately three- s (0.5 ng/L of PFOS; 0.4 ng/L of ntial for rapid real-world PFS detection			-	
er- and polyfluorinated alkyl d (PFOS). Compared with other PFAS,) exhibit poor sensitivity during C-ESI-MS/MS) and are therefore additive, and capillary voltage with the inistic theories for PFAS ionization is can be improved significantly by from 2.0 to 0.5 kV universally monium bicarbonate rather than e effects have not been previously suboptimal conditions. Using the we methods for PFAS analysis. Here, 5-fold while maintaining high FECA sensitivity but also provides			-	

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 対報 象抽	 ・ 文 ン 文 ク 献 ク 載 ① ラ ② ラ
D20	分析	Trinh, Vivian; Malloy, Cameron S; Durkin, Tyler J; Gadh, Aakanksha; Savagatrup, Suchol	Detection of PFAS and Fluorinated Surfactants Using Differential Behaviors at Interfaces of Complex Droplets	2022	ACS Sens. 2022 May 27;7(5):1514-1523. doi: 10.1021/acssensors.2c00257. Epub 2022 Apr 20.	Contamination of per- and polyfluoroalkyl substances (PFAS) in water supplies will continue to have serious health and environmental consequences. Despite the importance of monitoring the concentrations of PFAS at potential sites of contamination and at treatment plants, there are few suitable and rapid on-site methods. Many nonconventional techniques do not possess the necessary selectivity and sensitivity to distinguish PFAS from other surface-active components and to quantify the low concentrations in real-world conditions. Herein, we report a novel and rapid method for the detection of perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA) by leveraging their differential behaviors at the interfaces of emissive complex droplets. Measurement of surface and interfacial tensions via a force tensiometer reveals that PFAS preferentially self- assemble at the water-fluorocarbon oil interface (F/W) rather than the water-hydrocarbon oil interface (H/W). We also observe an opposite behavior for hydrocarbon surfactants. This difference in interfacial behavior produces distinct effects on the morphological change and optical emission of biphasic oil-in-water droplets. The change in the intensity of fluorescence emission, measured with a simple spectroscopic setup, correlates with the concentrations of PFAS. We also demonstrate that the range of detection and sensitivity can be tuned by adjusting the initial composition of the complex droplets. Our results illustrate an alternative mode of sensors that may provide a rapid and on-site detection of PFAS.			-
D21	分析	Yang, Liping; Chen, Xin; Zhu, Lingyan; Wang, Yixin; Shan, Guoqiang	Analysis of Specific Perfluorohexane Sulfonate Isomers by Liquid Chromatography-Tandem Mass Spectrometry: Method Development and Application in Source Apportionment	2022	J Anal Methods Chem. 2022 Sep 22;2022:8704754. doi: 10.1155/2022/8704754. eCollection 2022.	Characterization of perfluorohexane sulfonate (PFHxS) isomers, a chemical proposed for listing under the Stockholm Convention, is important to elucidate its environmental behaviors and sources. Optimized chromatographic separation coupled with monitoring of the characteristic fragments enabled the identification of four mono-substituted and two di-substituted branched PFHxS isomers. The transitions of molecular ions m/z 399 to the fragments m/z 80 (n-), m/z 169 (iso-), m/z 319 (1m-), m/z 80 (2m-), and m/z 180 (3m-) were selected for quantifying the mono-substituted isomers. Method accuracy of the established LC-MS/MS was verified by comparing the results of technical products with those determined by (19)F-nuclear magnetic resonance (NMR). The developed method was then used to quantify the isomeric compositions of PFHxS in the perfluorooctane sulfonate (PFOS) industrial products which contained PFHxS as an impurity, as well as in several kinds of water samples, with the limits of detection for all isomers in the range of 4 to 30 pg/L. For the first time, a liquid chromatography-tandem mass spectrometry method was established to separate and quantify the PFHxS isomers. The isomeric profiling of water samples suggested that PFHxS in the waters was mainly due to the direct contamination of PFHxS rather than from PFOS contamination.			-
D22	分析	Frigerio, Gianfranco; Cafagna, Simone; Polledri, Elisa; Mercadante, Rosa; Fustinoni, Silvia	Development and validation of an LC-MS/MS method for the quantitation of 30 legacy and emerging per- and polyfluoroalkyl substances (PFASs) in human plasma, including HFPO-DA, DONA, and cC6O4	2022	Anal Bioanal Chem. 2022 Jan;414(3):1259-1278. doi: 10.1007/s00216-021-03762-1. Epub 2021 Dec 15.	Per- and polyfluoroalkyl substances (PFASs) include persistent organic pollutants whose spread is still ubiquitous. Efforts to substitute substances of high concern with fluorinated alternatives, such as HFPO-DA (GenX), DONA (ADONA), and cC604, have been made. The aim of this work was to develop and validate an isotopic dilution liquid chromatography-tandem mass spectrometry (LC-MS/MS) method suitable to quantify 30 PFASs in human plasma. Analytes included legacy PFASs (PFOA, PFOS, and PFHxS), fluorinated alternatives (PFBA, PFBS, 6:2 FTSA, HFPO-DA, DONA, and cC604), and newly identified compounds (F-53B and PFECHS). The sample preparation was rapid and consisted of simple protein precipitation and centrifugation. Calibration standards and quality control solutions were prepared with a human pooled plasma containing relatively low background levels of the considered analytes. A complete validation was carried out: the lower limits of quantitation (LLOQs) ranged from 0.009 to 0.245 μg/L; suitable linearity (determination coefficients, R(2) 0.989-0.999), precision (2.0-19.5%, relative standard deviation), and accuracy (87.9-113.1% of theoretical) were obtained for considered concentration ranges. No significant variations of analyte responses were recorded under investigated storage conditions and during matrix effect tests. The external verification confirmed the accuracy of the method, although limited to 12 analytes. The method was also applied to 38 human plasma samples to confirm its applicability. The developed assay is suitable for large-scale analyses of a wide range of legacy and emerging PFASs in human plasma. To our knowledge, this is the first published method including cC604 for human biomonitoring.			-
D23	分析	Olomukoro, Aghogho A; Emmons, Ronald V; Godage, Nipunika H; Cudjoe, Erasmus; Gionfriddo, Emanuela	lon exchange solid phase microextraction coupled to liquid chromatography/laminar flow tandem mass spectrometry for the determination of perfluoroalkyl substances in water samples	2021	J Chromatogr A. 2021 Aug 16;1651:462335. doi: 10.1016/j.chroma.2021.462335. Epub 2021 Jun 9.	Per- and polyfluoroalkyl substances (PFAS) are toxic and bioaccumulative compounds that are persistent in the environment due to their water and heat resistant properties. These compounds have been demonstrated to be ubiquitous in the environment, being found in water, soil, air and various biological matrices. The determination of PFAS at ultra-trace levels is thus critical to assess the extent of contamination in a particular matrix. In this work, solid phase microextraction (SPME) was evaluated as a pre-concentration technique to aid the quantitation of this class of pollutants below the EPA established advisory limits in drinking water at parts-per-trillion levels. Four model PFAS with varying physicochemical properties, namely hexafluoropropylene oxide dimer acid (GenX), perfluoro-1- butanesulfonate (PFBS), perfluoro-n-octanoic acid (PFOA) and perfluoro-1-octanesulfonate (PFOS) were studied as a proof of concept. Analysis was performed with the use of ultra-high pressure liquid chromatography-laminar flow tandem mass spectrometry (UHPLC-MS/MS). This study proposes the use of hydrophilic-lipophilic balance-weak anion-exchange/polyacrylonitrile (HLB-WAX/PAN) as a SPME coating, ideal for all model analytes. A sample volume of 1.5 mL was used for analysis, the optimized protocol including 20 min extraction, 20 min desorption and 6 min LC/MS analysis. This method achieved LOQs of 2.5 ng L(-) (1) (PFOS) and 1 ng L (-) (1) (GenX, PFBS and PFOA) with satisfactory precision and accuracy values evaluated over a period of 5 days.			-

分野 タイトル 発行年 書誌情報 要旨 (原文) No 著者 (参考) Per- and polyfluoroalkyl substances (PFASs) pose a significant health threat to humans at th Sahu, Sushant P across the globe, there have been intense efforts to rapidly quantify PFASs in the environme Kole, Subarna; Rapid and Direct Perfluorooctanoic Acid Sensing with This work reports an electrochemical sensor with a selective perfluorinated anion exchange Selective Ionomer Coatings on Screen-Printed ACS Omega. 2022 Feb 3;7(6):5001-5007. doi: Arges. 2022 ACS Officea. 2022 . 35 57. (7) 10.1021/acsomega.1c05847. eCollection 2022 Feb 15. D24 分析 sensing of perfluorooctanoic acid (PFOA)-a type of PFAS. Notably, the sensor operates with Christopher G: Electrodes under Environmentally Relevant a limit of detection around 6.51 \pm 0.2 ppb (15 nM) in buffered deionized water and drinking Gartia, Manas Concentrations different ionomer electrode coatings, it was inferred that the PFAEI favors PFOA anions ove Ranjan through a combination of electrostatic and van der Waal interactions. Per- and poly-fluorinated substances (PFASs) are man-made chemicals that have been use end up in the food chain. New opinions on the risk assessment were recently published by the emphasising the need for more sensitive methods. From this, minimum required LOQs for th milk and egg have been calculated for perfluorooctanoic acid (PFOA) and GenX (hexafluorop A fully validated method is described for analysis of 13 PFASs, including PFOA and HFPO-D. Berendsen, B. Food Addit Contam Part A Chem Anal Control Expo Risk except perfluorodecane sulphonate (PFDS), can be quantitatively determined in these matri-A: Lakraoui, F: The analysis of perfluoroalkyl substances at ppt level 分析 D25 2020 Assess. 2020 Oct;37(10):1707-1718. doi: to 119% and a relative within-laboratory reproducibility between 12% and 41%. Also the metl Leenders, L; van in milk and egg using UHPLC-MS/MS 10.1080/19440049.2020.1794053. Epub 2020 Jul 27. the identity of the individual PFASs. The LOQ for HFPO-DA in milk and egg is 0.05 ng g(-1), Leeuwen, SP. LOQ. For PFOA in egg the determined LOQ is 0.025 ng g(-1), nicely below the required level LOQ was not achieved: 0.005 instead of 0.003 ng g(-1). However, on six out of eight days an demonstrated. It is concluded that the required LOQs are achievable when instrument perfor method can be expanded with long chain PFASs by using a cellulose filter instead of the PT was applied for a small-scale study in The Netherlands. Chromatographic retention factors (k) and mass spectral fragmentation patterns of per- and were determined using the optimized parameters in liquid chromatography with tandem high HRMS) analysis. Characteristic fragment ions obtained at various collision energies (MS(2) Guardian, Mary determine the structures of newly discovered (emerging) PFASs detected from industrial eff Grace E: Antle. Moreover, COnductor-like Screening MOdel for Realistic Solvents (COSMO-RS) derived octa Resolving unknown isomers of emerging per- and Ionathan P polyfluoroalkyl substances (PFASs) in environmenta J Hazard Mater. 2021 Jan 15;402:123478. doi: (K(ow)), along with mean isotropic polarizabilities calculated from Density Functional Theorem 2021 10.1016/j.jhazmat.2020.123478. Epub 2020 Jul 16. D26 分析 Vexelman, Paul amples using COSMO-RS-derived retention factor against their experimental k values (k(exp)) to obtain a multivariable regression model that A; Aga, Diana S; and mass fragmentation patterns unknown PFASs. The k values of different structural isomers of unknown PFASs were calcu Simpson, Scott predicted k value for the isomer that matches the MS(2) fragmentation observed was found study demonstrates the applicability of an approach that combines the observed MS(2) frag together with computationally-derived log K(ow) and polarizabilities, in assigning the structu environmentally relevant conditions when no reference standards are available. Per- and polyfluoroalkyl substances (PFASs) are man-made chemicals that have been ident widespread occurrence, including in food, is a potential concern for consumers. This work fo Sznajder-Katarzy and reliable analytical method for the simultaneous determination of ten perfluoroalkyl acids ńska, Katarzyna and oils). The perfluoroalkyl substances were extracted by the QuEChERS method, based or Surma. Determination of perfluoroalkyl substances (PFASs) ir Food Res Int. 2020 Nov;137:109583. doi: using styrene-divinylbenzene bulk sorbent, and quantitatively analysed by micro-high perfor 2020 10.1016/j.foodres.2020.109583. Epub 2020 Jul 23. 分析 Magdalena; D27 mass spectrometry. Recoveries ranged from 72 to 104% with an acceptable relative standard fats and oils by QuEChERS/micro-HPLC-MS/MS Wiczkowski. quantification were within the range 0.002-0.075 ng/g depending on the perfluoroalkyl comp Wiesław; Piskuła compound in fat and oil food samples was perfluorooctanoic acid (PFOA) with a detection f Mariusz levels were found for perfluorobutanoic acid (PFBA). The estimated exposure to PFOA, whic TWI for the EU and Polish population, respectively, is relatively high and indicates a potentia Here we report a highly efficient PFAS preconcentration method that uses anodically genera preconcentrate PFAS via aerosol formation, achieving ~ 1400-fold enrichment of PFOS and 20 min. This new method improves the enrichment factor by 15 to 105% relative to the previgenerated H(2) bubbles. The shrinking gas bubbles are in situ electrogenerated by oxidizing Ranaweera Highly efficient preconcentration using anodically H(+) produced by water oxidation reacts with HCO(3)(-) to generate CO(2) gas, forming gas Ruchiranga; An, Anal Bioanal Chem. 2022 Jun 21. doi: 10.1007/s00216-022-2022 04175-4. Online ahead of print. 分析 D28 generated shrinking gas bubbles for per- and and CO(2). Due to the high solubility of CO(2) in aqueous solutions, the CO(2)/O(2) bubbles Shizhong; Cao, polyfluoroalkyl substances (PFAS) detection electrode surface region. A mechanistic study reveals two reasons for the improvement: (1) Yue; Luo, Long enrichment rate, and (2) the attractive interactions between the positively charged anode ar high enrichment at zero bubble path length. Based on this preconcentration method, we der PFOA and PFOS in water in $\,\sim\,$ 20 min by coupling it with our bubble-nucleation-based dete US Environmental Protection Agency

	備考	出 対 象 抽	ン 文 ク 献 ① ラ	ン 文 ク 献 ② ラ
race levels. Because of its ubiquity ent while also mitigating their release. ionomer (PFAEI) coating for direct out the need of redox probes and has water. By testing the sensor with r other competing anions in solution			-	
d for a variety of applications and can he European Food Safety Authority, he analytical method for analysis of propylene oxide dimer acid, HFPO-DA). A, in milk and egg. All compounds, ces with a trueness ranging from 87% hod proved suitable for confirmation of well below the calculated required of 0.03 ng g(-1). In milk the required LOQ of 0.0025 ng g(-1) was rmance is optimal. The current FE filter vials. The presented method			-	
I polyfluoroalkyl substances (PFASs) n-resolution mass spectrometry (LC- fragmentation) were used to luent and surface water samples. anol-water partition coefficients y (DFT), of known PFASs were plotted can be used to predict k values of lated and compared to k(exp.) The to be within 4.2 % of k(exp). This mentation patterns and k values, ures of unknown PFASs at			-	
ified as global pollutants. Their ocuses on the application of a simple is in highly complex fatty matrices (fats in the dispersive-Solid Phase Extraction mance liquid chromatography tandem d deviation below 10%. Limits of round. The most predominant equency of 100%, and the highest wh was 46% and 19% of the existing al risk to human health.			-	
ted shrinking gas bubbles to d PFOA-the two most common PFAS-in ous method that uses cathodically water in an NH(4)HCO(3) solution. bubbles containing a mixture of O(2) start shrinking when they leave the shrinking bubbles increase the ind negatively charged PFAS provide monstrate the detection of \geq 70 mg/L ction method, fulfilling the need of the			-	

パーフルオロ化合物に係る国際機関等の評価及び科学的知見の情報収集並びに整理 別添-2 文献データベース文献リスト

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨 (原文)		出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D29	分析	Genualdi, Susan; Young, Wendy; DeJager, Lowri; Begley, Timothy	Method Development and Validation of Per- and Polyfluoroalkyl Substances in Foods from FDA's Total Diet Study Program	2023	J Agric Food Chem. 2021 May 26;69(20):5599-5606. doi: 10.1021/acs.jafc.1c01777. Epub 2021 May 13.	Human exposure to per- and polyfluoroalkyl substances (PFAS) through the US diet has not been well-characterized. Highly consumed foods are routinely monitored through FDA's Total Diet Study program. Portions of these samples were used to develop and validate a method for PFAS in a wide variety of foods. The extraction of 16 PFAS was performed using the quick, easy, cheap, effective, rugged, and safe (QuEChERS) method and analyzed by liquid chromatography/mass spectrometry. Method optimizations are described including investigations into the QuEChERS sorbents, matrix effects, and solid-phase extraction (SPE) cartridges. The use of a custom push-through SPE cartridge showed promising results as a rapid cleanup option for food samples. Challenges in ion confirmation are discussed, and the use of enhanced product ion (EPI) full-scan MS/MS spectra is presented as a potential option for verifying false positives. The validated method was then used for the analysis of 179 total diet study samples, and positive detects for perfluorooctanesulfonic acid (PFOS) were found in two fish and one meat sample.		-
D30	分析	Genualdi, Susan; Beekman, Jessica; Carlos, Katherine; Fisher, Christine M; Young, Wendy; DeJager, Lowri; Begley, Timothy	Analysis of per- and poly-fluoroalkyl substances (PFAS) in processed foods from FDA's Total Diet Study	2022	Anal Bioanal Chem. 2022 Jan;414(3):1189-1199. doi: 10.1007/s00216-021-03610-2. Epub 2021 Aug 26.	Additional occurrence data are needed to better understand human exposure to per- and poly-fluoroalkyl substances (PFAS) from commercially available foods in the United States. The Food and Drug Administration's (FDA) Total Diet Study (TDS) collects foods that are both nationally and regionally distributed. In 2018, 172 processed foods were collected from grocery stores around Lenexa, KS, as part of the TDS national collection. A previously developed method for the analysis of PFAS in foods as part of the TDS regional collection was modified and optimized for these samples. This method was single lab validated using 5 different matrices and method detection limits were calculated. During the analysis of these samples, challenges arose with method blanks and further investigation into statistical methods to distinguish between blank and sample concentrations were done. The confirmation of two short chain PFAS, perfluorobutanoic acid (PFBA) and perfluoropentanoic acid (PFPeA), was not possible using triple quadrupole mass spectrometry and a confirmation method was developed using high-resolution mass spectrometry. This technique was also used to investigate potential detections of perfluorooctanesulfonic acid (PFOS) and perfluorononanoic acid (PFNA) were found in frozen fish sticks/patties, PFOS and perfluorodecanoic acid (PFDA) in canned tuna, and PFOS in protein powder. Concentrations were all below 150 ppt, and no other detects were confirmed above the method detection limits in any other foods.		-
D31	分析	Ryu, Heejeong; Li, Baikun; De Guise, Sylvain; McCutcheon, Jeffrey; Lei, Yu	Recent progress in the detection of emerging contaminants PFASs	2023	J Hazard Mater. 2021 Apr 15;408:124437. doi: 10.1016/j.jhazmat.2020.124437. Epub 2020 Nov 1.	As an emerging contaminant, per- and polyfluoroalkyl substances (PFASs) make up a large group of persistent anthropogenic chemicals, which are difficult to degrade in the environment. Notwithstanding their wide range of applications in consumer products and industrial processes, PFASs have been detected in the environment as well as in human body. Due to their potential adverse human health effects, the U.S. Environmental Protection Agency (EPA) set the combined concentration of PFOA and PFOS in drinking water at 70 ng/L or 70 ppt (parts per trillion) as a lifetime health advisory level. Current standard detection methods for PFASs heavily rely on chromatographic techniques coupled with mass spectrometry. Although these methods provide accurate, specific, and sensitive measurements, their applications are greatly limited in advanced analytical laboratories because it necessitates expensive instrumentations, professional operators, complicated sample pretreatment, and considerable analysis time. Therefore, other detection methods beyond chromatographic based techniques, such as optical and electrochemical techniques, have also been extensively explored for simple, accessible, inexpensive, rapid, and sensitive detection of PFASs, particularly PFOA and PFOS. The purpose of this review is to provide recent progress in alternative detection platforms relying on non-MS based techniques for PFASs detection methods are grouped and discussed based on the difference of signals, with an emphasis on the working principles of different techniques, the sensing mechanism, and the sensing performance. The review is closed with the conclusion and discussion of future trends.		-
D32	分析	Yin, Hua-Qing; Tan, Kui; Jensen, Stephanie; Teat, Simon J; Ullah, Saif; Hei, Xiuze; Velasco, Ever; Oyekan, Kolade; Meyer, Noah; Wang, Xin-Yao; Thonhauser, Timo; Yin, Xue- Bo; Li, Jing	A switchable sensor and scavenger: detection and removal of fluorinated chemical species by a luminescent metal-organic framework	2023	Chem Sci. 2021 Sep 30;12(42):14189-14197. doi: 10.1039/d1sc04070g. eCollection 2021 Nov 3.	Fluorosis has been regarded as a worldwide disease that seriously diminishes the quality of life through skeletal embrittlement and hepatic damage. Effective detection and removal of fluorinated chemical species such as fluoride ions (F(-)) and perfluorooctanoic acid (PFOA) from drinking water are of great importance for the sake of human health. Aiming to develop water- stable, highly selective and sensitive fluorine sensors, we have designed a new luminescent MOF In(tcpp) using a chromophore ligand 2,3,5,6-tetrakis(4-carboxyphenyl)pyrazine (H(4)tcpp). In(tcpp) exhibits high sensitivity and selectivity for turn-on detection of F(-) and turn-off detection of PFOA with a detection limit of 1.3 μ g L(-1) and 19 μ g L(-1), respectively. In(tcpp) also shows high recyclability and can be reused multiple times for F(-) detection. The mechanisms of interaction between In(tcpp) and the analytes are investigated by several experiments and DFT calculations. These studies reveal insightful information concerning the nature of F(-) and PFOA binding within the MOF structure. In addition, In(tcpp) also acts as an efficient adsorbent for the removal of F(-) (36.7 mg g(-1)) and PFOA (980.0 mg g(-1)). It is the first material that is not only capable of switchable sensing of F(-) and PFOA but also competent for removing the pollutants via different functional groups.		

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン 文 ン 文 ク 献 ク 献 ① ラ ② ラ
D33	分析	Fu, Qiuguo; Meyer, Corina; Patrick, Michael; Kosfeld, Verena; Rüdel, Heinz; Koschorreck, Jan; Hollender, Juliane	Comprehensive screening of polar emerging organic contaminants including PFASs and evaluation of the trophic transfer behavior in a freshwater food web	2022	Water Res. 2022 Jun 30;218:118514. doi: 10.1016/j.watres.2022.118514. Epub 2022 Apr 25.	Bioaccumulation and trophic transfer of persistent legacy contaminants have been intensively characterized, but little is known on the contaminants of emerging concern (CECs) in freshwater food webs. Herein, we comprehensively screened CECs with a focus on polar substances and further evaluated their trophic transfer behavior in selected items from the food web of Lake Templin, Germany. Weselected one plankton, two mussel, and nine fish samples covering three trophic levels. With an effective multiresidue sample preparation method and high-resolution mass spectrometry-based target, suspect, and non-target screening, we characterized 477 targets and further screened unknown features in complex biota matrices. Of the 477 targets, 145 were detected and quantified in at least one species (0.02-3640 ng/g, dry weight). Additionally, the suspect and non-target analysis with experimental mass spectra libraries and in silico techniques (MetFrag and SIRIUS4/CSI:FingerID) enabled further identification of 27 unknown compounds with 19 confirmed by reference standards. Overall, the detected compounds belong to a diverse group of chemicals, including 71 pharmaceuticals, 27 metabolites, 26 pesticides, 16 per- and polyfluoroalkyl substances (PFASs), 4 plasticizers, 3 flame retardants, 11 other industrial chemicals and 14 others. Moreover, we determined the trophic magnification factor (TMF) of 34 polar CECs with >80% detection frequency, among which 6 PFASs including perfluorooctane sulfonic acid (PFTeA), and perfluoroundecanoic acid (PFUnA), exhibited biomagnification potential (TMF =1.8 - 4.2, p < 0.05), whereas 5 pharmaceuticals (phenazone, progesterone, venlafaxine, levamisole, and lidocaine) and 1 personal care product metabolite (galaxolidone) showed biodilution potential (TMF = 0.4 - 0.6, p < 0.05).			-
D34	分析	Phung, Thi Vi; Nguyen, Thuy Ngoc; Phan Thi, Lan-Anh; Pham, Hung Viet; Duong, Hong Anh	Determination of Per- and Polyfluoroalkyl Substances in Craft Villages and Industrial Environments of Vietnam	2021	J Anal Methods Chem. 2021 Apr 21;2021:5564994. doi: 10.1155/2021/5564994. eCollection 2021.	Per- and polyfluoroalkyl substances (PFASs) have attracted great concern because of their great recalcitrant nature and harmful environmental health effects. Eight PFASs in wastewater from craft villages and industrial environments of Vietnam were analyzed using liquid chromatography triple quadrupole mass spectrometry (LC-MS/MS) with negative electrospray ionization interface. For analysis of PFASs, percent recoveries ranged from 87 to 112, and MQL varied from 0.19 ng/L to 0.49 ng/L. Treated wastewater samples from eight metal-plating and eight textile-dyeing factories were collected for analysis of PFASs. Concentrations of PFOS in wastewater samples obtained from metal-plating factories with decorative plating stage were found at a range of 0.73-18.91 ng/L. For textile-dyeing factories, PFOA and/or PFHxA, which were present in all effluent wastewater samples, varied from 0.37 to 15.96 ng/L and 1.07 to 43.58 ng/L, respectively. Sixty surface water samples in four locations of the textile dyeing craft villages, a recycling plastic village, a paper recycling village, and 10 river water samples in the control area (a rural area without specific waste sources) were collected and analyzed for PFASs. The total concentrations of eight PFASs in surface water samples of craft villages ranged from 0.83 to 58.2 ng/L, which were significantly higher than those in the control area. PFOA, PFHxA, and PFOS are the three most dominant congeners in wastewater taken from craft villages with the highest concentrations of 27.4, 23.8, and 7.36 ng/L, respectively. The environmental risks posed by PFASs in surface water from craft villages were found at a range of 27.4, 23.8, and 7.36 ng/L, respectively. The environmental risks posed by PFASs in surface water from craft villages of extremely low to low level, particularly a few points have high ecological risks			-
D35	分析	Place, Benjamin J	Development of a Data Analysis Tool to Determine the Measurement Variability of Consensus Mass Spectra	2021	J Am Soc Mass Spectrom. 2021 Mar 3;32(3):707-715. doi: 10.1021/jasms.0c00423. Epub 2021 Feb 16.	The success of nontargeted analysis often depends on libraries containing reference mass spectra of known chemical compounds; the mass spectra of unknown compounds are compared to these reference mass spectra, leading to a probable compound identity. Typical calculations include the mean measured values for each ion m/z and intensity with no estimation of the variability of the measurement. This study presents a novel tool for the calculation of the variability of a measured mass spectrum, including the various data parameters that can impact the measured variability. Using perfluorooctanoic acid (PFOA) as the model compound, the variability of measured data-dependent fragmentation mass spectra (ddMS2) was calculated within replicate measurements of a simple solution of PFOA and a complex mixture (house dust extract) containing PFOA. The variability of the measured ddMS2 for PFOA in the solution and house dust extract were similar, with standard deviations about the measured m/z value ranging from m/z 0.00003 to 0.00015 and the standard deviations about the measured relative intensity units. In addition, the selected parameters for the extraction of ddMS2 from a single analytical run varied between the sample types due to the increased presence of background ions in the house dust extract. Finally, the variability of the ddMS2 spectra for PFOA in both samples was used to calculate a more robust similarity factor, informing the confidence of the identification of unknown compounds.			-
D36	分析	Dilmetz, Brooke A; Hoffmann, Peter; Condina, Mark R	Quantitative Approach Using Matrix-Assisted Laser Desorption/lonization Time-of-Flight (MALDI-ToF) Mass Spectrometry	2021	Methods Mol Biol. 2021;2228:159-166. doi: 10.1007/978-1- 0716-1024-4_12.	Quantitation using mass spectrometry (MS) is a routine approach for multiple analytes, including small molecules and peptides. Electrospray-based MS platforms are typically employed, as they provide highly reproducible outputs for batch processing of multiple samples. Quantitation using matrix-assisted laser desorption/ionization (MALDI) time-of-flight (ToF) mass spectrometry, while less commonly adopted, offers the ability to monitor analytes at significantly higher throughput and lower cost compared with ESI MS. Achieving accurate quantitation using this approach requires the development of appropriate sample preparation, spiking of appropriate internal standards, and acquisition to minimize spot-to-spot variability. Here we describe the preparation of samples for accurate quantitation using MALDI-ToF MS. The methodology presented shows the ability to quantitate perfluorooctanesulfonic acid (PFOS) from contaminated water.			-

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン文 ン文 ク献 ① ラ ② ラ
D37	分析	Guckert, Marc; Scheurer, Marco; Schaffer, Mario; Reemtsma, Thorsten; Nödler, Karsten	Combining target analysis with sum parameters-a comprehensive approach to determine sediment contamination with PFAS and further fluorinated substances	2022	Environ Sci Pollut Res Int. 2022 Dec;29(57):85802-85814. doi: 10.1007/s11356-022-21588-x. Epub 2022 Jun 30.	Recent studies aiming at a fluorine mass balance analysis in sediments combined the determination of extractable organic fluorine (EOF) with target analysis. They reported high fractions of unidentified organic fluorine (UOF) compounds, as the target analysis covers only a limited number of per- and polyfluoroalkyl substances (PFAS). For this reason, in this study, a comprehensive approach was used combining target analysis with an extended PFAS spectrum, the EOF and a modified total oxidisable precursor (TOP) assay, which includes trifluoroacetic acid, to determine the PFAS contamination in sediments (n=41) and suspended solids (n=1) from water bodies in Northern Germany (Lower Saxony). PFAS are ubiquitous in the sediments (detected in 83% of the samples). Perfluorinated carboxylic acids (PFCAs) were found in 64% of the samples; perfluorinated sulfonic acids (PFSAs) were detected less frequently (21%), with the highest concentration observed for perfluoroctanesulfonic acid (PFOS). Levels of precursors and substitutes were lower. Applying the TOP assay resulted in an increase in PFCAs in 43% of the samples analysed. In most cases, target analysis and the TOP assay could not account for the EOF concentrations measured. However, as the fraction of UOF decreased significantly, the application of the TOP assay in fluorine mass balance analysis proved to be an important tool in characterising the PFAS contamination of riverine sediments.			-
D38	分析	Gardiner, Christine; Robuck, Anna; Becanova, Jitka; Cantwell, Mark; Kaserzon, Sarit; Katz, David; Mueller, Jochen; Lohmann, Rainer	Field Validation of a Novel Passive Sampler for Dissolved PFAS in Surface Waters	2022	Environ Toxicol Chem. 2022 Oct;41(10):2375-2385. doi: 10.1002/etc.5431. Epub 2022 Aug 24.	Numerous per- and polyfluoroalkyl substances (PFAS) are of growing concern worldwide due to their ubiquitous presence, bioaccumulation and adverse effects. Surface waters in the United States have displayed elevated concentrations of PFAS, but so far discrete water sampling has been the commonly applied sampling approach. In the present study we field-tested a novel integrative passive sampler, a microporous polyethylene tube, and derived sampling rates (R(s)) for nine PFAS in surface waters. Three sampling campaigns were conducted, deploying polyethylene tube passive samplers in the effluent of two wastewater treatment plant (WWTP) effluents and across Narragansett Bay (Rhode Island, USA) for 1 month each in 2017 and 2018. Passive samplers exhibited linear uptake of PFAS in the WWTP effluents over 16-29 days, with in situ R(s) for nine PFAS ranging from 10 ml day(-1) (perfluoropentanoic acid) to 29 ml day(-1) (perfluorooctanesulfonic acid). Similar sampling rates of 19 ± 4.8 ml day(-1) were observed in estuarine field deployments. Applying these R(s) values in a different WWTP effluent predicted dissolved PFAS concentrations mostly within 50% of their observations in daily composite water samples, except for perfluorobutanoic acid (where predictions from passive samplers were 3 times greater than measured values), perfluorononanoic acid (1.9 times), perfluorodecanoic acid (1.7 times), and perfluoropentanesulfonic acid (0.1 times). These results highlight the potential use of passive samplers as measurement and assessment tools of PFAS in dynamic aquatic environments. Environ Toxicol Chem 2022;41:2375-2385. © 2022 SETAC.			-
D39	分析	Skaggs, Christopher S; Logue, Brian A	Ultratrace analysis of per- and polyfluoroalkyl substances in drinking water using ice concentration linked with extractive stirrer and high performance liquid chromatography - tandem mass spectrometry	2021	J Chromatogr A. 2021 Dec 6;1659:462493. doi: 10.1016/j.chroma.2021.462493. Epub 2021 Aug 25.	Detection of drinking water contaminants is vital to the protection of human health. One group of contaminants that have recently generated serious concerns over health risks are per- and polyfluoroalkyl substances (PFAS). These compounds are very bio- persistent, leading to their detection in all types of water sources, including drinking water. While analysis of drinking water for PFAS is important, it is currently arduous to detect ultratrace levels of these contaminants. Specifically, current ultratrace PFAS analysis methods are difficult, costly, require large sample volumes, and consume relatively large volumes of organic solvent. In the present work, an analytical method using Ice Concentration Linked with Extractive Stirrer (ICECLES) and high performance liquid chromatography-tandem quadrupole mass spectrometry (HPLC-MS/MS), was developed and validated to provide simple and ultratrace analysis of drinking water for 14 PFAS. The method featured a relatively low sample volume requirement (10 mL), automated extraction, minimal matrix effects, and minimal organic solvent use (i.e., the method requires only 50 µL of methanol per sample). The method produced a wide linear range of 0.5 to 500 ng/L, ultratrace limits of detection (0.05 to 0.3 ng/L), and good accuracy and precision (i.e., 87 to 108% accuracy and ≤19% relative standard deviation as a measure of precision). This method was tested on drinking water samples from across the United States and detected at least one PFAS compound in 52 of the 53 drinking water samples tested. Perfluorohexanoic acid (PFHxA), perfluorodecanoic acid, PFHxA, 213 ng/L for PFHA, 213 ng/L for PFHA. Additionally, perfluorononanoic acid, perfluorodecanoic acid, and perfluoroheptanoic acid were each detected in at least one drinking water sample at concentrations > 20 ng/L. The availability of the method presented here allows ultratrace detection of PFAS while circumventing many of the disadvantages of current methods.			-
D40	分析	Chakrabarty, Shubhashis; Shelver, Weilin L; Smith, David J	Electrospray Ionization Inlet Tandem Mass Spectrometry: A Hyphenated Method for the Sensitive Determination of Chemicals in Animal Tissues and Body Fluids	2021	J Am Soc Mass Spectrom. 2021 Jan 6;32(1):14-20. doi: 10.1021/jasms.9b00114. Epub 2020 Feb 20.	This study demonstrates the utility of electrospray ionization inlet mass spectrometry (ESII-MS/MS) for the quantitative determination of analytes in complex animal matrices without chromatographic separation. Veterinary drugs including flunixin, its metabolite 5-hydroxyflunixin, and zilpaterol and persistent organic perfluoroalkyl compounds were determined in incurred plasma, urine, and/or tissue samples. Limits of detection (LOD) of zilpaterol in kidney, liver, lung, and muscle ranged from 0.02 to 0.06 ng/g, whereas the limit of quantitation (LOQ) for zilpaterol in all tissues was 0.1 ng/g. For urinary or plasma flunixin, 5-hydroxyflunixin, and PFOS/PFHxS, LODs ranged from 0.1 to 0.7 ng/mL while the LOQs ranged from 0.4 to 50 ng/mL. Regression coefficients for matrix-matched standard curves were 0.993-0.997, 0.977-0.999, and 0.999 for plasma, tissues, and urine, respectively. Correlations between quantitative results obtained by ESII-MS/MS and LC-MS for flunixin, 5-hydroxyflunixin, and zilpaterol ranged from 0.930 to 0.985. ESII-MS/MS provided rapid, sensitive, and accurate analyses of veterinary drugs and environmental contaminants from complex matrices without chromatographic separation.			-

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D41	分析	Young, Wendy; Wiggins, Stacey; Limm, William; Fisher, Christine M; DeJager, Lowri; Genualdi, Susan	Analysis of Per- and Poly(fluoroalkyl) Substances (PFASs) in Highly Consumed Seafood Products from U.S. Markets	2022	J Agric Food Chem. 2022 Oct 26;70(42):13545-13553. doi: 10.1021/acs.jafc.2c04673. Epub 2022 Oct 17.	Seafood consumption has been identified as one of the major contributors of per- and poly(fluoroalkyl) substances (PFASs) to the human diet. To assess dietary exposure, highly consumed seafood products in the United States were selected for analysis. The analytical method previously used for processed food was extended to include four additional long-chain perfluoroarboxylic acids (PFCAs), which have been reported in seafood samples. This method was single-lab-validated, and method detection limits were reported at 345 ng kg(-1) for perfluorobutanoic acid (PFBA) and 207 ng kg(-1) for perfluoropentanoic acid (PFPeA) and below 100 ng kg(-1) for the rest of the PFAS analytes. The 81 seafood samples (clams, crab, tuna, shrimp, tilapia, cod, salmon, pollock) were analyzed for 20 PFASs using the updated analytical method. Most of the seafood packaging was also analyzed by Fourier transform infrared-attenuated total reflectance (FTIR-ATR) to identify packaging potentially coated with PFASs. None of the packaging samples in this study were identified as having PFASs. A wide range of concentrations was observed among the seafood samples. Such a wide range is consistent with those reported in previous studies. The highest concentrations were reported in clams and crabs, followed by cod, tuna, pollock, tilapia, salmon, and shrimp. Technical perfluoroctanoic acid (PFOA) dominated the profile of the clam samples, which has been consistently found in other clam samples, especially in Asia. Long-chain PFCAs, specifically perfluoroundecanoic (PFUdA) and perfluorododecanoic (PFDoA), were the most frequently detected analytes across all seafood samples. The trends observed are comparable with those in the literature where benthic organisms tend to have the highest PFAS concentrations, followed by lean fish, fatty fish, and aquaculture. The results from this study will be used to prioritize future studies and to inform steps to reduce consumer exposure to PFASs.		-
D42	分析	Chang, Po- Hsiang; Chen, Chien-Yen; Mukhopadhyay, Raj; Chen, Wenhua; Tzou, Yu-Min; Sarkar, Binoy	Novel MOF-808 metal-organic framework as highly efficient adsorbent of perfluorooctane sulfonate in water	2022	J Colloid Interface Sci. 2022 Oct;623:627-636. doi: 10.1016/j.jcis.2022.05.050. Epub 2022 May 11.	Perfluorooctane sulfonate (PFOS) is a highly persistent contaminant of emerging concern causing harmful effects to human and ecosystem health. In this study, a novel MOF-808 metal-organic framework (MOF) was prepared and evaluated for adsorptive removal of PFOS from aqueous solution. The MOF-808 had high specific surface area (SSA; 1610 m(2)/g) and was structurally stable in aqueous medium for 7 days under different pH conditions. The MOF-808 reached PFOS adsorption equilibrium within 30 min (at 500 mg/L initial PFOS) and attained the maximum adsorption capacity of 939 mg/g at pH 4.1 - 5.4 (with 50 - 500 mg/L initial PFOS). The PFOS adsorption capacity of MOF-808 was unaffected at pH 2 to 7, but gradually decreased at pH > 7. High SSA, favorable pore size and abundant active adsorption sites on MOF-808 triggered high PFOS adsorption onto the adsorbent. The PFOS adsorption process was endothermic and spontaneous in nature. Electrostatic interaction between the cationic central cluster ([Zr(6)O(4)(OH)(4)](12+)) of MOF-808 and PFOS anion was identified as the key mechanism of PFOS adsorption onto MOF-808, as evident from the infrared spectroscopic investigation of the adsorbent. This study suggests that MOF-808 can be considered as a highly efficient adsorbent for PFOS removal from water and warrants future research to evaluate the application and performance of the material under wastewater conditions.		-
D43	分析	Fan, Xueqi; Jiang, Yiming; Guan, Xiaoyu; Bao, Yixiang; Gu, Mengbin; Mumtaz, Mehvish; Huang, Jun; Yu, Gang	Determination of total reducible organofluorine in PFAS-impacted aqueous samples based on hydrated electron defluorination	2022	Sci Total Environ. 2022 Jul 10;829:154548. doi: 10.1016/j.scitotenv.2022.154548. Epub 2022 Mar 11.	Per- and polyfluoroalkyl substances (PFASs) is a large group of thousands of anthropogenic chemicals. Recently, measurement of total organic fluorine (TOF) to reflect the total PFASs has been recommended in limits and advisories. In this study, a total reducible organofluorine (TROF) assay is developed based on hydrated electron ($e(aq)(-)$) conversion of PFASs into inorganic fluorine combined with ion chromatograph, which is a common and widespread instrument. The $e(aq)(-)$ is generated in UV/sulfite system with alkaline condition, and the concentration of TROF ($C(F_TROF)$) is the difference of fluoride concentration before and after assay. Method validation uses perfluoroctanesulfonic acid, perfluoroctaneic acid and their main alternatives, and F(-) recoveries are 76.6%-101%, except for perfluorobutanesulfonic acid (48.5%). Method application of TROF assay uses industrial surfactant products and fluorochemical industry-contaminated water, meanwhile, target PFAS analysis and total oxidizable precursors (TOP) assay are concurrently conducted. Concentrations of PFASs detected in target analysis and TOP assay were converted to fluorine equivalents concentrations ($C(F_Target)$ and $C(F_TOP)$). $\Sigma C(F_Target)$ and $\Sigma C(F_TOP)$ account for 0.80%-36% of $C(F_TROF)$ in industrial samples, 0.12%-54% in environmental water and 9.7%-14% in wastewater. The TROF assay can be used to initially judge whether PFASs contamination occurred near a hotspot with known sources. The $C(F_TROF)$ could infer the extent of PFAS contamination in PFAS-impacted samples and estimate the fraction of uncharacterized PFAS.		-

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D44	分析	Trimmel, Simone Vike-Jonas, Kristine; Gonzalez, Susana V; Ciesielski, Tomasz Maciej; Lindstrøm, Ulf; Jenssen, Bjørn Munro; Asimakopoulos, Alexandros G	Rapid Determination of Per- and Polyfluoroalkyl Substances (PFAS) in Harbour Porpoise Liver Tissue by HybridSPE(®)-UPLC(®)-MS/MS	2021	Toxics. 2021 Aug 1;9(8):183. doi: 10.3390/toxics9080183.	A rapid hybrid solid phase extraction (HybridSPE(®)) protocol tailored to ultra-performance liquid chromatography-electrospray ionization tandem mass spectrometry (UPLC(®)-ESI-MS/MS) analysis was developed for the determination of 15 per- and polyfluoroalkyl substances (PFAS) in liver tissue from harbour porpoises (Phocoena phocoena). The HybridSPE(®) technique has been applied in trace concentration bioanalysis, but it was mainly used for liquid biological media until now. In this study, the protocol was applied on tissue matrix, and it demonstrated acceptable absolute recoveries (%) ranging from 44.4 to 89.4%. The chromatographic separation was carried out using a gradient elution program with a total run time of 4 min. The inter-day method precision ranged from 2.15 to 15.4%, and the method limits of detection (LODs) ranged from 0.003 to 0.30 ng/g wet weight (w.w.). A total of 20 liver samples were analyzed to demonstrate the applicability of the developed method in liver tissue from a wildlife species.			-
D45	分析	Taylor, Chloe M; Ellingsen, Theo A; Breadmore, Michael C; Kilah, Nathan L	Porphyrin-based colorimetric sensing of perfluorooctanoic acid as proof of concept for perfluoroalkyl substance detection	2021	Chem Commun (Camb). 2021 Nov 4;57(88):11649-11652. doi: 10.1039/d1cc04903h.	A functionalized porphyrin receptor was prepared to bind perfluorooctanoic acid. UV-Vis spectroscopic analysis showed the receptor gave a rapid colorimetric response that could also be detected visually at environmentally relevant concentrations. Spiked soil samples were used to demonstrate detection of perfluorooctanoic acid without intensive sample pre-treatment or laboratory instrument analysis.			-
D46	分析	Piva, Elena; Fais, Paolo; Cecchetto, Giovanni; Montisci, Massimo; Viel, Guido; Pascali, Jennifer P	Determination of perfluoroalkyl substances (PFAS) in human hair by liquid chromatography-high accurate mass spectrometry (LC-QTOF)	2021	J Chromatogr B Analyt Technol Biomed Life Sci. 2021 May 15;1172:122651. doi: 10.1016/j.jchromb.2021.122651. Epub 2021 Mar 10.	Biomonitoring of perfluoroalkyl substances (PFASs) in hair is conventionally achieved by SPE extraction and liquid chromatography-triple quadrupole analysis, with sensitivities in the range of ng/g. The aim of this study was to develop and validate a rapid method to detect 20 perfluoroalkyl substances (PFASs) in human hair from general populations by SPE purification and liquid-chromatography coupled to accurate mass measurement (LC-QTOF). The obtained sensitivities (LOQ), linearity and RSD accuracies were respectively in the range of 0.07-0.5 ng/g, 0.1 (or 0.2 or 0.5)-10 ng/g, 1-16%. To verify the applicability of the method, 11 hair samples from volunteers were tested. The detected PFAS were PFBA (range 0.24-14.6 ng/g), PFBS (0.496 ng/g), PFOA (range 0.08-0.178 ng/g) and PFOS (<loq-0.239 abundance="" and="" compared="" detection="" determination="" for="" frequency="" g).="" hair="" in="" matrix.<="" method="" ng="" of="" pfas="" previously="" proved="" published="" results="" studies.="" td="" terms="" tested="" the="" useful="" were="" with=""><td></td><td></td><td>-</td></loq-0.239>			-
D47	分析	Barbosa, Marta O; Ribeiro, Rui S; Ribeiro, Ana R L; Pereira, M Fernando R; Silva, Adrián M T	Solid-phase extraction cartridges with multi-walled carbon nanotubes and effect of the oxygen functionalities on the recovery efficiency of organic micropollutants	2020	Sci Rep. 2020 Dec 18;10(1):22304. doi: 10.1038/s41598-020 79244-8.	Pristine and functionalized multi-walled carbon nanotubes (MWCNTs) were investigated as adsorbent materials inside solid- phase extraction (SPE) cartridges for extraction and preconcentration of 8 EU-relevant organic micropollutants (with different pKa and polarity) before chromatographic analysis of surface water. The recoveries obtained were $> 60\%$ for 5/8 target pollutants (acetamiprid, atrazine, carbamazepine, diclofenac, and isoproturon) using a low amount of this reusable adsorbent (50 mg) and an eco-friendly solvent (ethanol) for both conditioning and elution steps. The introduction of oxygenated surface groups in the carbon nanotubes by using a controlled HNO(3) hydrothermal oxidation method, considerably improved the recoveries obtained for PFOS (perfluorooctanesulfonic acid) and methiocarb, which was ascribed to the hydrogen bond adsorption mechanism, but decreased those observed for the pesticide acetamiprid and for two pharmaceuticals (carbamazepine and diclofenac), suggesting $\pi - \pi$ dispersive interactions. Moreover, a good correlation was found between the recovery obtained for methiocarb and the amount of oxygenated surface groups on functionalized MWCNTs, which was mainly attributed to the increase of phenols and carbonyl and quinone groups. Thus, the HNO(3) hydrothermal oxidation method can be used to finely tune the surface chemistry (and texture) of MWCNTs according to the specific micropollutants to be extracted and quantified in real water samples.			-
D48	分析	Miralles-Marco, Ana; Wang, Miaomiao; Park, June-Soo; Gatidou, Georgia; Nika, Maria- Christina; Bialorucki, Samantha; Kalantzi, Olga- Ioanna; Thomaidis, Nikolaos S; Stasinakis, Athanasios S; Petreas. Myrto	Exploring the integrity of targeted PFASs in extracted wastewater samples during transport and storage stages	2021	Chemosphere. 2021 Nov;282:131065. doi: 10.1016/j.chemosphere.2021.131065. Epub 2021 Jun 1.	Little information exists on the effects of shipping and handling on per- and polyfluoroalkyl substances (PFASs) in environmental samples. Thus, we evaluated the integrity of dried wastewater extracts and the sensitivity of our high-resolution mass spectrometry (HRMS) instrument to perform such analyses by monitoring 13 representative PFASs in samples extracted, evaporated, and stored at room temperature up to one month. Relative to zero-day recoveries of six detected PFASs ranged between 94 and 124% (RSD <38%) for influents, between 88 and 126% (RSD <18%) for effluents after 28 days. Larger variabilities are tentatively associated with the lack of specific mass-labeled standards and the interactions between analytes and remaining matrix components over time. In a second stage, a mix of local and international dry-shipped wastewater samples were analyzed and the same PFASs were quantified. Up to six PFASs were identified, with median concentrations ranging from 1.3 (perfluoro butyl sulfonate (PFBS)) to 7.7 ng/L (perfluoro hexanoic acid (PFHxA)) and from 1.5 (PFBS) to 13.8 ng/L (PFHxA) in local influents and effluents respectively; and from 0.7 (perfluoro hexyl sulfonate (PFHxS)) to 52.8 ng/L (PFHxA) and from 0.5 (PFHxS) to 21.4 ng/L (PFHxA) in Greek influents and effluents, respectively. The importance of this study lies on the need to consider the wider recovery shifts and expanded variability ranges of PFASs derived from the transport and storage times of dried extracts, particularly when applied to HRMS and wide-scope screening approaches.			-

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 象抽 ① ラ ② ラ
D49	分析	Bai, Shi; Hu, Anming; Hu, Youjin; Ma, Ying; Obata, Kotaro; Sugioka, Koji	Plasmonic Superstructure Arrays Fabricated by Laser Near-Field Reduction for Wide-Range SERS Analysis of Fluorescent Materials	2022	Nanomaterials (Basel). 2022 Mar 15;12(6):970. doi: 10.3390/nano12060970.	Surface-enhanced Raman scattering (SERS) enables trace-detection for biosensing and environmental monitoring. Optimized enhancement of SERS can be achieved when the energy of the localized surface plasmon resonance (LSPR) is close to the energy of the Raman excitation wavelength. The LSPR can be tuned using a plasmonic superstructure array with controlled periods. In this paper, we develop a new technique based on laser near-field reduction to fabricate a superstructure array, which provides distinct features in the formation of periodic structures with hollow nanoclusters and flexible control of the LSPR in fewer steps than current techniques. Fabrication involves irradiation of a continuous wave laser or femtosecond laser onto a monolayer of self-assembled silica microspheres to grow silver nanoparticles along the silica microsphere surfaces by laser near-field reduction. The LSPR of superstructure array can be flexibly tuned to match the Raman excitation wavelengths from the visible to the infrared regions using different diameters of silica microspheres. The unique nanostructure formed can contribute to an increase in the sensitivity of SERS sensing. The fabricated superstructure array thus offers superior characteristics for the quantitative analysis of fluorescent perfluorooctanoic acid with a wide detection range from 11 ppb to 400 ppm.		-
D50	分析	Dickman, Rebecca A; Aga, Diana S	Efficient workflow for suspect screening analysis to characterize novel and legacy per- and polyfluoroalkyl substances (PFAS) in biosolids	2022	Anal Bioanal Chem. 2022 Jun;414(15):4497-4507. doi: 10.1007/s00216-022-04088-2. Epub 2022 May 24.	Land application of treated sewage sludge (also known as biosolids) is considered a sustainable route of disposal because it reduces waste loading into landfills while improving soil health. However, this waste management practice can introduce contaminants from biosolids, such as per- and polyfluoroalkyl substances (PFAS), into the environment. PFAS have been observed to be taken up by plants, accumulate in humans and animals, and have been linked to various negative health effects. There is limited information on the nature and amounts of PFAS introduced from biosolids that have undergone different treatment processes. Therefore, this study developed analytical techniques to improve the characterization of PFAS in complex biosolid samples. Different clean-up techniques were evaluated and applied to waste-activated sludge (WAS) and lime-stabilized primary solids (PS) prior to targeted analysis and suspect screening of biosolid samples. Using liquid chromatography with high-resolution mass spectrometry, a workflow was developed to achieve parallel quantitative targeted analysis and qualitative suspect screening. This study found that concentrations of individual PFAS (27 targeted analytes) can range from 0.6 to 84.6 ng/g in WAS (average total PFAS = 241.4 ng/g) and from 1.6 to 33.8 ng/g in PS (average total PFAS = 72.1 ng/g). The suspect screening workflow identified seven additional PFAS in the biosolid samples, five of which have not been previously reported in environmental samples. Some of the newly identified compounds are a short-chain polyfluorinated carboxylate (a PFOS replacement), a diphosphate ester (a PFOA precursor), a possible transformation product of carboxylate PFAS, and an imidohydrazide which contains a sulfonate and benzene ring.		-
D51	分析	Gao, Xueyan; Wang, Yuxin; Chen, Dawei; Li, Jingguang; Zhong, Yuxin; Zhao, Yunfeng; Wu, Yongning	On-line solid phase extraction-ultra high performance liquid chromatography-quadrupole/Orbitrap high resolution mass spectrometry determination of per- and polyfluoroalkyl substances in human serum	2022	J Chromatogr B Analyt Technol Biomed Life Sci. 2022 Oct 14;1212:123484. doi: 10.1016/j.jchromb.2022.123484. Online ahead of print.	A rapid, high-performance, and accurate on-line TurboFlow ultra high performance liquid chromatography-quadrupole/Orbitrap high resolution mass spectrometry method was developed for the analysis of 46 per- and polyfluoroalkyl substances (PFAS), including 17 perfluoroalkylcarboxylic acids, 15 perfluoroalkylsulfonates, 3 fluorinated telomer sulfonates, 2 perfluoroalkyl unsaturated carboxylates, 2 perfluorooctanesulfonamidoacetic acid, 3 perfluorooctanesulfonamides, hexafluoropropylene oxide- dimer acid, ammonium 4,8-dioxa-3H-perfluorononanoate, 6:2 chlorinated polyfluorinated ether sulfonate (CI-PFESA), and 8:2 CI- PFESA, in human serum. The TurboFlow column, mobile phase, sample injection volume, loading flow rate, and elution time were optimized. The linearities of matrix calibration curves, method limits of quantification, accuracy and precision were investigated for method validation. Serum samples (50 μ L) were precipitated with acetonitrile and directly injected into the system. The method showed good linearity (R(2) > 0.99), satisfactory recoveries (matrix-spiked recoveries range: 68.9%-115.7%), good precision (relative standard deviation ranges: 1.2%-12.1%) and a low method limit of quantification (0.1-1 ng mL(-1)). The developed method is rapid, accurate and convenient for large-scale biomonitoring of PFAS in humans. Fifty real serum samples from China were analyzed and the results showed that br-perfluorooctanesulfonate (PFOS) accounted for approximately 30% of the Σ PFOS in serum, which suggested there was high exposure to 6:2 CI-PFESA.		-

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン 文 ク 献 ① ラ	ン 文 ク 献 ② ラ
D52	分析	Wu, Chen; Wang, Qi; Chen, Hao; Li, Mengyan	Rapid quantitative analysis and suspect screening of per-and polyfluorinated alkyl substances (PFASs) in aqueous film-forming foams (AFFFs) and municipal wastewater samples by Nano-ESI-HRMS	2022	Water Res. 2022 Jul 1;219:118542. doi: 10.1016/j.watres.2022.118542. Epub 2022 May 3.	A rapid analytical method for per- and polyfluoroalkyl substances (PFASs) combining nano-electrospray ionization and high- resolution mass spectrometry (Nano-ESI-HRMS) was developed and applied to aqueous film-forming foams (AFFFs) and wastewater samples collected from three local wastewater treatment plants (WWTPs). This method exhibited high sensitivity with lower limits of detection (LODs) of 3.2~36.2 ng/L for 22 target PFAS analytes. In AFFF formulations, Nano-ESI-HRMS enabled the first-time detection of trifluoromethanesulfonic acid (TFMS), perfluoroethyl cyclohexanesulfonate (PFECHS), 6:2 fluorotelomer sulfonyl amido sulfonic acid (6:2 FTSAS-SO(2)), N-ammoniopropyl perfluoroalkanesulfonamidopropylsulfonate (N-AmP-FASAPS, n = 3-6), ketone-perfluorooctanesulfonic acid (Keto-PFOS), fluorotelomer unsaturated amide sulfonic acid (FTUAMS, n = 7), and 6:2 fluorotelomer amide (6:2 FTAm). Their structures were verified by the tandem MS analysis using collision-induced dissociation. Further, the combination of absolute and semi-quantification results revealed 16 PFASs from 9 PFAS classes as dominant AFFF constituents, accounting for 88.2~96.5% of the total detected anionic and zwitterionic PFASs, including perfluorinated sulfonic acids (PFSAs, n = 1,4~8), 6:2 fluorotelomer sulfonates (6:2 FTS), fluorotelomer thioether amido sulfonic acid (FTSAS, n = 6,8), fluorotelomer sulfinyl amido sulfonic acid (FTSAS-SO, n = 6,8), N-AmP-FASAPS (n = 6), 6:2 fluorotelomer sulfonamide alkylbetaine (6:2 FTAB), perfluoroalkylsulfonamido amino carboxylate (PFASAC, n = 6), 2- ((perfluoroactyl)thio)acetatic acid (Thio-8:2 FTCA), and 6:2 FTAm. At WWTPs, aerobic and anaerobic biotransformation of PFAS precursors at the aeration tanks and secondary clarifiers were evident by the generation of mid/short-chain perfluoroalkyl acids, such as perfluoroheptanoic acid (PFHpA), perfluorohexanoic acid (PFHxA), perfluoropentanoic acid (FTCAs). Overall, Nano-ESI-HRMS enabled comprehensive PFAS quantitative analysis and suspect screening, applicable			-	
D53	分析	Tian, Lingxi; Guo, Huiqin; Li, Jing; Yan, Liushui; Zhu, Enze; Liu, Xiaoming; Li, Kexin	Fabrication of a near-infrared excitation surface molecular imprinting ratiometric fluorescent probe for sensitive and rapid detecting perfluorooctane sulfonate in complex matrix	2021	J Hazard Mater. 2021 Jul 5;413:125353. doi: 10.1016/j.jhazmat.2021.125353. Epub 2021 Feb 10.	Construction of fluorescent probe for highly sensitive and selective detection of perfluorooctane sulfonate (PFOS) in water and biological samples is a very important strategy in related pollutant monitoring and environmental health risk appraisal. To overcome the drawback of low sensitivity caused by high-back ground signal of the conventional sensor, a molecularly imprinted near-infrared excitation ratiometric fluorescent probe was constructed and employed to determine PFOS. The sensing process was achieved through the selectively recognition of specific cavities in the probe surface with analyte, accompanied by fluorescence quenching due to the photoinduced electron transfer effect between upconversion materials and PFOS. Under optimized experimental conditions, the fluorescence quenching efficiency of the probe has good linearity against the concentrations of PFOS response divided into two segments within linear ranges of 0.001-0.1 nmol/L and 0.1-1 nmol/L, respectively, with low detection limit of 1 pmol/L. Selective experiment results indicate that the C-F chain length plays a dominant role in molecular recognition and high sensitively detection. The fabricated probe shows well detection performance in a wide pH range. Furthermore, real samples analyses indicate that such an efficient fluorescent probe has potentials in PFOS determination in surface water, human serum and egg extract sample analyses.			-	
D54	分析	Luo, Xin-Yue; Zhao, Xuan; Ren, Lin; Wang, Wen- Jia; Yong, Li; Yuan, Yue; Zeng, Hong-Yan; Zou, Xiao-Li	[Study on the Analytical Method of Solid Phase Extraction-Ultra Performance Liquid Chromatography Tandem Quadrupole Linear Ion Trap Mass Spectrometry for 12 Perfluorinated Compounds in Human Urine]	2021	Sichuan Da Xue Xue Bao Yi Xue Ban. 2021 Jul;52(4):679- 685. doi: 10.12182/20210760504.	OBJECTIVE: To establish a method for simultaneous determination of 12 kinds of perfluorinated compounds (PFCs) in human urine based on ultra performance liquid chromatography tandem quadrupole linear ion trap mass spectrometry (UPLC-QTtrap-MS). METHODS: After pH adjustment with 2% formic acid, the urine samples were loaded on a WAX solid phase extraction (SPE) cartridge for extraction, purification and concentration. The eluates were collected, concentrated to dryness under nitrogen, and reconstituted with 10 mmol/L ammonium acetate aqueous solution-methanol (V (water) : V (methanol) = 70:30) before injection. UPLC was performed on a C (18) cartridge, and methanol and 10 mmol/L ammonium acetate aqueous solution was used as mobile phases with gradient elution. QTtrap-MS was operated in multiple reaction monitoring (MRM) mode, and the internal standard calibration curves were applied for quantitative analysis. RESULTS: Good linearity was obtained in the linear range, with the method detection limits and method quantification limits being 0.032 ng/L-6.5 ng/L and 0.10 ng/L-21 ng/L, respectively, for the 12 kinds of PFCs. The spiked recoveries of the 12 kinds of PFCs were 91.5%-114%, with the intra-day precision and the inter-day precision being 0.57%-16.0% and 1.88%-20.1%, respectively. The established method was applied to the determination of 12 kinds of PFCs in the urine samples of primary school students collected in one area. Nine kinds of PFCs were detected in the urine samples in this area. Among the PFCs detected, perfluorobutanesulfonic acid (PFBS) and perfluorocationic acid (PFOA) were the main PFCs found in the student urine samples. CONCLUSION: The method established in this study could be used to simultaneously examine 12 kinds of PFCs in urine. The method combined SPE with isotope internal standard correction and achieved good sensitivity and accuracy.			-	

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 対報 象抽 ①	 ・文 ン 文 ・献 ク 献 ・
D55	分析	Zhu, Hongkai; Kannan, Kurunthachalam	Total oxidizable precursor assay in the determination of perfluoroalkyl acids in textiles collected from the United States	2020	Environ Pollut. 2020 Oct;265(Pt B):114940. doi: 10.1016/j.envpol.2020.114940. Epub 2020 Jun 7.	Per- and polyfluoroalkyl substances (PFASs) are used in specialty/functional textiles to impart oil, water, and stain repellency. Little is known, however, with regard to the occurrence of PFASs in textiles including infant clothing. In this study, 13 perfluoroalkyl acids (PFAAs), comprising four perfluoroalkyl sulfonic acids (PFSAs; C4-C10) and nine perfluoroalkyl carboxylic acids (PFCAs; C4-C12) were determined in 160 textile samples collected from the United States. Two extraction methods, one involving a simple solvent extraction (i.e., before oxidation) and the other with an oxidative treatment (i.e., after oxidation) of textile extracts, were used. The sum concentrations of 13 PFAAs (i.e., Σ PFAA) in textile extracts before oxidation ranged from <lod 63.7="" <math="" to="">\mug/m(2) (<lod-285 3.18="" <math="" a="" g),="" mean="" ng="" of="" value="" with="">\mug/m(2) (14.2 ng/g). Σ PFAA concentrations were the highest in flame retarded textiles (n = 23; mean: 13.3 μg/m(2); 59.4 ng/g), followed by water repellent textiles (n = 56; 2.88 μ g/m(2); 12.9 ng/g) and infant clothes (n = 81; 0.521 μg/m(2); 2.33 ng/g). C4-C10 PFCAs accounted for at least three-quarters of the Σ PFAA content in our textile samples. Textile extracts analyzed after oxidative treatment exhibited Σ PFAA concentrations 10-fold higher than those in extracts analyzed prior to oxidation, which suggested that PFAA precursors are used in textiles. Precursors that generated C4-C5 PFCAs, upon oxidation, were more prevalent than those that yielded PFOA. The calculated dermal exposure doses in infants of PFAAs present in clothes were at least 1-2 orders of magnitude below the reference doses proposed by the United States Environmental Protection Agency. This is the first time that the oxidative treatment was applied in the analysis of PFASs in textiles, and our results suggest the existence of PFCA precursors in textiles.</lod-285></lod>			-
D56	分析	Amziane, Ahmed; Monteau, Fabrice; El Djalil Lalaouna, Abd; Alamir, Barkahom; Le Bizec, Bruno; Dervilly, Gaud	Optimization and validation of a fast supercritical fluid chromatography tandem mass spectrometry method for the quantitative determination of a large set of PFASs in food matrices and human milk	2022	J Chromatogr B Analyt Technol Biomed Life Sci. 2022 Nov 1;1210:123455. doi: 10.1016/j.jchromb.2022.123455. Epub 2022 Sep 11.	An Ultra-High Performance Supercritical Fluid Chromatography coupled with tandem Mass Spectrometry analytical method (UHPSFC-MS/MS) was developed for the determination of 34 perfluoroalkylated substances (PFASs) in food-related matrices. Two parameters (i.e. stationary phase and co-solvent) were selected and optimized using a step-by-step method, while a design of experiment (DoE) method using a central composite design (CCD) was implemented to optimize column temperature, mobile phase flow rate, co-solvent concentration and automated back pressure regulator (ABPR). The Torus 2-PIC column was selected along with ammonium acetate AcoNH(4) as additive in the co-solvent. DoE optimization of both peak width and resolution enabled validating an optimized model (desirability 0.613) and setting column temperature at 38.7 ° C, AcoNH(4) concentration at 8 mM, mobile phase flow rate of 1.9 mL/min and ABPR at 1654 psi. The validated resulting method enabled reaching limits of quantification below 0.2 ng/g (w.w.) for 97 % PFASs in accordance with current EU requirements. The strategy was successfully applied to the characterization of a range (n > 30) of food-related matrices (red meat, poultry meat, eggs, fish and breast milk) collected in Algeria in 2019. PFOA and PFBA were observed as the most frequently detected PFASs, i.e. in 96.96 % and 90.9 % of the samples respectively. The highest concentrations were determined in fishery products up to 4.42 ng/g (w.w.) for PFTeDA and 0.75 ng/g (w.w.) for PFOS.			-
D57	分析	Wang, Hao; Li, Xing; Shao, Mingyuan; Lin, Li; Mu, Tongna; Liu, Yanqin	Simultaneous determination of 9 environmental pollutants including bisphenol A in vegetable oil by solid phase extraction-liquid chromatography-tandem mass spectrometry	2021	Anal Methods. 2021 Aug 12;13(31):3527-3534. doi: 10.1039/d1ay00801c.	In this study, a high performance liquid chromatography-tandem mass spectrometry (HPLC-MS/MS) method with solid phase extraction was established for the simultaneous determination of bisphenol A, bisphenol F, bisphenol S, 4-nonylphenol, n-nonylphenol, octylphenol, n-octylphenol, perfluorooctane sulfonate acid and perfluorooctanoic acid in vegetable oil. The sample was extracted with ammonia acetonitrile solution (1 : 9, V/V) by ultrasonication. And the obtained extract was purified by using a PRIME HLB solid phase extraction column. The identification and quantification of the compounds was performed by liquid chromatography-tandem mass spectrometry in multiple reaction monitoring (MRM) mode. The internal standard method was used for quantitative analysis. Under optimal experimental conditions, the limits of quantitation of bisphenol A, bisphenol F, bisphenol S, 4-nonylphenol, n-nonylphenol, octylphenol and n-octylphenol in vegetable oil were 1.0 μ g kg-1. The limits of quantitation of perfluorooctane sulfonic acid and perfluorooctanoic acid in vegetable oil were 0.1 μ g kg-1. The average spiked recoveries of the method were in the range of 89.2-117.1% with the relative standard deviations (RSD) of 2.9-9.8% (n = 6). This method is sensitive, versatile and reproducible, and is suitable for the simultaneous determination of bisphenol A, bisphenol S, 4-nonylphenol, n-nonylphenol, n-octylphenol, perfluorooctane sulfonate acid and perfluorooctane caid in vegetable oil were 0.1 μ g kg-1. The average spiked recoveries of the method were in the range of 89.2-117.1% with the relative standard deviations (RSD) of 2.9-9.8% (n = 6). This method is sensitive, versatile and reproducible, and is suitable for the simultaneous determination of bisphenol A, bisphenol F, bisphenol S, 4-nonylphenol, n-nonylphenol, n-octylphenol, perfluorooctane sulfonate acid and perfluorooctanoic acid in vegetable oil.			-
D58	分析	Hemida, Mohamed; Ghiasvand, Alireza; Gupta, Vipul; Coates, Lewellwyn J; Gooley, Andrew A; Wirth, Hans-J ürgen; Haddad, Paul R; Paull, Brett	Small-Footprint, Field-Deployable LC/MS System for On-Site Analysis of Per- and Polyfluoroalkyl Substances in Soil	2021	Anal Chem. 2021 Sep 7;93(35):12032-12040. doi: 10.1021/acs.analchem.1c02193. Epub 2021 Aug 26.	Per- and polyfluoroalkyl substances (PFASs) are emerging environmental pollutants of global concern. For rapid field site evaluation, there are very few sensitive, field-deployable analytical techniques. In this work, a portable lightweight capillary liquid chromatography (capLC) system was coupled with a small footprint portable mass spectrometer and configured for field-based applications. Further, an at-site ultrasound-assisted extraction (pUAE) methodology was developed and applied with a portable capLC/mass spectrometry (MS) system for on-site analysis of PFASs in real soil samples. The influential variables on the integration of capLC with MS and on the resolution and signal intensity of the capLC/MS setup were investigated. The important parameters affecting the efficiency of the pUAE method were also studied and optimized using the response surface methodology based on a central composite design. The mean recovery for 11 PFASs ranged from 0.6 to 0.1 ng/g, with wide dynamic ranges (1-600 ng/g) and excellent linearities (R(2) > 0.991). The in-field portable system was benchmarked against a commercial labbased LC-tandem MS (MS/MS) system for the analysis of PFASs in real soil samples, with the results showing good agreement. When deployed to a field site, 12 PFASs were detected and identified in real soil samples at concentrations ranging from 8.1 ng/g (for perfluorooctanesulfonic acid) to 2935.0 ng/g (perfluorohexanesulfonic acid).			-

パーフルオロ化合物に係る国際機関等の評価及び科学的知見の情報収集並びに整理 別添-2 文献データベース文献リスト

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 象抽 ① ラ ② ラ
D59	分析	Vela-Soria, Fernando; Serrano-López, Laura; García- Villanova, Javier; de Haro, Tomás; Olea, Nicolas; Freire, Carmen	HPLC-MS/MS method for the determination of perfluoroalkyl substances in breast milk by combining salt-assisted and dispersive liquid-liquid microextraction	2020	Anal Bioanal Chem. 2020 Nov;412(28):7913-7923. doi: 10.1007/s00216-020-02924-x. Epub 2020 Sep 16.	The widespread use of perfluoroalkyl substances has resulted in the universal exposure of humans to these endocrine-disrupting chemicals, including the exposure of neonates through breastfeeding. The objective of this study was to develop a method to determine 10 perfluoroalkyl substances in breast milk (1-mL aliquot) by combining salt-assisted liquid-liquid extraction with dispersive liquid-liquid microextraction and using high-performance liquid chromatography-tandem mass spectrometry. Chemometric strategies were applied to optimize experimental parameters. The limit of quantification was 20 pg mL(-1) for all analytes, and inter-day variability (evaluated as relative standard deviation) ranged from 8.2 to 13.8%. The method was validated by a recovery assay with spiked samples. Percentage recoveries ranged from 85.9 to 110.8%. The method was satisfactorily applied to assess target compounds in 20 breast milk samples from donors. Perfluorooctanoic acid, perfluorooctane sulfonate, and perfluorohexanoic acid were the most frequently detected analytes. This analytical procedure can provide useful information on newborn's exposure to these xenobiotics.		-
D60	分析	Huerta, Belinda; McHugh, Brendan; Regan, Fiona	Development and application of an LC-MS method to the determination of poly- and perfluoroalkyl substances (PFASs) in drinking, sea and surface water samples	2022	Anal Methods. 2022 Jun 1;14(21):2090-2099. doi: 10.1039/d2ay00300g.	Poly- and perfluoroalkyl substances (PFASs) are a group of synthetic organic surfactants that have become a global concern because of their toxicity and widespread presence in the aquatic environment and organisms globally. In this study, a new analytical method has been developed and validated for the analysis of 15 perfluorinated compounds in different water matrices: river water, drinking water and seawater. Water extraction was performed in anion exchange solid phase extraction cartridges, and extracts were analysed by liquid chromatography in tandem with mass spectrometry. Recoveries for target analytes were between 35 and 120%, depending on the water matrix. Method detection limits were in the range of 0.5-17 ng L(-1). The validated method was applied to the determination of perfluorinated compounds in water samples around Ireland. Eight compounds out of fifteen were detected at least in one sample. Measured concentrations were higher in river water than seawater, and drinking water had the lowest levels, although still detectable for a considerable amount of compounds. The most prevalent compounds were PFPeA, PFOA and PFHxA, present in all types of water, and they had the highest concentrations.		-
D61	分析	Vela-Soria, F; García-Villanova, J; Mustieles, V; de Haro, T; Antignac, J P; Fernandez, M F	Assessment of perfluoroalkyl substances in placenta by coupling salt assisted liquid-liquid extraction with dispersive liquid-liquid microextraction prior to liquid chromatography-tandem mass spectrometry	2021	Talanta. 2021 Jan 1;221:121577. doi: 10.1016/j.talanta.2020.121577. Epub 2020 Aug 26.	The widespread use of perfluoroalkyl substances (PFAS) is resulting in a broad human exposure to these endocrine disrupting chemicals (EDCs), prompting biomonitoring research to evaluate its magnitude and impact, especially during critical windows of exposure such as fetal and perinatal periods. This study was focused on developing a method to determine 10 PFAS in placental tissue by combining salt-assisted liquid-liquid extraction with dispersive liquid-liquid microextraction and using liquid chromatography-tandem mass spectrometry. Chemometric strategies were applied to optimize the experimental parameters. The limit of quantification was 0.02 ng g(-1) for all analytes, and the inter-day variability (as relative standard deviation) ranged from 7.9% to 13.8%. Recoveries ranged from 88.2% to 113.9%. The suitableness of the procedure was demonstrated by assessing the targeted compounds in 20 placenta samples. The highest concentrations were recorded for perfluorooctanoic acid and perfluorooctane sulfonate, with maximum concentrations of 0.62 and 1.02 ng g(-1) and median concentrations of 0.13 and 0.53 ng g(-1), respectively. Median concentrations of the other PFAS ranged from detected values to 0.08 ng g(-1). This analytical procedure yields useful data on fetal exposure to PFAS.		-
D62	分析	Ahmadireskety, Atiye; Da Silva, Bianca Ferreira; Townsend, Timothy G; Yost, Richard A; Solo- Gabriele, Helena M; Bowden, John A	Evaluation of extraction workflows for quantitative analysis of per- and polyfluoroalkyl substances: A case study using soil adjacent to a landfill	2021	Sci Total Environ. 2021 Mar 15;760:143944. doi: 10.1016/j.scitotenv.2020.143944. Epub 2020 Dec 4.	Specific aspects of previously reported extraction workflows, for measurement of per- and polyfluoroalkyl substances (PFAS) in solid matrices, have not been adequately interrogated. The objective of this study was to explore the importance of each workflow step in providing the most appropriate extraction for a comprehensive set of PFAS (51 different species) in soil. We compared different procedures, including two pre-extraction set ups (overnight handling of samples prior to extraction), two extraction solvents (methanol (MeOH), and acetonitrile (ACN)), two extraction solvent volumes (10 mL and 8.5 mL), and two post-extraction cleanup strategies (ENVI-Carb and ion-pair). Of the 51 species targeted, 21 were at quantifiable levels in soil samples collected adjacent to a landfill, of which 13 PFAS were consistently detected among the different extraction workflows. Overall, results showed no significant difference in PFAS concentration between different extraction solvents and cleanup strategies. Perfluoropentanoic acid, perfluorohexanoic acid, and perfluorooctanoic acid had the highest concentrations in all extraction workflows, accounting for nearly 13%, 38%, and 17% of the total monitored PFAS (Σ PFAS), respectively. While final concentration values were similar across methods, recovery and accuracy studies showed that MeOH had the best recovery, with 88% of the isotopically labeled PFAS standards showing extraction recovery within the acceptable range of 80% to 120% (compared to 14% of isotopically labeled PFAS monitored), on average, exhibited higher accuracy (relative error ≤20%) using ENVI-Carb clean up (in comparison with 51% in workflows using ion pair clean up). Results also demonstrated that larger volumes of MeOH (and subsequent re-extractions) did not yield a better recovery, enabling a reduction in overall analysis time and cost in comparison to many published methods.		-

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 対報 象抽 ① ラ	ン 文 ク 献 ② ラ
D63	分析	Barbosa, Marta O; Ribeiro, Rui S; Ribeiro, Ana R L; Pereira, M Fernando R; Silva, Adrián M T	Carbon xerogels combined with nanotubes as solid- phase extraction sorbent to determine metaflumizone and seven other surface and drinking water micropollutants	2021	Sci Rep. 2021 Jul 5;11(1):13817. doi: 10.1038/s41598-021- 93163-2.	Carbon xerogels (CXs) were synthesized by polycondensation of resorcinol and formaldehyde, followed by thermal annealing, and subjected to hydrothermal oxidation. Solid-phase extraction (SPE) cartridges were filled with CXs and tested for extraction of metaflumizone and other seven environmental micropollutants (acetamiprid, atrazine, isoproturon, methiocarb, carbamazepine, diclofenac, and perfluorooctanesulfonic acid) before chromatographic analysis. The recoveries obtained with the pristine CX were low for most analytes, except for metaflumizone ($69 \pm 5\%$). Moreover, it was concluded that the adsorption/desorption process of the micropollutants performed better on CXs with a less acidic surface (i.e., pristine CX). Thus, cartridges were prepared with pristine CX and multi-walled carbon nanotubes (MWCNTs) in a multi-layer configuration. This reusable cartridge was able to simultaneously extract the eight micropollutants and was used to validate an analytical methodology based on SPE followed by ultra-high performance liquid chromatography-tandem mass spectrometry. A widespread occurrence of 6/8 target compounds was observed in surface water collected in rivers supplying three drinking water treatment plants and in the resulting drinking water at the endpoint of each distribution system. Therefore, the first study employing CXs and MWCNTs as sorbent in multi-layer SPE cartridges is herein reported as a proof of concept for determination of multi-class water micropollutants.		-	
D64	分析	Androulakakis, Andreas; Alygizakis, Nikiforos; Gkotsis, Georgios; Nika, Maria-Christina; Nikolopoulou, Varvara; Bizani, Erasmia; Chadwick, Elizabeth; Cincinelli, Alessandra; Claß en, Daniela; Danielsson, Sara; Dekker, Rene W R J; Duke, Guy; Glowacka, Natalia; Jansman, Hugh A	Determination of 56 per- and polyfluoroalkyl substances in top predators and their prey from Northern Europe by LC-MS/MS	2022	Chemosphere. 2022 Jan;287(Pt 2):131775. doi: 10.1016/j.chemosphere.2021.131775. Epub 2021 Aug 10.	Per- and polyfluoroalkyl substances (PFAS) are a group of emerging substances that have proved to be persistent and highly bioaccumulative. They are broadly used in various applications and are known for their long-distance migration and toxicity. In this study, 65 recent specimens of a terrestrial apex predator (Common buzzard), freshwater and marine apex predators (Eurasian otter, harbour porpoise, grey seal, harbour seal) and their potential prey (bream, roach, herring, eelpout) from northern Europe (United Kingdom, Germany, the Netherlands and Sweden) were analyzed for the presence of legacy and emerging PFAS, employing a highly sensitive liquid chromatography electrospray ionization tandem mass spectrometry (LC-ESI-MS/MS) method. 56 compounds from 14 classes were measured; 13 perfluoroalkyl carboxylic acids (PFCAs), 7 perfluoroalkyl sulphonic acids (PFSAs), 3 perfluoroatene sulfonamides (FOSAs), 4 perfluoroalkyl carboxylic acids (PFAAs), 3 perfluoroalkylphosphnic acids (PFPi's), 5 telomer alcohols (FTOHs), 2 mono-substituted polyfluorinated phosphate esters (diPAPs), 6 saturated fluorotelomer acids (FTAS), 3 unsaturated fluorotelomer acids (FTUAs), 2 N-Alkyl perfluoroather sulfonamidoethanols (FOSEs), 3 fluorotelomer sulphonic acids (FFCAs), a perfluoroether carboxylic acids (PFECAs) and 1 chlorinated perfluoroether sulphonic acid (CI-PFESA). All samples were lyophilized before analysis, in order to enhance extraction efficiency, improve the precision and achieve lower detection limits. The analytes were extracted from the dry matrices through generic methods of extraction, using an accelerated solvent extraction (ASE), followed by clean-up through solid phase extraction (SPE). Method detection limits and method quantification limits ranged from 0.02 to 1.25 ng/g wet weight (ww) and from 0.05 to 3.79 ng/g (ww), respectively. Recovery ranged from 0.2 to 20.2 µg/g (ww), whereas in the fish species muscle tissues it ranged from 16 to 325 ng/g (ww). All analyzed specimens were primarily contaminated with PFOS,			
D65	分析	Running, Logan; Atilla-Gokcumen, G Ekin; Aga, Diana S	Development of a Liquid Chromatography-Mass Spectrometry-Based In Vitro Assay to Assess Changes in Steroid Hormones Due to Exposure to Per- and Polyfluoroalkyl Substances	2022	Chem Res Toxicol. 2022 Jul 18;35(7):1277-1288. doi: 10.1021/acs.chemrestox.2c00116. Epub 2022 Jun 13.	Per- and poly-fluorinated substances (PFASs) are organic pollutants that have been linked to numerous health effects, including diabetes, cancers, and dysregulation of the endocrine system. This study aims to develop a liquid chromatography with tandem mass spectrometry (LC-MS/MS) assay to measure changes in 17 hormones in H295R cell line (a steroid producing adrenocortical cells) upon exposure to PFASs. Due to the challenges in the analysis of steroid hormones using electrospray ionization MS, a chemical derivatization method was employed to achieve $0.07-2 \mu g/L$ detection limits in LC-MS/MS. Furthermore, a 10-fold concentration factor through solid-phase extraction (SPE) allows for consistent sub-parts per billion detections. Optimization of the derivatization conditions showed doubly-derivatized products in some hormone analytes, including progesterone, corticosterone, and cortisol, and gave improved ionization efficiency up to 20-fold higher signal than the singly-derivatized product. The use of SPE for sample cleanup to analyze hormones from cellular media using weak anion exchange sorbent yielded 80-100% recovery for the 17 targeted hormones. The method was validated by exposing H295R cells to two known endocrine disruptors, forskolin and prochloraz, which showed expected changes in hormones. An initial exposure of H295R cells with various PFAS standards and their mixtures at 1 μ M showed significant increases in progestogens with some PFAS treatments, which include PFBS, PFHxA, PFOS, PFDA, and PFDS. In addition, modest changes in hormone levels were observed in cells treated with other sulfonated or carboxylated headgroup PFASs. This sensitive LC-MS/MS method for hormone analysis in H295R cells will allow for the investigations of the alterations in the hormone production caused by exposure to various environmental insults in cell-based assays and other in vitro models.		-	

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D66	分析	Stoykova, Petya; Ohkawa, Hideo; Inui, Hideyuki	Simple monitoring of endocrine-disrupting chemicals using transgenic Arabidopsis plants expressing medaka estrogen receptor	2022 Chemosphere. 2022 Jan;286(Pt 1):131633. doi: 10.1016/j.chemosphere.2021.131633. Epub 2021 Jul 22.	Endocrine-disrupting chemicals (EDCs) are widespread contaminants that severely affect the endocrine systems of living organisms. In addition to the conventional instrument-based approaches for quantifying organic pollutants, a monitoring method using transgenic plants has also been proposed. Plants carrying a recombinant receptor gene combined with a reporter gene represent a system for the easy detection of ligands that specifically bind to the receptor molecule. Here, the EDC detection sensitivity of transgenic Arabidopsis plants expressing the medaka (Oryzias latipes) estrogen receptor (mER) and green fluorescent protein (GFP) genes, was assessed. Four transgenic Arabidopsis lines, obtained by transformation with expression plasmids constructed using combinations of two types of the ligand-binding domains of mER, the DNA-binding domain of LexA and the transactivation domain of VP16 in the chimeric receptors, showed significant induction of GFP when germinated on a medium contaminated with 1 ng/mL 4-t-octylphenol (OP). The most sensitive XmEV19-2 plants detected 0.1 ng/mL OP and 1 pg/mL 17 β -estradiol. GFP expression was suppressed by the insecticides imidacloprid and fipronil, whereas perfluorooctanesulfonic acid induced it at 0.1 ng/mL. Experiments with river water-based medium showed that XmEV19-2 can be used for monitoring polluted waters, detecting OP at concentrations as low as 5 ng/mL. Notably, XmEV19-2 showed a significant decrease in root length when grown on 0.1 ng/mL OP. mER transgenic plants can be a promising tool for simple monitoring of EDCs, without the peed for extraction and concentration steps in sample preparation.			-
D67	分析	Liu, Yikun; Zhou, Wei; Sun, Wenqi; Chen, Zilin	Analysis of fluorinated compounds by micellar electrokinetic chromatography - mass spectrometry	2021 ^J Chromatogr A. 2021 May 24;1645:462123. doi: 10.1016/j.chroma.2021.462123. Epub 2021 Apr 1.	 Does, without the field for extraction and concentration steps in sample preparation. Micellar electrokinetic chromatography (MEKC) is a good separation technique with high efficiency, high selectivity and simple preparation process. Hyphenation of MEKC with mass spectrometry (MS) could extend its application in complex sample analysis. However, direct coupling MEKC using commonly used surfactants like sodium dodecyl sulfate (SDS) with ESI-MS will lead to strong signal suppression. In this work, a MEKC-MS method using volatile ammonium perfluorooctanoate as surfactant was developed. The MS compatibility of ammonium perfluorooctanoate was investigated. The result revealed that there is no signal suppression even the concentration of ammonium perfluorooctanoate was up to 300 mM. Meanwhile, we found that ammonium perfluorooctanoate used as surfactant in MEKC provided powerful F-F interaction and hydrophobic interaction, which was beneficial for separation of fluorinated compounds. Using the ammonium perfluorooctanoate based MEKC method, several groups of fluorinated compounds, which cannot be separated using non-fluorinated surfactants like lauric acid and SDS based MEKC method, were baseline separated. Finally, the MEKC-ESI-MS method was successfully applied for analysis of two herbicides including fluometuron and fenuron in lake water samples with high separation efficiency, high sensitivity, good linearity and reproducibility. 			-
D68	分析	Bugsel, Boris; Bauer, Rebecca; Herrmann, Florian; Maier, Martin E; Zwiener, Christian	LC-HRMS screening of per- and polyfluorinated alkyl substances (PFAS) in impregnated paper samples and contaminated soils	Anal Bioanal Chem. 2022 Jan;414(3):1217-1225. doi: 10.1007/s00216-021-03463-9. Epub 2021 Jul 8.	High per- and polyfluorinated alkyl substance (PFAS) concentrations have been detected in agricultural soils in Southwest Germany. Discharges of PFAS-contaminated paper sludge and compost are suspected to be the cause of the contamination. Perfluorinated carboxylic acids (PFCAs) have been detected also in groundwater, drinking water, and plants in this area. Recently, previously unknown compounds have been identified by high-resolution mass spectrometry (HRMS). Major contaminants were polyfluorinated dialkylated phosphate esters (diPAPs) and N-ethyl perfluoroctane sulfonamide ethanol-based phosphate diester (diSAmPAP). In this study, HRMS screening for PFAS was applied to 14 soil samples from the contaminated area and 14 impregnated paper samples which were from a similar period than the contamination. The paper samples were characterized by diPAPs (from 4:2/6:2 to 12:2/12:2), fluorotelomer mercapto alkyl phosphates (FTMAPs; 6:2/6:2 to 10:2/10:2), and diSAmPAP. In soil samples, diPAPs and their transformation products (TPs) were the major contaminants, but also FTMAPs, diSAmPAP, and their TPs occurred. The distribution patterns of the carbon chain lengths of the precursor PFAS in soil samples were shown to resemble those in paper samples. This supports the hypothesis that paper sludge is a major source of contamination. The presence of major degradation products like PFCAs, FTSAs, or PFOS and their distribution of carbon chain lengths indicate the activity of biotic or abiotic degradation processes and selective leaching processes from the upper soil horizons.			-

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D69	分析	Wang, Chunlan; Zhang, Haixuan; Zhu, Li; Hu, Wangxia; Lin, Ziwei	[Simultaneous determination of 11 volatile perfluorinated compound precursors in textiles using gas chromatography-triple quadrupole mass spectrometry]	2021	Se Pu. 2021 Nov;39(11):1239-1246. doi: 10.3724/SP.J.1123.2021.01043.	Perfluorinated compounds (PFCs) are persistent organic compounds. PFCs are artificially prepared hydrocarbons in which hydrogen atoms are completely replaced by fluorine. PFCs have excellent thermal stability and chemical stability, high surface activity, and hydrophobic and/or oleophobic properties owing to their exceptionally strong C-F bonds, low polarizability, and weak intermolecular van der Waals interactions. Currently, PFCs and their precursors are widely used in textile production as finishing agents and surfactants. In recent years, increasing attention has been devoted to PFCs and their precursors. In many countries and regions, such as the European Union, Canada, Denmark, and the United States, directives and regulations have been issued to restrict the use of PFCs and their precursors; the number of these compounds in such lists is increasing continuously. Studies have shown that PFCs are hepatotxic, embryotoxic, reproductive-toxic, neurotoxic, and carcinogenic, and can interfere with the endocrine system, change animal instinct behavior, and potentially induce developmental neurotoxicity in humans, especially in young children. However, there are few established methods for the simultaneous detection of multiple PFC precursors, necessitating the same particularly for textiles. In this study, a method was developed for the simultaneous determination of 11 volatile PFC precursors in textiles using gas chromatography-triple quadrupole tandem mass spectrometry (GC-MS/MS). The target compounds included four fluorotelomer alcohols (FTOHs), three fluorocatnesulfonic acid. Some PFC precursors are converted into perfluorocarboxylic acid, and FOSAs are precursors of perfluorocatnesulfonic acid. Some PFC precursors are converted into perfluorocarboxylic acid and perfluoroalkyl sulfonic acid, which threaten human health and ecological security. In this study, an effective ultrasonic-assisted extraction method for the 11 target compounds was established. The effects of the extraction solvent, extraction temper			-
D70	分析	Li, Mengyuan; Li, Pengfei; Han, Yehong; Han, Dandan; Yan, Hongyuan	Rapid and inexpensive nylon-66-filter solid-phase extraction followed by gas chromatography tandem mass spectrometry for analyzing perfluorinated carboxylic acids in milk	2022	J Chromatogr A. 2022 Aug 16;1677:463288. doi: 10.1016/j.chroma.2022.463288. Epub 2022 Jun 27.	In this study, a new rapid and inexpensive filter solid-phase extraction method (FSPE) was developed for the extraction and separation of five perfluorinated carboxylic acids (PFCAs) (namely, perfluorooctanoic acid, perfluorononanoic acid, perfluorodecanoic acid, and perfluorododecanic acid) from milk samples. Commercial nylon 66 syringe filters were used as adsorbents without additional modification. The proposed method could achieve the fast adsorption of analytes by benefitting from the advantages of using the nylon 66 filter membrane on PFCAs with multiple adsorption interactions, namely, hydrophobic interactions and hydrogen bonds. The FSPE was designed to achieve the rapid isolation of analytes based on the rapid solid-liquid separation while using the solid-phase extraction disk. PFCAs residues in milk were extracted by first flowing the samples through a nylon 66 syringe filter from top to bottom. Double contact desorption with methanol was then accomplished by pulling and pushing the syringe, followed by derivatization with acetyl chloride-methanol. Finally, the extracted PFCAs residues were monitored using gas chromatography-tandem mass spectrometry (GC-MS/MS) quantification. Under optimal conditions, the established method presented good linearity (correlation coefficient ≥ 0.9996), precision (relative standard deviation $\le 13\%$), accuracy (81-105%), sensitivity (limits of quantification: 4-18 ng kg(-1)) and extraction performance (10 min).			-
D71	分析	Musatadi, M; González-Gaya, B; Irazola, M; Prieto, A; Etxebarria, N; Olivares, M; Zuloaga, O	Focused ultrasound-based extraction for target analysis and suspect screening of organic xenobiotics in fish muscle	2020	Sci Total Environ. 2020 Oct 20;740:139894. doi: 10.1016/j.scitotenv.2020.139894. Epub 2020 Jun 4.	The development of multitarget and/or suspect screening methods for the analysis of xenobiotics in fish samples is compulsory due to the lack of works in the literature where a deep evaluation of the variables affecting extraction and clean-up steps is performed. The aim of the present work was to optimize and validate a multitarget (180 compounds) method for the analysis of priority and emerging xenobiotics in fish muscle using focused ultrasound-assisted solid-liquid extraction. From the different extraction solvents studied, a single extraction in cold acetonitrile rendered the best consensus results in terms of absolute recoveries and the number of target compounds extracted. Matrix effect was minimized using commercially available Captiva ND-Lipid filters, which provided clean extracts and satisfactory repeatability compared to other approaches. Absolute recoveries were corrected using matrix-matched calibration and apparent recoveries in the 43%-105%, 73%-131% and 78%-128% ranges were obtained at low (20 ng g(-1)), medium (100 ng g(-1)), and high (200 ng g(-1)) spiking levels, respectively. A 60% of the xenobiotics showed limits of identification lower than 20 ng g(-1). The developed method was successfully applied to the quantification and suspect screening of samples bought in a local market (hake, gilt-head bream, sea bass and prawn) and fished (thicklip grey mullet) at the Urdaibai estuary (north of Spain). Food additives, antiparasitic drugs and PFOS were quantified at ng g(-1) level. Moreover, the targeted method was extended to the suspect screening, revealing the presence of plastic related products (caprolactam, phthalates, polyethylenglycols), pharmaceutical products (albendazole, mebendazole, valpromide) and pesticides or insect repellents (icaridin, myristyl sulfate, nootkatone). Therefore, FUSLE in cold acetonitrile combined with Captiva ND-Lipid filters and liquid chromatography tandem high-resolution mass spectrometry (LC-q-Orbitrap) were successfully applied to both multitarget quantitativ			-

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D72	分析	Bowers, Bailey B; Thornton, Joel A; Sullivan, Ryan C	Evaluation of iodide chemical ionization mass spectrometry for gas and aerosol-phase per- and polyfluoroalkyl substances (PFAS) analysis	2022	Environ Sci Process Impacts. 2022 Oct 3. doi: 10.1039/d2em00275b. Online ahead of print.	Per- and polyfluoroalkyl substances (PFAS) are a class of ultra-persistent anthropogenic contaminants. PFAS are ubiquitous in environmental and built systems, but very few online methods exist for their characterization in atmospheric gases and aerosols. Iodide time-of-flight chemical ionization mass spectrometry (iodide-ToF-CIMS) is a promising technology for online characterization of PFAS in the atmosphere. Previous work using iodide-ToF-CIMS was successful in measuring gas-phase perfluoroalkyl carboxylic acids and fluorotelomer alcohols, but those are just two of the myriad classes of PFAS that are atmospherically relevant. Therefore, our first objective was to test other sample introduction methods coupled to iodide-TOF- CIMS to evaluate its ability to measure a wider suite of PFAS in both gas and aerosol phases. Using a variety of sample introduction techniques, we successfully measured gas-phase fluorotelomer alcohols (FTOHs), gas and aerosol-phase perfluoroalkyl carboxylic acids (PFCAs), and aerosol-phase perfluoroalkyl sulfonic acids and polyfluoroalkyl phosphoric acid diesters (PFSAs and diPAPs). We also determined iodide-ToF-CIMS response factors for these compounds by introducing known quantities using a Filter Inlet for Gases and AEROsols (FIGAERO). These response factors ranged from 400 to 6 × 10(4) ions per nanogram, demonstrating low limits of detection. Furthermore, PFAS are a poorly understood diverse class of molecules that exhibit unusual and often unexpected physicochemical properties due to their highly fluorinated nature. Since detection of PFAS with iodide-ToF-CIMS relies on the analyte molecule to either undergo proton transfer or adduct formation with iodide, understanding PFAS behavior during chemical ionization gives rise to a more fundamental understanding of these compounds. Through voltage scanning experiments and DFT calculations, we found that PFCAs and FTOHs readily form iodide adducts, while PFSAs and diPAPs preferentially undergo proton transfer to iodide. Generally, binding			-	
D73	分析	Miller, Kelsey E; Strynar, Mark J	Improved Tandem Mass Spectrometry Detection and Resolution of Low Molecular Weight Perfluoroalkyl Ether Carboxylic Acid Isomers	2022	Environ Sci Technol Lett. 2022 Aug 3;9(9):747-751. doi: 10.1021/acs.estlett.2c00509.	Per- and polyfluoroalkyl substances (PFAS) are emerging contaminants widely used in a variety of industrial and consumer applications. Due to phasing out legacy PFAS, some manufacturers developed short-chain alternatives like perfluoroalkyl ether carboxylic acids (PFECA). Published liquid chromatography-tandem mass spectrometry (LC-MS/MS) methods cover a wide range of these replacement chemicals including PFMPA (perfluoro-3-methoxypropanoic acid) and PFMBA (perfluoro-4-methoxybutanoic acid). However, many methods do not monitor for their branched isomers, PMPA (perfluoro-2-methoxypropanoic acid) and PEPA (perfluoro-2-ethoxypropanoic acid), respectively. Although these isomers are chromatographically separable under certain conditions, using the common MS/MS transitions for PFMPA ($m/z 229 \rightarrow 85$) and PFMBA ($m/z 279 \rightarrow 85$) can yield low or no detection signals for PMPA and PEPA, thus leading to underestimated values or nondetects. We compared various MS/MS transitions for these isomers and determined the optimal transitions for PMPA ($m/z 185 \rightarrow 85$) and PEPA ($m/z 235 \rightarrow 135$). We applied the developed method to water sampled near two chemical manufacturing plants and observed these analytes, plus a suspected third isomer. Using these MS/MS transitions will ensure all isomers are detected and will lead to better monitoring and exposure estimates of PFECA in humans and the environment.			-	
D74	分析	Huang, Zhenzhen; Liu, Peng; Lin, Xia; Xing, Yudong; Zhou, Yan; Luo, Yuehua; Lee, Hian Kee	Cucurbit(n)uril-functionalized magnetic composite for the dispersive solid-phase extraction of perfluoroalkyl and polyfluoroalkyl substances in environmental samples with determination by ultra-high performance liquid chromatography coupled to Orbitrap high- resolution mass spectrometry	2022	J Chromatogr A. 2022 Jul 5;1674:463151. doi: 10.1016/j.chroma.2022.463151. Epub 2022 May 14.	Perfluoroalkyl and polyfluoroalkyl substances (PFASs) have raised serious public health concerns because of their potential adverse effects in humans as revealed by toxicological and epidemiological research. However, routine monitoring of PFASs is still challenging due to their trace levels in various environmental and biological matrices. In this study, magnetic composite materials based on iron (II, III) oxide (Fe(3)O(4)) with surface functionalization by cucurbit(n)uril (CB(n)) (Fe(3)O(4)@CB(n)) (n = 6, 7, 8), were prepared and evaluated as new adsorbents for the magnetic solid-phase extraction of nine PFASs in lake water, tap water and fish muscle samples. The Fe(3)O(4)@CB(n) was characterized to examine their surface morphologies, sizes magnetism and thermal stability. Featuring good aqueous solution dispersibility, the macrocyclic structure of Fe(3)O(4)@CB(n) was also endowed with strong host-guest interactions, allowing extraction and enrichment capability towards the PFASs in complex matrices. MSPE using Fe(3)O(4)@CB(7) combination with ultra-high performance liquid chromatography coupled to Orbitrap high-resolution mass spectrometry, gave satisfactory quantitative analytical performance with low limits of detection of 0.004-0.04 μ g L(-)(1) and limits of quantification of 0.005-0.1 μ g L(-)(1), linearities ranging from 0.01 to 10 μ g L(-)(1) with high coefficients of determination (R(2) \geq 0.993), and enrichment factors (15-76) for the nine target PFASs. The method proved to be effective for the enrichment and analysis of trace levels of PFASs in genuine environmental water and fish muscle samples, indicating that Fe(3)O(4)@CB(7) has promising applicability as an adsorbent for these contaminants.			-	

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D75	分析	Harris, Keegan J; Munoz, Gabriel; Woo, Vivian; Sauvé, Sé bastien; Rand, Amy A	Targeted and Suspect Screening of Per- and Polyfluoroalkyl Substances in Cosmetics and Personal Care Products	2022	Environ Sci Technol. 2022 Oct 18;56(20):14594-14604. doi: 10.1021/acs.est.2c02660. Epub 2022 Sep 30.	Per- and polyfluoroalkyl substances (PFAS) are anthropogenic chemicals reported in cosmetics and personal care products as ingredients, possible impurities in the raw material manufacturing process, or degradation products. The purpose of this study was to further delineate contributions of these varying PFAS sources to these products. Thirty-eight cosmetics and personal care products were selected and analyzed for polyfluoroalkyl phosphates (PAPs), perfluoroalkyl carboxylic acids (PFCAs), fluorotelomer sulfonic acids (FTSAs), and perfluoroalkyl sulfonic acids (PFSAs) using targeted liquid chromatography tandem mass spectrometry (LC-MS/MS). A subset of products was also subjected to suspect screening using LC-high resolution mass spectrometry (HRMS) for >200 compounds. Results of LC-MS/MS and LC-HRMS indicated a predominant and ubiquitous presence of PAPs (detection frequency 99.7%, mean and median Σ PAPs 1 080 000 and 299 ng/g). Total median PFCA and PFSA concentrations were 3 and 38 times lower, respectively. There were significant correlations (Spearman's correlation coefficients = 0.60-0.81, p < 0.05) between 6:2 PAPs and their biotransformation products. Low levels of other PFAS classes were detected, including those previously measured in wastewater and human blood (e.g., hydrido-PFCAs), and five compounds associated with aqueous film-forming foams. Overall, these data highlight that cosmetics and personal care products can contain a breadth of PFAS at extremely high levels, leading to human and environmental exposure.		-
D76	分析	Fang, Zhou; Li, Yuan; Li, Yanying; Yang, Danxing; Zhang, Hao; Jones, Kevin C; Gu, Cheng; Luo, Jun	Development and Applications of Novel DGT Passive Samplers for Measuring 12 Per- and Polyfluoroalkyl Substances in Natural Waters and Wastewaters	2021	Environ Sci Technol. 2021 Jul 20;55(14):9548-9556. doi: 10.1021/acs.est.0c08092. Epub 2021 Mar 12.	Extensive and long-term use of per- and polyfluoroalkyl substances (PFASs) has caused their widespread distribution in aquatic systems. A new diffusive gradients in thin-films (DGT) passive sampling method based on weak anion exchanger (WAX) binding layer is developed here for monitoring five perfluoroalkyl carboxylic acids (PFCAs), five perfluoroalkanesulfonic acids (PFSAs) and two PFASs (6:2 FTSA and GenX) in waters. Performance of WAX-DGTs was independent of environmental conditions, namely pH (3.03-8.96), ionic strength (1-500 mM), and DOM content (4-30 mg L-1). Diffusion coefficients (D) of the 12 PFASs in the diffusive gels were measured, 9 for the first time. Linear correlations between D and perfluoroalkyl chain lengths (CF2) were established to obtain D for congener chemicals with the similar functional group and structure. The binding capacity of the WAX-DGT sampler was at least 440 μ g PFASs per sampler, sufficient for applications in waters across a wide range of conditions and PFASs concentrations. Successful applications of WAX based DGT samplers in a wastewater treatment plant (WWTP) and three rivers has demonstrated that DGT is a powerful tool for monitoring, surveillance and research of these 12 PFASs in aquatic systems, and can be extended to wider suites of PFs in future.		-
D77	分析	Chow, Steven J; Ojeda, Nadezda; Jacangelo, Joseph G; Schwab, Kellogg J	Detection of ultrashort-chain and other per- and polyfluoroalkyl substances (PFAS) in U.S. bottled water	2021	Water Res. 2021 Aug 1;201:117292. doi: 10.1016/j.watres.2021.117292. Epub 2021 May 27.	Per- and polyfluoroalkyl substances (PFAS) are compounds of emerging concern due to their persistence in the global water cycle and detection in drinking water sources. However, PFAS have been poorly studied in bottled water, especially in the United States. This study investigated the occurrence of PFAS and related factors in 101 uniquely labelled bottled water products for sale in the U.S. Products were screened for 32 target PFAS by solid phase extraction-liquid chromatography-tandem mass spectrometry (SPE-LC-MS/MS). Fifteen of 32 measured analytes were detected, consisting primarily of C3-C10 perfluorocarboxylic acids (PFCA) and C3-C6 and C8 perfluorosulfonic acids (PFSA). PFAS were detected above method detection limits in 39/101 tested products. The Σ 32PFAS concentrations detected were 0.17-18.87 ng/L with a median of 0.98 ng/L; 97% of samples were below 5 ng/L. PFCA (83%) and short-chain perfluoroalkyl acids (PFAA) containing 5 or less CF2 groups (67%) were more prevalent on a mass basis than PFSA and longer-chain PFAA, respectively. Ultrashort-chain PFPrA, measured for the first time in bottled water, accounted for the greatest individual fraction of detected PFAS mass (42%) and was found almost exclusively in products labeled as Spring water. Purified water products contained significantly less PFAS than Spring water products, which was attributed to the use of reverse osmosis (RO) treatment in the majority of Purified waters (25/35) compared to Spring waters (1/45). RO-treated products contained significantly lower Σ 32PFAS, long-chain, short-chain, and PFPrA concentrations than products without RO. Although no enforceable PFAS regulations exist for bottled water in the U.S., the finding that some products approach levels of concern justify a framework for monitoring PFAS in bottled water production.		-
D78	分析	Ye, Tong; Chen, Yu; Fu, Jie; Zhang, Aiqian; Fu, Jianjie	[Perfluoroalkyl and polyfluoroalkyl substances in eggs: analytical methods and their application as pollutant bioindicator]	2021	Se Pu. 2021 Feb;39(2):184-196. doi: 10.3724/SP.J.1123.2020.09023.	Perfluoroalkyl and polyfluoroalkylated substances (PFASs) are environmentally persistent and biomagnified along food chains. They have been widely detected globally, even in the human body, and their potential toxicity has attracted great attention. Eggs are the origin of new life of ovipara and are rich in nutrients, thus they serve as one of the main protein sources for humans. Therefore, the level of pollutants in eggs can affect the reproduction of ovipara, and it is also related to human health by food intake. In recent years, poultry egg samples have been widely used in the assessment of biological and ecological pollution as a non-invasive biota matrix. At the same time, recent studies have used eggs to evaluate the developmental toxicity and associated health risks based on the pollutant levels in egg samples. In this study, the methods of sample pretreatment and instrumental detection of PFASs for egg samples are summarized. In addition, the application of eggs as a pollutants bioindicator of PFASs contamination has been discussed.		-

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 象抽 ① ラ ② ラ
D79	分析	Brase, Richard A; Mullin, Elizabeth J; Spink, David C	Legacy and Emerging Per- and Polyfluoroalkyl Substances: Analytical Techniques, Environmental Fate, and Health Effects	2021	Int J Mol Sci. 2021 Jan 20;22(3):995. doi: 10.3390/ijms22030995.	Due to their unique chemical properties, per- and polyfluoroalkyl substances (PFAS) have been used extensively as industrial surfactants and processing aids. While several types of PFAS have been voluntarily phased out by their manufacturers, these chemicals continue to be of ecological and public health concern due to their persistence in the environment and their presence in living organisms. Moreover, while the compounds referred to as "legacy" PFAS remain in the environment, alternative compounds have emerged as replacements for their legacy predecessors and are now detected in numerous matrices. In this review, we discuss the historical uses of PFAS, recent advances in analytical techniques for analysis of these compounds, and the fate of PFAS in the environment. In addition, we evaluate current biomonitoring studies of human exposure to legacy and emerging PFAS and examine the associations of PFAS exposure with human health impacts, including cancer- and non-cancer-related outcomes. Special focus is given to short-chain perfluoroalkyl acids (PFAAs) and ether-substituted, polyfluoroalkyl alternatives including hexafluoropropylene oxide dimer acid (HFPO-DA; tradename GenX), 4,8-dioxa-3H-perfluorononanoic acid (DONA), and 6:2 chlorinated polyfluoroethersulfonic acid (6:2 Cl-PFESA; tradename F-53B).		-
D80	分析	Deji, Zhuoma; Zhang, Xin; Liu, Peng; Wang, Xin; Abulaiti, Kadila; Huang, Zhenzhen	Electrospun UiO-66-F(4)/polyacrylonitrile nanofibers for efficient extraction of perfluoroalkyl and polyfluoroalkyl substances in environmental media	2022	J Hazard Mater. 2022 May 15;430:128494. doi: 10.1016/j.jhazmat.2022.128494. Epub 2022 Feb 16.	Perfluoroalkyl and polyfluoroalkyl substances (PFASs) are a family of emerging contaminants which are widely present in environment. In this work, novel UiO-66-F4/polyacrylonitrile (UiO-66-F4/PAN) hybrid nanofibers were firstly prepared via blend electrospinning or in-situ growth method for the pipette-tip solid phase extraction of PFASs. Characterizations demonstrate the as-synthesized UiO-66-F4/PAN nanofibers have good chemical and thermal stability, possess large surface area (248 m²/g) and mesoporous framework structure. Several extraction factors including the amount of adsorbent, pH and ionic strength of sample solution, extraction time and eluent were investigated and the optimum conditions are 20 mg of the selected sorbent, adjusting to pH 5 and adding 4% w/v NaCl to sample solution, extraction for 12 min (3 min × 4). The good adsorption affinity of UiO-66- F4/PAN for PFASs can be attributed to the extensive adsorption sites and multiple interactions including hydrophobic interaction, hydrogen bonding and F-F interaction. Low limit of detection (0.008-0.076 µg/L), limit of quantification (0.010-0.163 µg/L) and recoveries (70.84-113.57%) for 9 PFASs with relative standard deviations < 15% were achieved. When applied in the analysis of target PFASs in lake water, tap water, beverage, and shrimp muscle samples, this method could achieve robust and accurate results with sufficient sensitivity for nine PFASs.		-
D81	分析	McDermett, Kaylin S; Guelfo, Jennifer; Anderson, Todd A; Reible, Danny; Jackson, Andrew W	The development of diffusive equilibrium, high- resolution passive samplers to measure perfluoroalkyl substances (PFAS) in groundwater	2022	Chemosphere. 2022 Sep;303(Pt 1):134686. doi: 10.1016/j.chemosphere.2022.134686. Epub 2022 Apr 27.	Per- and poly-fluoroalkyl substances (PFAS) are a group of anthropogenic, highly recalcitrant organic compounds consisting of thousands of individual species that are of increasing importance as groundwater contaminants. In-situ measurements of PFAS would be useful to better understand vertical profiles and mobility, contamination in partially saturated media, and to reduce sampling artifacts associated with groundwater collection and analysis. Diffusive equilibrium, high-resolution passive samplers (HRPPs) can be directly driven (>10 m) in sediments or groundwater. The samplers equilibrate with porewater through diffusion across the sampler membrane, providing high spatial resolution (sample every 20 cm) porewater concentrations of dissolved species. The objective of this study was to develop an HRPP to measure PFAS in contaminated groundwater and saturated media. To achieve this objective, a screening study was conducted to demonstrate quantitative measurement of selected PFAS as well as the kinetics of uptake into a sampler using both nylon and stainless steel membranes. Utilizing the results of the screening study, a prototype sampler was demonstrated in a laboratory flow box. Over a deployment period of 28 days, concentrations of several perfluoroalkyl carboxylic acids (PFCAs), a perfluoroalkyl sulfonate (PFSA), and a precursor PFAS reached equilibrium with porewater (sampler concentration >90 percent of porewater concentration). Application of these samplers could provide improved understanding of the behavior of PFAS in saturated or partially saturated groundwater systems and allow better assessment of fate and transport in the subsurface. Reliable subsurface site characterization will yield robust site assessments, conceptual models, and improve remediation designs as well as increase confidence in post remedial assessments at PFAS-impacted locations.		-
D82	分析	Aro, Rudolf; Eriksson, Ulrika; Kärrman, Anna; Reber, Iris; Yeung, Leo W Y	Combustion ion chromatography for extractable organofluorine analysis	2021	iScience. 2021 Aug 10;24(9):102968. doi: 10.1016/j.isci.2021.102968. eCollection 2021 Sep 24.	Combustion ion chromatography (CIC) has found a role in environmental analytical chemistry for fluorine content analysis. It is used for extractable organofluorine (EOF) analysis to evaluate perfluoroalkyl and polyfluoroalkyl substances (PFASs) and other organofluorine burden. The prevailing assumption has been that all PFASs are incinerated in CIC and matrix components have no impact on this process, but this has not been experimentally evaluated. In this work, the combustion efficiencies of 13 different PFASs were determined (66-110%). A notable difference was observed between calibrating the CIC with inorganic fluorine or organofluorine. Potential interferences from cations and coextracted matrix components from whole blood and surface water samples were evaluated. These observations should be acknowledged when performing EOF analysis using CIC, overlooking either non-100% combustion efficiencies or the differences in calibrating the CIC with inorganic fluorine could lead to underestimating EOF content and through that to misguide policy decisions.		-

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D83	分析	Kaiser, Andreas- Marius; Aro, Rudolf; Kärrman, Anna; Weiss, Stefan; Hartmann, Christina; Uhl, Maria; Forsthuber, Martin; Gundacker, Claudia; Yeung, Leo W Y	Comparison of extraction methods for per- and polyfluoroalkyl substances (PFAS) in human serum and placenta samples-insights into extractable organic fluorine (EOF)	2021	Anal Bioanal Chem. 2021 Jan;413(3):865-876. doi: 10.1007/s00216-020-03041-5. Epub 2020 Nov 19.	Since the detection of per- and polyfluoroalkyl substances (PFAS) in humans and different environmental media in the last two decades, this substance group has attracted a lot of attention as well as increasing concerns. The fluorine mass balance approach, by comparing the levels of targeted PFAS after conversion to fluorine equivalents with those of extractable organic fluorine (EOF), showed the presence of unidentified organofluorine in different environmental samples. Out of the thousands of PFAS in existence, only a very small fraction is included in routine analysis. In recent years, liquid chromatography coupled with tandem-mass spectrometry (LC-MS/MS) has demonstrated the ability to analytically cover a wide spectrum of PFAS. In contrast, conventional extraction methods developed 10 to 15 years ago were only evaluated for a limited number of PFAS. The aim of the present study was to evaluate the advantages and disadvantages of three different extraction methods, adapted from the literatures without further optimization (ion-pair liquid-liquid extraction, solid-phase extraction (SPE), using hydrophilic-lipophilic (HLB) or weak anion exchange (WAX) sorbents), for human biomonitoring of 61 PFAS in serum and placental tissue samples. In addition, levels of EOF were compared among these extraction methods via spiked samples. Results showed that performance, in terms of recovery, differed between the extraction methods for different PFAS; different extraction methods, showed an accordance of 107.6% (± 21.3); the detected perfluoroalkyl acids (PFAAs) in maternal and cord serum samples were in the range of 0.076 to 2.9 ng/mL.Graphical abstract.		-
D84	分析	Tenorio, Raul; Maizel, Andrew C; Schaefer, Charles E; Higgins, Christopher P; Strathmann, Timothy J	Application of High-Resolution Mass Spectrometry to Evaluate UV-Sulfite-Induced Transformations of Per- and Polyfluoroalkyl Substances (PFASs) in Aqueous Film-Forming Foam (AFFF)	2022	Environ Sci Technol. 2022 Oct 18;56(20):14774-14787. doi: 10.1021/acs.est.2c03228. Epub 2022 Sep 26.	UV-sulfite has been shown to effectively degrade per- and polyfluoroalkyl substances (PFASs) in single-solute experiments. We recently reported treatment of 15 PFASs, including perfluoroalkyl sulfonic acids (PFSAs), perfluoroalkyl carboxylic acids (PFCAs), and fluorotelomer sulfonic acids (FTSs), detected in aqueous film-forming foam (AFFF) using high-resolution liquid chromatography quadrupole time-of-flight mass spectrometry (LC-QTOF-MS) targeted analysis. Here, we extend the analysis within those original reaction solutions to include the wider set of PFASs in AFFF for which reactivity is largely unknown by applying recently established LC-QTOF-MS suspect screening and semiquantitative analysis protocols. Sixty-eight additional PFASs were detected (15 targeted + 68 suspect screening = 83 PFASs) with semiquantitative analysis, and their behavior was binned on the basis of (1) detection in untreated AFFF, (2) PFAS photogeneration, and (3) reactivity. These 68 structures account for an additional 20% of the total fluorine content in the AFFF (targeted + suspect screening = 57% of total fluorine content). Structure-reactivity trends were also revealed. During treatment, transformations of highly reactive structures containing sulfonamide (-SO2N-) and reduced sulfur groups (e.g., -S- and -SO-) adjacent to the perfluoroalkyl [F(CF2)n-] or fluorotelomer [F(CF2)n(CH2)2-] chain are likely sources of PFCA, PFSA, and FTS generation previously reported during the early stages of reactions. The results also show the character of headgroup moieties adjacent to the F(CF2)n-/F(CF2)n(CH2)2- chain (e.g., sulfur oxidation state, sulfonamide type, and carboxylic acids) and substitution along the F(CF2)n- chain (e.g., H-, ketone, and ether) together may determine chain length-dependent reactivity trends. The results highlight the importance of monitoring PFASs		-
D85	分析	Fredriksson, Felicia; Kärrman, Anna; Eriksson, Ulrika; Yeung, Leo Wy	Analysis and characterization of novel fluorinated compounds used in surface treatments products	2022	Chemosphere. 2022 Sep;302:134720. doi: 10.1016/j.chemosphere.2022.134720. Epub 2022 Apr 26.	outside conventional targeted analytical methodologies. Side-chain fluorinated polymers are speculated to be potential precursors to other non-polymeric aliphatic per- and polyfluoroalkyl acids (PFAAs). Limited knowledge of environmental occurrence of this compound class is partly due to lack of structural information and authentic standards. In this study, two novel fluorinated compounds, suspected to be side-chain fluorinated copolymers used in two commercial technical mixtures (Scotchgard™ Pre-2002 formulation and Scotchgard™ Post- 2002 formulation) were analyzed and characterized in order to provide information to facilitate detection and quantification. The commercial mixtures were analyzed using tandem mass spectrometry and high-resolution mass spectrometry; besides already reported C4- and C8-fluoroalkylsulfonamido (FASA) side-chains, a proposed structure was determined for the perfluorooctane (C8) sulfonamide-urethane copolymer in the Pre-2002 formulation. Structural isomers were also observed for C4- and C8-FASA- based copolymers. Total fluorine analysis revealed that the Scotchgard™ Pre-2002 Formulation contained a fluorine content of 0.5% and 1.8% for the Scotchgard™ Post-2002 Formulation. The equivalent FASA side-chain content was determined to be 0.8% for Pre-2002 and 3.1% for Post-2002. Both C4- and C8-FASA-based copolymers underwent hydrolysis and oxidation and were transformed to their respective perfluoroalkyl side chain, which suggest that transformation products can be analyzed for example after total oxidizable precursor (TOP) assay. Both compounds were shown to strongly sorb to sediment particles, which also gives indications about their environmental fate and transport pathways.		

引添-2	文献データベース文献リスト	

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D86	分析	Zweigle, Jonathan; Bugsel, Boris; Capitain, Catharina; Zwiener, Christian	PhotoTOP: PFAS Precursor Characterization by UV/TiO(2) Photocatalysis	2022	Environ Sci Technol. 2022 Nov 15;56(22):15728-15736. doi: 10.1021/acs.est.2c05652. Epub 2022 Oct 28.	To unravel the complexity of per- and polyfluoroalkyl substances (PFAS) in products and environmental samples, sum parameters that provide relevant information on chemical characteristics are necessary since not all PFAS can be captured by target analysis in case of missing reference standards or if they are not extractable or amenable to the analytical method. Therefore, we evaluated photocatalysis (UV/TiO2) as a further total oxidizable precursor approach (PhotoTOP) to characterize perfluoroalkyl acid precursors via their conversion to perfluoroalkyl carboxylic acids (PFCAs). Photocatalysis has the advantage that no salts are needed, allowing direct injection with liquid chromatography-mass spectrometry without time-consuming and potentially discriminating sample cleanup. OH radicals were monitored with OH probes to determine the reactivity. For eight different precursors (diPAPs, FTSAs, FTCAs, N-EtFOSAA, PFOSA), mass balance was achieved within 4 h of oxidation, and also, in the presence of matrix, complete conversion was possible. The PhotoTOP was able to predict the precursor chain length of known and here newly identified precursors qualitatively when applied to two PFAS-coated paper samples and technical PFAS mixtures. The length of the perfluorinated carbon chain (n) was mostly conserved in the form of PFCAs (n-1) with only minor fractions of shorter-chain PFCAs. Finally, an unknown fabric sample and a polymer mixture (no PFAS detectable in extracts) were oxidized, and the generated PFCAs indicated the occurrence of side-chain fluorinated polymers.		-
D87	分析	Kärrman, Anna; Yeung, Leo W Y; Spaan, Kyra M; Lange, Frank Thomas; Nguyen, Minh Anh; Plassmann, Merle; de Wit, Cynthia A; Scheurer, Marco; Awad, Raed; Benskin, Jonathan P	Can determination of extractable organofluorine (EOF) be standardized? First interlaboratory comparisons of EOF and fluorine mass balance in sludge and water matrices	2021	Environ Sci Process Impacts. 2021 Oct 20;23(10):1458-1465. doi: 10.1039/d1em00224d.	The high proportion of unidentified extractable organofluorine (EOF) observed globally in humans and the environment indicates widespread occurrence of unknown per- and polyfluoroalkyl substances (PFAS). However, efforts to standardize or assess the reproducibility of EOF methods are currently lacking. Here we present the first EOF interlaboratory comparison in water and sludge. Three participants (four organizations) analyzed unfortified and PFAS-fortified ultrapure water, two unfortified groundwater samples, unfortified wastewater treatment plant effluent and sludge, and an unfortified groundwater extract. Participants adopted common sample handling strategies and target lists for EOF mass balance but used in-house combustion ion-chromatography (CIC) and liquid chromatography-tandem mass spectrometry (LC-MS/MS) methods. EOF accuracy ranged from 85-101% and 76-109% for the 60 and 334 ng L-1 fluorine (F) - fortified water samples, respectively, with between-laboratory variation of 9-19%, and within-laboratory variation of 3-27%. In unfortified sludge and aqueous samples, between-laboratory variation ranged from 21-37%. The contribution from sum concentrations of 16 individual PFAS (Σ PFAS-16) to EOF ranged from 2.2-60% but extended analysis showed that other targets were prevalent, in particular ultra-short-chain perfluoroalkyl acids (e.g. trifluoroacetic acid) in aqueous samples and perfluoroalkyl acid-precursors (e.g. polyfluoroalkyl phosphate diesters) in sludge. The EOF-CIC method demonstrated promising accuracy, robustness and reporting limits but poor extraction efficiency was observed for some targets (e.g. trifluoroacetic acid).		-
D88	分析	Young, Robert B; Pica, Nasim E; Sharifan, Hamidreza; Chen, Huan; Roth, Holly K; Blakney, Greg T; Borch, Thomas; Higgins, Christopher P; Kornuc, John J; McKenna, Amy M; Blotevogel, Jens	PFAS Analysis with Ultrahigh Resolution 21T FT-ICR MS: Suspect and Nontargeted Screening with Unrivaled Mass Resolving Power and Accuracy	2022	Environ Sci Technol. 2022 Feb 15;56(4):2455-2465. doi: 10.1021/acs.est.1c08143. Epub 2022 Jan 31.	Per- and polyfluoroalkyl substances (PFASs) are a large family of thousands of chemicals, many of which have been identified using nontargeted time-of-flight and Orbitrap mass spectrometry methods. Comprehensive characterization of complex PFAS mixtures is critical to assess their environmental transport, transformation, exposure, and uptake. Because 21 tesla (T) Fourier-transform ion cyclotron resonance mass spectrometry (FT-ICR MS) offers the highest available mass resolving power and sub-ppm mass errors across a wide molecular weight range, we developed a nontargeted 21 T FT-ICR MS method to screen for PFASs in an aqueous film-forming foam (AFFF) using suspect screening, a targeted formula database (C, H, Cl, F, N, O, P, S; ≤865 Da), isotopologues, and Kendrick-analogous mass difference networks (KAMDNs). False-positive PFAS identifications in a natural organic matter (NOM) sample, which served as the negative control, suggested that a minimum length of 3 should be imposed when annotating CF2-homologous series with positive mass defects. We putatively identified 163 known PFASs during suspect screening, as well as 134 novel PFASs during nontargeted screening, including a suspected polyethoxylated perfluoroalkane sulfonamide series. This study shows that 21 T FT-ICR MS analysis can provide unique insights into complex PFAS composition and expand our understanding of PFAS chemistries in impacted matrices.		-
D89	分析	Fan, Xueqi; Bao, Yixiang; Mumtaz, Mehvish; Huang, Jun; Yu, Gang	Determination of total oxidizable precursors in foam surfactants and foam contaminated water based on UV-activated persulfate oxidation	2021	Sci Total Environ. 2021 Apr 1;763:142943. doi: 10.1016/j.scitotenv.2020.142943. Epub 2020 Oct 14.	In this study, ultraviolet (UV)-activated persulfate under alkaline condition was developed as an alternative Total Oxidizable Precursor (TOP) assay to convert per- and polyfluoroalkyl substances (PFASs) precursors into detectable perfluoroalkyl acids (PFAAs). The conventional heat-based TOP assay takes 6 h at 85 ° C, which is time consuming and may lose the volatile PFASs. Shorter time treatment would be beneficial to promote the analysis efficiency of the samples. We here report the UV-based TOP method as faster replacement of conventional heat-based TOP assay. The 6:2 fluorotelomer sulfonate (FTS), 8:2 FTS, and perfluorooctanesulfonamide (FOSA) achieved nearly complete conversion (with the molar yield of PFAAs of 97.2%-109.9%) at 60 min. This new UV-based TOP assay was then applied to 23 industry samples, and the results are comparable with the heat-based TOP assay. The perfluoroalkyl carboxylic acids (PFCAs) concentrations of 23 samples before and after normal TOP assay were 0- 4290 mg L-1 and 438-77,420 mg L-1, respectively. The PFCAs after 60 min UV-based TOP assay was 310-81,881 mg L-1. The QuotientMol of 21 samples were 0.71-1.28, the QuotientMol of other two samples were 1.45 and 1.68, this probably due to the loss of volatile precursors during heat-based TOP assay. The UV-based TOP assay is an efficient, reliable and faster alternative to the conventional heat-based TOP assay.		-

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D90	分析	Stramenga, Arianna; Tavoloni, Tamara; Stecconi, Tommaso; Galarini, Roberta; Giannotti, Massimiliano; Siracusa, Melania; Ciriaci, Martina; Bacchiocchi, Simone; Piersanti, Arianna	Perfluoroalkyl and polyfluoroalkyl substances (PFASs): An optimized LC-MS/MS procedure for feed analysis	2021	J Chromatogr B Analyt Technol Biomed Life Sci. 2021 Dec 1;1186:123009. doi: 10.1016/j.jchromb.2021.123009. Epub 2021 Oct 30.	Perfluoroalkyl and polyfluoroalkyl substances (PFASs) are extremely stable highly fluorinated aliphatic compounds, widely used in chemical and industrial applications since 1950s. They are ubiquitously detected in the environment and diet is the main route for human exposure. To ensure human safety, it is necessary to follow the whole food production chain, including animal feed. Still PFASs are not regulated as undesirable substances in feed, although several studies have shown they can be transferred from feed to livestock and thereafter to food. This paper describes the development, optimization and the full validation of a sensitive and reliable analytical protocol enabling the quantification of 19 PFASs in animal feeds by liquid chromatography - mass spectrometry (LC-MS/MS). The method was optimized, assessing the possible matrix interferences, and submitted to comprehensive validation (55 independent spiking experiments). Validation experiments were conducted on blank fish feed samples (natural levels of PFASs < 0.10 ng g-1) spiked at five different concentrations (0.10, 0.50, 1.0, 5.0 and 10 ng g-1). Apparent recoveries (R%) were generally between 88 and 111%; R% < 80% were obtained only at the lower validation levels for those molecules not having the corresponding labelled analogues. Relative standard deviations in repeatability conditions (RSDr) and within-lab reproducibility conditions (RSDwR) were lower or equal to 11% and 22% respectively. Limits of quantification were set for most of the analytes at 0.10 ng g-1 (LOQs) and verified with repeated analysis on fortified samples (0.10 ng g-1). Limits of detection (LODs) were calculated as 1/3 LOQ. Finally the method was applied to 23 feed samples of different type (compound feed, vegetable feed material, complementary feed, pre-mixture and mineral feed) and all of them did not show PFAS above LOQ.		-
D91	分析	Barola, Carolina; Moretti, Simone; Giusepponi, Danilo; Paoletti, Fabiola; Saluti, Giorgio; Cruciani, Gabriele; Brambilla, Gianfranco; Galarini, Roberta	A liquid chromatography-high resolution mass spectrometry method for the determination of thirty- three per- and polyfluoroalkyl substances in animal liver	2020	J Chromatogr A. 2020 Sep 27;1628:461442. doi: 10.1016/j.chroma.2020.461442. Epub 2020 Jul 31.	An analytical method for the quantification of thirty-three perfluoroalkyl and polyfluoroalkyl substances (PFASs) in animal liver was developed applying the isotopic dilution methodology with twenty-one labelled isotopologues of native compounds. The proposed protocol involved the determination of short and long aliphatic chain PFASs (C4C18) extracting liver with acetonitrile followed by two clean-up steps. The instrumental analysis was performed with liquid chromatography coupled to high-resolution mass spectrometry. The acquisition method combined full MS/dd-MS2, t-SIM/dd-MS2 and SIM experiments with variable resolution in order to maximize in one chromatographic run accuracy, sensitivity and selectivity. An eight-level validation study was performed evaluating linearity, trueness, precision, quantification and detection limits. Trueness was from 94 to 126% with intra-laboratory reproducibility lower than 20%. Limits of quantification were in the range 2-100 pg g-1, except for 2,3,3,- tetrafluoro-2-(1,1,2,2,3,3,3-heptafluoropropoxy)-propanoic acid, HFPO-DA (500 pg g-1). The analysis of a certified reference material (IRMM-427) and participation in a proficiency test scheme (FAPAS - 0687) confirmed these satisfactory performances. Finally, the application of the developed procedure to detect PFASs in sixteen liver samples of farm animals revealed that chicken		-
D92	分析	Jalili, Vahid; Barkhordari, Abdullah; Paull, Brett; Ghiasvand, Alireza	Microextraction and Determination of Poly- and Perfluoroalkyl Substances, Challenges, and Future Trends	2021	Crit Rev Anal Chem. 2021 Aug 20:1-20. Online ahead of print.	was the less contaminated species. Per- and polyfluoroalkyl substances (PFAS) are fluorocarbon compounds in which hydrogen atoms have been partly or entirely replaced by fluorine. They have a very wide range of applications, while they are persistent in the environment and exhibit bioaccumulative and toxic properties. Neither chemical nor biological mechanisms can decompose PFAS due to their strong C-F bonds. PFAS have shown adverse effects on various organisms, even at trace levels. Accordingly, highly sensitive and selective analytical methods are required for their tracing in biological and environmental matrices. The physicochemical properties of PFAS like surfactant characteristics and high-water solubility are unique and different from other known pollutants. Accordingly, the number of articles on the analysis of PFAS is less than the other well-known contaminants. The routine PFAS sample preparation methods (like solvent extraction) coupled with chromatographic systems, face challenges such as high limits of detection, need for laborious derivatization, limited selectivity, and expensive instrumentation. Recent efforts to address these limitations have aroused considerable attention to the development of microextraction techniques, which are consistent with the principles of green chemistry and can be made easily portable and automated. Moreover, these methods have shown enough sensitivity and selectivity for the analysis of different analytes (including PFAS) in a wide range of samples with different matrices. This research aims to review the microextraction methods and detection techniques, applied for the sample pretreatment of PFAS in various matrices, along with a critical discussion of the challenges and potential future trends.		-
D93	分析	Huyan, Chenxi; Ding, Shichao; Lyu, Zhaoyuan; Engelhard, Mark H; Tian, Yuhao; Du, Dan; Liu, Dong; Lin, Yuehe	Selective Removal of Perfluorobutyric Acid Using an Electroactive Ion Exchanger Based on Polypyrrole@Iron Oxide on Carbon Cloth	2021	ACS Appl Mater Interfaces. 2021 Oct 20;13(41):48500- 48507. doi: 10.1021/acsami.1c09374. Epub 2021 Oct 7.	Perfluorobutyric acid (PFBA) is one type of perfluoroalkyl and polyfluoroalkyl substances (PFASs) and is widely used as an industrial compound. The removal of PFBA has attracted considerable scientific interests in recent decades because it causes environmental pollution and human diseases. Currently, the adsorption method has been used commonly to remove PFASs from wastewater. However, it is usually limited by the inevitable "secondary waste" produced in this treatment process. In this work, PFBA can be effectively removed by synergistic electrical switching ion exchange (ESIX) and a new type of nanostructured ion exchanger has been designed and synthesized by coating a polypyrrole (PPy)@Fe(2)O(3) nanoneedle on carbon cloth (PPy@Fe(2)O(3) NN-CC). Results show that the PPy@Fe(2)O(3) NN-CC nanocomposite enhances ion exchange speed and efficiency, which ensures its high adsorption capacity and rapid regeneration property, thereby reducing secondary waste. Moreover, ESIX based on the PPy@Fe(2)O(3) NN-CC nanocomposite has high selectivity for adsorption of PFBA over other common anions in water, such as Cl(-), SO(4)(2-), and NO(3)(-).		-

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨 (原文)	備考	出 情 対 報 象 抽	ン文 ン文 ク献 ① ラ ② ラ
D94	分析	Hill, Nicholas I; Becanova, Jitka; Lohmann, Rainer	A sensitive method for the detection of legacy and emerging per- and polyfluorinated alkyl substances (PFAS) in dairy milk	2022	Anal Bioanal Chem. 2022 Jan;414(3):1235-1243. doi: 10.1007/s00216-021-03575-2. Epub 2021 Aug 5.	There is widespread contamination by per- and polyfluoroalkyl substances (PFAS) across the globe, with adverse effects on human and environmental health. For human exposure, drinking water and dietary exposure have been recognized as important PFAS exposure pathway for the general population. Several documented cases of dairy milk contamination by PFAS have raised concerns over this exposure pathway in general. A sensitive method for determination of 27 PFAS in milk was hence modified and applied on raw and processed milk samples from 13 farms across the United States (U.S.). A combination of acid and basic extraction method and ENVI-Carb clean-up achieved recoveries of targeted PFAS between 70 and 141%. The method detection limits (MDL) ranged from 0.8 to 22 ng/L (for 26 PFAS) and 144 ng/L for perfluorobutanoic acid (PFBA). The uniqueness of this method is considered in the targeted screening of a broad range of legacy PFAS, as well as perfluorinated sulfonamide species and fluorotelomer sulfonates. No legacy PFAS were detected in 13 milk samples from regions of concern given local use of biosolids or proximity to fire training areas. Overall, then, the uptake of perfluoroalkyl acids (PFAA) from dairy milk in the U.S. is considered low.			-
D95	分析	Stamm, Jacob; DeJesus, Lindsey; Jones, A Daniel; Dantus, Marcos	Quantitative Identification of Nonpolar Perfluoroalkyl Substances by Mass Spectrometry	2022	J Phys Chem A. 2022 Nov 16. doi: 10.1021/acs.jpca.2c05373. Online ahead of print.	Identifying and quantifying mixtures of compounds with very similar fragmentation patterns in their mass spectra presents a unique and challenging problem. In particular, the mass spectra of most per- and poly-fluoroalkyl substances (PFAS) lack a molecular ion. This complicates their identification, especially when using the absence of chromatographic separation. Here, we focus on linear, nonpolar, short-chain PFAS, which have received less attention than amphipathic PFAS despite their longer environmental lifetimes and greater global warming potentials. We identify and quantify $n-C(5)F(12)$ and $n-C(6)F(14)$ in binary mixtures by analyzing small changes in abundances of the main fragment ions following femtosecond tunnel laser ionization, without the need of chromatographic separation. Time-resolved femtosecond ionization mass spectrometry reveals that the metastable cation of both compounds undergoes predissociation within 1-2 ps of ion formation, with yields of $C(3)F(7)(+)$ showing evidence of coherent vibrational dynamics. These coherent oscillations are compared to low-level ion-state calculations and supported the idea that the oscillations in the $C(3)F(7)(+)$ ion yield are due to vibrations in the $C(5)F(12)(+)$ and $C(6)F(14)(+)$ radical cations and are associated with the predissociation dynamics of the metastable molecular ion. Surprisingly, we find that the fragment ions used for quantifying the mixtures have similar fragmentation dynamics. Conversely, the odd-electron $C(2)F(4)(+)$ fragment shows different time dependence between the two compounds, yet has negligible difference in the relative ion yield between the two compounds. Our findings indicate that femtosecond laser ionization may be a useful tool for identifying and quantifying mixtures of PFAS without the need of chromatography or high-resolution mass spectrometry.			-
D96	分析	Yao, Bin; Sun, Runze; Alinezhad, Ali; Kubátová, Alena; Simcik, Matt F; Guan, Xiaohong; Xiao, Feng	The first quantitative investigation of compounds generated from PFAS, PFAS-containing aqueous film- forming foams and commercial fluorosurfactants in pyrolytic processes	2022	J Hazard Mater. 2022 Aug 15;436:129313. doi: 10.1016/j.jhazmat.2022.129313. Epub 2022 Jun 7.	Pyrolysis as a thermochemical technology is commonly used in waste management and remediation of organic-contaminated soil. This study, for the first time, investigated fluorinated and non-fluorinated compounds emitted from per- and polyfluoroalkyl substances (PFAS) and relevant products upon pyrolysis (200-890 ° C) and their formation mechanisms. Approximately 30 non- fluorinated compounds were detected from PFAS-containing aqueous film-forming foams (AFFFs) and commercial surfactant concentrates (SCs) after heating, including glycols and glycol ethers that were predominant at 200 ° C. Oxygen (e.g., 1,4-dioxane) and nitrogen heterocycles and benzene were unexpectedly observed at higher temperatures (300-890 ° C), which were likely formed as a consequence of the thermal dehydration, dehydrogenation, and intermolecular cyclization of glycols and glycol ethers. Fluorinated volatiles in six major classes were detected at low and moderate temperatures (200-500 ° C), including perfluoroalkyl aldehydes, fluorotelomer alcohols, and polyfluorinated alkanes/alkenes. Several features of the pyrolyses of PFAS suggest that the underlying decomposition mechanism is radical-mediated. Perfluoroheptene thermally decomposed at 200 ° C to shorter-chain homologues following a radical chain-scission mechanism. Most of these volatiles observed at low/moderate temperatures were not detected at 890 ° C. Ultra-short-chain fluorinated greenhouse gases (e.g., perfluoromethane) were not found.			-
D97	分析	Rawn, Dorothea F K; Ménard, Cathie; Feng, Sherry Yu	Method development and evaluation for the determination of perfluoroalkyl and polyfluoroalkyl substances in multiple food matrices	2022	Food Addit Contam Part A Chem Anal Control Expo Risk Assess. 2022 Apr;39(4):752-776. doi: 10.1080/19440049.2021.2020913. Epub 2022 Feb 4.	A method for the determination of 21 perfluorinated and 10 polyfluorinated alkyl substances (PFAS) was developed for application in different food matrices. Acetonitrile was used as the extraction solvent with solid phase extraction weak anion-exchange (SPE- WAX) clean up, with LC-MS/MS analysis using both surrogate and performance standards to correct for losses during sample preparation and matrix effects. The method has been evaluated in four different matrices (fish, pizza, chicken nuggets and spinach). Originally, the focus was to develop a method for foods commonly thought to be a source of PFASs (e.g. fish). It was expanded to include foods where PFAS exposure would be possible through their presence in grease-proof food packaging (e.g. pizza, chicken nuggets). Vegetables (lettuce) and fruit (tomato) have recently been considered as part of proficiency testing programmes, so the inclusion of some testing in a vegetable matrix (i.e. spinach) was also added to the testing. Limits of quantification ranged from 0.018 ng g(-1) (L-PFDS) to 5.28 ng g(-1) (FHEA), although method quantification limits for PFBA (12.4 ng g(-1)), 6:2 PAP (8.96 ng g(-1)) and 8:2 PAP (3.49 ng g(-1)) were elevated above instrumental limits owing to their consistent detection in reagent blank samples. PFAS analyses were strongly impacted by matrix, therefore the use of isotopically labelled internal standards was critical to the development of accurate results. The accuracy of the method using numerous proficiency testing schemes or interlaboratory comparison studies has shown the developed method to be successful with z-scores for all concerned analytes in all test matrices remaining within ± 2.0 , with the exception of PFBA in wheat flour which was -2.4.			-

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D98	分析	Griffin, Emily K; Aristizabal- Henao, Juan J; Bowden, John A	Evaluation of Different Extraction Methods for the Analysis of Per- and Polyfluoroalkyl Substances in Dried Blood Spots from the Florida Manatee (Trichechus manatus)	2023	Environ Toxicol Chem. 2021 Oct;40(10):2726-2732. doi: 10.1002/etc.5175. Epub 2021 Sep 2.	Per- and polyfluoroalkyl substances (PFAS) are environmental contaminants linked to adverse health effects in humans and wildlife. Marine mammals, particularly manatees, have shown potential as sentinels for evaluating the presence and effects of anthropogenic chemicals. However, traditional blood collection techniques with marine mammals can be challenging, highlighting the need for improved strategies. In the present study, four different methods for the extraction of PFAS from dried blood spots were evaluated. Environ Toxicol Chem 2021;40:2726-2732. © 2021 SETAC.			-
D99	分析	Chen, Yanlong; Lu, Zicheng; Huang, Siming; Li, Gongke; Hu, Yuling; Zhong, Qisheng	Simultaneous enrichment of bisphenols and polyfluoroalkyl substances by cyclodextrin-fluorinated covalent organic frameworks membrane in food packaging samples	2022	2 J Chromatogr A. 2022 Mar 15;1666:462864. doi: 10.1016/j.chroma.2022.462864. Epub 2022 Feb 3.	Efficient separation and preconcentration of trace harmful substances in food samples is a prerequisite for reliable analysis. Most of harmful substances with different properties coexist in the food samples, which is difficult to achieve simultaneously extraction through traditional adsorbents. In this work, a new adsorbent based on cyclodextrin- fluorinated covalent organic frameworks (CD-F-COF) was prepared. The mechanism of the CD-F-COF recognizing polyfluoroalkyl substances (PFASs) and bisphenols (BPs) were validated by molecular simulation. The CD-F-COF showed strong fluorophilic and host-guest interactions for polyfluoroalkyl substances (PFASs) and bisphenols (BPs), respectively. The CD-F-COF coated membranes were immobilized on the syringe filter and coupled with multi-channel syringe pump to achieve high-throughput sample pretreatment. After that, a sensitive analytical method for the simultaneous enrichment and determination of trace BPs and PFASs was established followed by HPLC-MS/MS. The results indicated that the limits of detection for the seven BPs and three PFASs were in the range of 0.006-0.050 ng/g and 0.001-0.008 ng/g. This method has great potential for application in sample preparation as it can fulfill fast and high-throughput for enrichment of trace multiple targets.			
D100	分析	Srivastava, Prashant; Williams, Mike; Du, Jun; Navarro, Divina; Kookana, Rai; Douglas, Grant; Bastow, Trevor; Davis, Greg; Kirby, Jason K	Correction: Method for extraction and analysis of per- and poly-fluoroalkyl substances in contaminated asphalt	2022	2 Anal Methods. 2022 Sep 15;14(35):3474-3475. doi: 10.1039/d2ay90109a.	Correction for 'Method for extraction and analysis of per- and poly-fluoroalkyl substances in contaminated asphalt' by Prashant Srivastava et al., Anal. Methods, 2022, 14, 1678-1689			-
D101	分析	Jia, Shenglan; Marques Dos Santos, Mauricius; Li, Caixia; Snyder, Shane A	Recent advances in mass spectrometry analytical techniques for per- and polyfluoroalkyl substances (PFAS)	2022	2 Anal Bioanal Chem. 2022 Apr;414(9):2795-2807. doi: 10.1007/s00216-022-03905-y. Epub 2022 Feb 7.	The ubiquitous presence of per- and polyfluoroalkyl substances (PFAS) in various environments has led to increasing concern, and these chemicals have been confirmed as global contaminants. Following the chemical regulatory restrictions imposed, PFAS alternatives that are presumed to be less toxic have been manufactured to replace the traditional ones in the market. However, owing to the original release and alternative usage, continuous accumulation of PFAS has been reported in environmental and human samples, with uncertain consequences for ecosystem and human health. It is crucial to promote and improve existing analytical techniques to facilitate the detection of trace amounts of PFAS in diverse environmental matrices. This review summarizes analytical methods that have been applied to and advanced for targeted detection and suspect screening of PFAS, which mainly include (i) sampling and sample preparation methods for various environment matrices and organisms, and quality assurance/quality control during the analysis process, and (ii) quantitative methods for targeted analysis and automated suspect screening strategies for non-targeted PFAS analysis, together with their applications, advantages, shortcomings, and need for new method development.			-
D102	分析	Fan, Chen; Wang, Huijun; Liu, Yang; Cao, Xueli	New deep eutectic solvent based superparamagnetic nanofluid for determination of perfluoroalkyl substances in edible oils	202.	Talanta. 2021 Jun 1;228:122214. doi: 10.1016/j.talanta.2021.122214. Epub 2021 Feb 17.	Perfluoroalkyl substances (PFASs) have been identified as global pollutants and raise considerable food safety concerns. However, the development of an analytical method with satisfied pretreatment performance for PFASs with varying alkyl chain length in the fatty samples remains a challenge. We describe herein the preparation of superparamagnetic nanofluid, based on a new choline chloride/1-(o-tolyl)biguanide deep eutectic solvent (DES) system, for direct extraction of perfluoroalkyl carboxylic acids from edible oils. Target PFASs, especially the short-chain one, all possessed high recoveries (90-109% with intra-day and inter-day precision below 10%). This was achieved by adjusting the constituent ratio of DES for balancing the anion-exchange (electrostatic) interactions and hydrogen-bond interactions. Employing the prepared nanofluid in magnetic microextraction, followed by high-resolution mass spectrum analysis, resulted in a rapid (15 min for pretreatment), simple, sensitive (detection limit: 0.3-1.6 pg g(-1)), and efficient method for the enrichment and determination of trace PFASs. Furthermore, the introducing of N-H-F weak force increased the pretreatment selectivity to effectively reduce the matrix effect. At the end of the study, the proposed methodology was successfully applied to the analysis of target analytes in real samples.			-

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D103	分析	Meng, Pingping; DeStefano, Noelle J; Knappe, Detlef R U	Extraction and Matrix Cleanup Method for Analyzing Novel Per- and Polyfluoroalkyl Ether Acids and Other Per- and Polyfluoroalkyl Substances in Fruits and Vegetables	2022	J Agric Food Chem. 2022 Apr 27;70(16):4792-4804. doi: 10.1021/acs.jafc.1c07665. Epub 2022 Feb 21.	Per- and polyfluoroalkyl ether acids (PFEAs) are a subclass of per- and polyfluoroalkyl substances (PFAS) that are detected with increasing frequency in environmental matrices. Diet can be an important route of PFEA exposure, but the presence of PFEAs in food is poorly understood. Extraction methods for food samples exist for traditionally studied PFAS, but their suitability for PFEAs and other novel PFAS remains unknown. In this study, an extraction and matrix cleanup method was developed to quantify 45 PFAS, including 13 PFEAs, 3 perfluoroalkane sulfonamides, and 6 fluorotelomer carboxylic acids in 10 types of fruits and vegetables. Homogenized samples were extracted with basic methanol, and resulting extracts were diluted with water and cleaned up using solid-phase extraction with weak anion-exchange cartridges. The method was validated by performing spike-recovery experiments at spike levels of 1 ng/g in all 10 matrices and 0.1 ng/g in 2 matrices. For PFAS without a corresponding isotopically labeled internal standard (IS), adopting an IS with a similar chromatographic retention time generated the most accurate recoveries. Dependent upon the matrix, recoveries of 38-44 PFAS (including 10-13 PFEAs) fell within 50-150% for samples spiked at 1 ng/g. Recoveries of 40 and 38 PFAS in blueberries and corn, respectively, fell within 50-150% for samples spiked at 0.1 ng/g. Method quantification limits (MQLs) of PFAS in pure solvents were determined as the lowest calibration level with an accuracy between 70 and 130%. To compensate for matrix effects, a matrix factor was applied on the basis of the analyte response in different matrices relative to the pure solvent. The MQLs of 45 PFAS (including 13 PFEAs) in 10 matrices ranged from 0.025 to 0.25 ng/g. Overall, this method is capable of sensitively quantifying 45 PFAS in many fruits and vegetables.			-
D104	分析	Ruyle, Bridger J; Thackray, Colin P; McCord, James P; Strynar, Mark J; Mauge- Lewis, Kevin A; Fenton, Suzanne E; Sunderland, Elsie M	Reconstructing the Composition of Per- and Polyfluoroalkyl Substances in Contemporary Aqueous Film-Forming Foams	2021	Environ Sci Technol Lett. 2021 Jan 12;8(1):59-65. doi: 10.1021/acs.estlett.0c00798.	Hundreds of public water systems across the United States have been contaminated by the use of aqueous film-forming foams (AFFF) containing per- and polyfluoroalkyl substances (PFAS) during firefighting and training activities. Prior work shows AFFF contain hundreds of polyfluoroalkyl precursors missed by standard methods. However, the most abundant precursors in AFFF remain uncertain, and mixture contents are confidential business information, hindering proactive management of PFAS exposure risks. Here, we develop and apply a novel method (Bayesian inference) for reconstructing the fluorinated chain lengths, manufacturing origin, and concentrations of oxidizable precursors obtained from the total oxidizable precursor (TOP) assay that is generally applicable to all aqueous samples. Results show virtually all (median 104 \pm 19%) extractable organofluorine (EOF) in contemporary and legacy AFFF consists of targeted compounds and oxidizable precursors, 90% of which are 6:2 fluorotelomers in contemporary products. Using high-resolution mass spectrometry, we further resolved the 6:2 fluorotelomers to assign the identity of 14 major compounds, yielding a priority list that accounts for almost all detectable PFAS in contemporary AFFF. This combination of methods can accurately assign the total PFAS mass attributable to AFFF in any aqueous sample with differentiation of gross precursor classes and identification of major precursor species.			-
D105	分析	Pellicer-Castell, Enric; Belenguer- Sapiña, Carolina; El Haskouri, Jamal; Amorós, Pedro; Herrero- Martínez, José Manuel; Mauri- Aucejo, Adela R	Iron-Doped Bimodal Mesoporous Silica Nanomaterials as Sorbents for Solid-Phase Extraction of Perfluoroalkyl Substances in Environmental Water Samples	2022	Nanomaterials (Basel). 2022 Apr 23;12(9):1441. doi: 10.3390/nano12091441.	In this work, sorbets based on UVM-7 mesoporous silica doped with Fe were synthesized and applied to solid-phase extraction of perfluoroalkyl substances from environmental water samples. These emerging pollutants were then determined by liquid chromatography coupled with a mass spectrometry detector. Thus, Fe-UVM-7 mesoporous silica materials with different contents of iron, as well as different pore sizes (by using alkyltrimethilamonium bromide surfactants with different organic tail lengths) were synthesized, and their structure was confirmed for the first time by transmission electron microscopy, nitrogen adsorption-desorption, X-ray diffraction, and Raman spectroscopy. After comparison, Fe50-UVM-7-C(12) was selected as the best material for analyte retention, and several extraction parameters were optimized regarding the loading and elution step. Once the method was developed and applied to real matrices, extraction efficiencies in the range of 61-110% were obtained for analytes with C(8)-C(14) chain length, both perfluoroalkyl carboxylates, and perfluoroalkyl sulfonates. Likewise, limits of detection in the range of 3.0-8.1 ng L(-1) were obtained for all target analytes. In the analysis of real well-water samples, no target compounds were detected. Spiked samples were analyzed in comparison to Oasis WAX cartridges, and statistically comparable results were achieved.			-
D106	分析	Ao, Yan; Nian, Min; Tang, Weifeng; Zhang, Jun; Zhang, Qianlong; Ao, Junjie	A sensitive and robust method for the simultaneous determination of thirty-three legacy and emerging per- and polyfluoroalkyl substances in human plasma and serum	2022	Anal Bioanal Chem. 2022 Nov 16. doi: 10.1007/s00216-022- 04426-4. Online ahead of print.	Legacy and emerging per- and polyfluoroalkyl substances (PFAS) have attracted growing attention due to their potential adverse effects on humans. We developed a method to simultaneously determine thirty-three PFAS (legacy PFAS, precursors, and alternatives) in human plasma and serum using solid phase extraction coupled to ultra-performance liquid chromatography-tandem mass spectrometry (SPE-UPLC-MS/MS). The method yielded good linearity (>0.995) and excellent limits of detection (LODs) (0.0005~0.012 ng mL(-1) in plasma and 0.002~0.016 ng mL(-1) in serum). The relative recoveries ranged from 80.1 to 116%, with intra- and inter-day precision less than 14.3%. The robustness of this method has been tested continuously for 10 months (coefficients of variation <14.9%). Our method was successfully applied to the PFAS analysis of 42 real human plasma and serum samples collected from women. The proposed method is attractive for the biomonitoring of multi-class PFAS in human health risk assessment and epidemiological studies.			-

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D107	分析	Brown, Hilary M; Fedick, Patrick W	Rapid, low-cost, and in-situ analysis of per- and polyfluoroalkyl substances in soils and sediments by ambient 3D-printed cone spray ionization mass spectrometry	2021	Chemosphere. 2021 Jun;272:129708. doi: 10.1016/j.chemosphere.2021.129708. Epub 2021 Jan 27.	A rapid method to empirically determine the presence of trace per- and polyfluoroalkyl substances (PFAS) in solid media, such as soils, sands, and sediments, without any sample preparation, through ambient ionization mass spectrometry (MS), is described. 3D-printed cone spray ionization (3D-PCSI) is an ambient ionization technique that employs a 3D-printed conductive plastic cone to perform both sampling and ionization. The 3D-PCSI sources are fabricated in the shape of a hollowed square pyramid to hold bulk matrices, and consist of rigid walls to aid in the uniformity and consistency of sampling and ionization. Solid samples are placed within the hollowed pyramid and a solvent is added to perform an in-situ extraction, followed by spray-based ionization when a voltage is applied. The low cost of 3D-printing, its reproducibility at scale, and lack of sample preparation, enables 3D-PCSI-MS to rapidly and efficiently screen for trace PFAS, in-situ, in bulk samples. Demonstrated here is the detection of trace PFAS that were doped into six different soil and sediment matrices, by 3D-PCSI-MS, to validate the universality of the method, irrespective of matrix composition. All PFAS were identified by their indicative MS(3) spectra and ranged in detection limits from 100 ppt to 10 ppb depending on the compound and soil classification. Legacy aqueous film forming foams (AFFF) were analyzed in soil by 3D-PCSI-MS, as were soil samples collected around an AFFF testing facility. The sampling rate for 3D-PCSI-MS was less than 2 min per sample, demonstrating the applicability to high-throughput mapping of a contaminated area.			-
D108	分析	Song, Xin; Wang, Rongyu; Wang, Xiao; Han, Haoyue; Qiao, Zhaoyu; Sun, Xiaowei; Ji, Wenhua	An amine-functionalized olefin-linked covalent organic framework used for the solid-phase microextraction of legacy and emerging per- and polyfluoroalkyl substances in fish	2022	J Hazard Mater. 2022 Feb 5;423(Pt B):127226. doi: 10.1016/j.jhazmat.2021.127226. Epub 2021 Sep 16.	Due to the environmental persistence and various health problems associated with per- and polyfluoroalkyl substances (PFASs), they have come under increased public scrutiny. However, the efficient extraction of PFASs from complex media remains challenging. Herein, an olefin-linked covalent organic framework (COF-CN) has been prepared via a Knoevenagel condensation reaction, followed by reduction using LiAIH(4) to form an amine-functionalized COF (COF-NH(2)). The characterization results demonstrated that the crystal structure was maintained during the post-modification step. Isothermal and kinetic adsorption studies showed the higher affinity of COF-NH(2) toward PFASs. Based on density functional theory, the adsorption mechanism of the stable six-member-ring structure formed between COF-NH(2) and PFASs via hydrogen bonding was tentatively revealed. After optimizing the solid-phase microextraction parameters, legacy and emerging PFASs were efficiently extracted from fish using the COF-NH(2) coating, followed by detection using ultra-performance liquid chromatography-tandem mass spectrometry. The method exhibited ideal linearity, low limits of quantification, excellent precision, and high relative recoveries. Finally, the bioconcentration kinetics for goldfish was studied, which can provide a feasible platform for investigating the accumulate ion and toxicity of PFASs.			-
D109	分析	George, Sarabeth; Dixit, Atray	A machine learning approach for prioritizing groundwater testing for per-and polyfluoroalkyl substances (PFAS)	2021	J Environ Manage. 2021 Jul 24;295:113359. doi: 10.1016/j.jenvman.2021.113359. Online ahead of print.	Regulatory agencies are beginning to recognize and regulate per-and polyfluoroalkyl substances (PFAS) as concerning environmental contaminants. In groundwater management, testing and mitigation strategies are desirable, but can be time and cost-intensive processes. As a result, only a fraction of all groundwater wells has been tested for PFAS levels, resulting in potentially extended drinking water exposure to PFAS in the meantime. In this study, we build a series of machine learning models (including linear and random forest regressors) to predict PFAS based on a groundwater dataset from California. These models are used to compare the relative predictive ability of co-contaminant fingerprints, hydrological properties, soil parameters, proximity of airports/military bases, and geospatial data. Additionally, a random forest machine learning model that combines all data types can quantitatively predict the maximum PFAS compound concentration in a well with a Spearman correlation of 0.64 and can discern wells containing concerningly high concentrations of PFAS with an accuracy of 91 % (AUC of 0.90). This approach may have widespread utility for other hazardous anthropogenic compounds in groundwater. Future investigations should evaluate the practicability of using machine learning to prospectively prioritize contaminant testing in groundwater wells.			-
D110	分析	Clark, Rebecca B; Dick, Jeffrey E	Towards deployable electrochemical sensors for per- and polyfluoroalkyl substances (PFAS)	2021	Chem Commun (Camb). 2021 Aug 25;57(66):8121-8130. doi 10.1039/d1cc02641k. Epub 2021 Jul 29.	Per- and polyfluoroalkyl substances (PFAS) are an emerging class of pervasive and harmful environmental micropollutant with negative health effects on humans. Therefore, there has been extensive research into the remediation (i.e., the detection, extraction, and destruction) of these chemicals. For efficient extraction and destruction, PFAS contamination must be detected at its onset; however, conventional PFAS detection methods rely on sample collection and transport to a centralized facility for testing, which is expensive and time-consuming. Electrochemistry offers a robust, inexpensive, and deployable sensing strategy that could detect pollution at its onset; however, the electrochemical inactivity of PFAS necessitates the use of a surface it functionalization strategy. Molecularly imprinted polymers (MIPs), which are a popular surface functionalization strategy, have been around since the 1980s for specific electrochemical detection and have expanded electrochemical detection to analytes that are not electrochemically active. MIPs have been more recently demonstrated for the detection of a variety of PFAS species, but additional advances must be made for realization of a deployable, electrochemical MIP-based sensor. This Feature highlights the history of MIPs for PFAS detection and our group's recent advances that are essential to enable the creation of a deployable electrochemical PFAS sensor: development of rigorous analytical standards to quantify interferent effects, miniaturization of the detection platform for quantification in river water, the use of ambient O(2) as the mediator molecule for detection, and the development of hardware for in-field multiplexed electrochemical sensing.			-

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D111	分析	Chen, Beining; Yang, Zhengshuang; Qu, Xiaolei; Zheng, Shourong; Yin, Daqiang; Fu, Heyun	Screening and Discrimination of Perfluoroalkyl Substances in Aqueous Solution Using a Luminescent Metal-Organic Framework Sensor Array	2021	ACS Appl Mater Interfaces. 2021 Oct 13;13(40):47706- 47716. doi: 10.1021/acsami.1c15528. Epub 2021 Oct 4.	The extensive production and large-scale use of perfluoroalkyl substances (PFASs) have raised their presence in aquatic environments worldwide. Thus, the facile and reliable screening of PFASs in aqueous systems is of great significance. Herein, we designed a novel fluorescent sensor array for the rapid screening and discrimination of multiple PFASs in water. The sensor array comprised three highly stable zirconium porphyrinic luminescent metal-organic frameworks (i.e., PCNs) with different topological structures. The sensing mechanism was based on the static fluorescence quenching of PCNs by PFASs upon their adsorptive interactions. The fluorescence response patterns were characteristic for each PFAS because of their different adsorption affinities toward different PCNs. Through the interpretation of response patterns by statistical methods, the proposed PCN array successfully discriminated six different kinds of PFASs, each PFAS at different concentrations and PFAS mixtures at different molar ratios. The practicability of this array was further verified by effectively discriminating PFASs in two real water samples. Remarkably, the PCN sensors exhibited a very short response time toward PFASs (within 10 s) due to the ordered pore structure allowing fast PFAS diffusion. This study not only provides a facile method for rapid PFAS screening in waters but also broadens the application of luminescent metal-organic frameworks and array techniques in sensing fields.			-
D112	分析	Yang, Yuanyuan; Liu, Sisi; Wang, Runmei; Li, Cailin; Tang, Jianhui; Chen, Tao; Ying, Guang-Guo; Chen, Chang-Er	Diffusive gradients in thin films (DGT) probe for effectively sampling of per- and polyfluoroalkyl substances in waters and sediments	2022	J Environ Sci (China). 2022 Nov;121:90-97. doi: 10.1016/j.jes.2021.09.003. Epub 2022 Feb 1.	The passive sampling technique, diffusive gradients in thin films (DGT) has attracted increasing interests as an in-situ sampler for organic contaminants including per- and polyfluoroalkyl substances (PFAS). However, its effectiveness has been questioned because of the small effective sampling area (3.1 cm(2)). In this study, we developed a DGT probe for rapid sampling of eight PFAS in waters and applied it to a water-sediment system. It has a much larger sampling area (27 cm(2)) and as a result lower method quantification limits (0.15 - 0.21 ng/L for one-day deployment and 0.02 - 0.03 ng/L for one-week deployment) and much higher (by > 10 factors) sampling rate (100 mL/day) compared to the standard DGT (piston configuration). The sampler could linearly accumulate PFAS from wastewater, was sensitive enough even for a 24 hr deployment with performance comparable to grab sampling (500 mL). The DGT probe provided homogeneous sampling performance along the large exposure area. The use of the probe to investigate distributions of dissolved PFAS around the sediment-water interface was demonstrated. This work, for the first time, demonstrated that the DGT probe is a promising monitoring tool for trace levels of PFAS and a research tool for studying their distribution, migration, and fate in aquatic environments including the sediment-water interface.			-
D113	分析	Szabo, Drew; Marchiandi, Jaye; Green, Mark P; Mulder, Raoul A; Clarke, Bradley O	Evaluation and validation of methodologies for the extraction of per- and polyfluoroalkyl substances (PFASs) in serum of birds and mammals	2022	Anal Bioanal Chem. 2022 Apr;414(9):3017-3032. doi: 10.1007/s00216-022-03962-3. Epub 2022 Feb 19.	Advances in analytical techniques have allowed greater detection of environmental contaminants from small volumes of sample. Four methodologies were evaluated for the extraction of 53 per- and polyfluoroalkyl substances (PFASs) from eight classes in 200 μ L of avian and mammal serum. Spiked serums at four concentrations (0, 0.5, 5.0 and 25 ng mL(-1)) were prepared by protein precipitation (PPT), enhanced matrix removal (EMR), weak anion exchange (WAX), and hydrophilic-lipophilic balance (HLB) solid-phase extraction cartridges. The extract from each methodology was analysed by high-performance liquid chromatography coupled with tandem mass spectrometry (HPLC-MS/MS), and concentrations were compared with known concentrations in the spiked media. EMR performed the best overall, with 40 of 53 compounds effectively recovered at 5 ng mL(-1). Furthermore, EMR was effective overall at concentrations. There was a negative correlation between internal standard recovery for compounds with increasing octanol-water coefficients (K(ow)) for WAX (R = - 0.65, p = 0.0043) and HLB (R = - 0.62, p = 0.0077) extractions, indicating methanol may not be a suitable solvent for long-chain PFAS extraction from protein-rich tissues. EMR and PPT represent fast and effective methodologies for the extraction of PFASs from low volumes of serum which allows greater accuracy and precision that can be applied to future human and wildlife biomonitoring programmes.			-
D114	分析	Aro, Rudolf; Eriksson, Ulrika; Kärrman, Anna; Jakobsson, Kristina; Yeung, Leo W Y	Extractable organofluorine analysis: A way to screen for elevated per- and polyfluoroalkyl substance contamination in humans?	2022	Environ Int. 2022 Jan 15;159:107035. doi: 10.1016/j.envint.2021.107035. Epub 2021 Dec 9.	The ubiquitous occurrence of a few per- and polyfluoroalkyl substances (PFAS) in humans and the environment has been previously reported. However, the number of PFAS humans and the environment are potentially exposed to is much higher, making it difficult to investigate every sample in detail. More importantly, recent studies have shown an increasing fraction of potentially unknown PFAS in human samples. A screening tool for identifying samples of concern that may contain high PFAS levels, to be studied more thoroughly, is needed. This study presents a simplified workflow to detect elevated PFAS levels using extractable organofluorine (EOF) analysis. A fluorine mass balance analysis on samples with high EOF, targeting 63 PFAS, can then confirm the PFAS contamination. Whole blood samples from a cohort of individuals with historical drinking water contamination from firefighting foams (n = 20) in Ronneby (Sweden) and a control group (n = 9) with background exposure were used as a case study. The average EOF concentration in the Ronneby group was 234 ng/mLF (<107-592 ng/mLF) vs 24.8 ng/mLF (17.6-37.8 ng/mL F) in the control group. The large difference (statistically significant, p < 0.05) in the EOF levels between the exposed and control groups would have made it possible to identify samples with high PFAS exposure only using EOF data. This was confirmed by target analysis, which found an average Σ PFAS concentration of 346 ng/mL in the exposed group and 7.9 ng/mL in the control group. The limit of quantification for EOF analysis (up to 107 ng/mLF using 0.5 mL whole blood) did not allow for the detection of PFAS levels in low or sub parts per billion (ng/mL) concentrations, but the results indicate that EOF analysis is a suitable screening method sensitive enough to detect elevated/significant/exposure above background levels by known or unknown PFAS.			-

パーフルオロ化合物に係る国際機関等の評価及び科学的知見の情報収集並びに整理 別添-2 文献データベース文献リスト

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文ン文 対報 象抽 ① ラ ② ラ
D115	分析	Song, Xin-Li; Lv, Hui; Liao, Ke- Chao; Wang, Dong-Dong; Li, Gui-Mei; Wu, Yi- Yao; Chen, Qian- Yu; Chen, Yue	Application of magnetic carbon nanotube composite nanospheres in magnetic solid-phase extraction of trace perfluoroalkyl substances from environmental water samples	2022	Talanta. 2022 Sep 10;253:123930. doi: 10.1016/j.talanta.2022.123930. Online ahead of print.	The layer-by-layer assembly technique was used to synthesize novel multiwalled carbon nanotubes (MWCNTs) on magnetic carbon (Fe(3)O(4)@C) nanospheres, which were then used to extract six perfluoroalkyl substances (PFAS) in environmental real water samples using ultra high-performance liquid chromatography coupled to tandem mass spectrometry. The as-synthesized sorbent MWCNTs@Fe(3)O(4)@C was employed for magnetic solid-phase extraction (MSPE). The as-prepared MWCNTs@Fe(3)O(4)@C was characterized by scanning electron microscopy (SEM), Fourier transform infrared spectroscopy (FTIR) and vibrating sample magnetometer (VSM). The main extraction parameters were systematically optimized by Box-Behnken design. Under optimal conditions, excellent results were achieved. The synthesized sorbent showed wide linear ranges (0.1-1000 ng L(-1)), low detection limits (0.03-0.09 ng L(-1)) and good repeatability (3.80%-9.52%) for extracting and detecting six PFAS. The developed method was also applied to analyze six PFAS from environmental water samples. This study indicated that MWCNTs@Fe(3)O(4)@C composites are promising materials for the extraction and determination of PFAS from water samples.		-
D116	分析	Yukioka, Satoru; Tanaka, Shuhei; Suzuki, Yuji; Echigo, Shinya; Fujii, Shigeo	Data-independent acquisition with ion mobility mass spectrometry for suspect screening of per- and polyfluoroalkyl substances in environmental water samples	2021	J Chromatogr A. 2021 Feb 8;1638:461899. doi: 10.1016/j.chroma.2021.461899. Epub 2021 Jan 13.	Per- and polyfluoroalkyl substances (PFASs) have environmentally persistent, and the various types of PFASs have been detected in water environments. Many previous studies have performed data-dependent acquisition (DDA) of mass spectra from an environmental sample by high-resolution mass spectrometry to identify PFAS suspects individually. In comparison, the data- independent acquisition (DIA) of comprehensive mass spectra of the sample is a technology which enables to know the occurrences of suspects and non-targets simultaneously. However, it is difficult to associate the fragment ions of targeted precursor ions by retention time only, because of the existence of co-eluting ions derived from environmental samples. Since the separation of ions is not enough with only the conventional DIA method, here, we attempted to support it using ion mobility mass spectrometry (IMS) to distinguish the relevant ions from co-eluting ions by drift time. Firstly, suspect screening of PFASs with eternal database resulted in determining 32-96 PFAS suspects in firefighting foam impacted groundwater samples (n = 8) by suspect screening. Among all the pairs of respective precursor ions and fragment ions of the PFAS suspects, 5%-19% (4-9 PFASs) of them were associated without considering the drift time of IMS, while 37%-49% (15-43 PFASs) of them were associated with considering the drift time. The consideration of the drift time increased the association ratios in all samples. In a sample, most precursor ions could be associated with their fragment ions. Thus, the method improved the identification by excluding the unrelated co-eluting ions by IMS. Moreover, the method can acquire a certain reliable MS/MS spectra of suspects in environmental samples in one analysis. It is not essential to conduct instrumental analyses again for samples stored for a long time even when the data sets and/or methodologies of data analyses are modified (e.g., the original database, screening list, or statistical filtering/data cleaning approach). It wil		-
D117	分析	Li, Jingkun; Gao, Yueying; Wan, Yuqi; Liu, Jinghan; Liu, Lin; Wang, Jiahua; Sun, Xiulan; Pi, Fuwei; Chen, Xiangfeng	A novel analytical strategy for the determination of perfluoroalkyl acids in various food matrices using a home-made functionalized fluorine interaction SPME in combination with LC-MS/MS	2022	Food Chem. 2022 Jan 1;366:130572. doi: 10.1016/j.foodchem.2021.130572. Epub 2021 Jul 12.	In this study, a fluorine-fluorine interaction approach through fluoridating boron nitride nanosheets (BNNs) for sensing perfluoroalkyl acids (PFAAs) in multiple food matrices was developed. Through a facile hydrothermal fluorination modification, the BNNs were transferred into homogeneous fluorinated boron nitride nanoparticles (F-BNNs) with robust networks and specific surface area. After morphological modification, the particles displayed strong adsorption and sensing capabilities on PFAAs in both solid and liquid food matrix. Under the evaluation of mass spectrometry, F-BNNs based microextraction approach exhibited low method detection limits (MDLs) in the ranges of 0.9-3.9 pg mL(-1) and 3.6-15.8 pg g(-1) for milk and meat matrices, respectively, with satisfactory repeatability (RSD% <13.5%) and recoveries (77.7-110.5%). This work not only depicted a facile approach for preparing F-BNNs based SPME fiber, but also provided a routine analysis protocol for monitoring PFAAs in food systems.		-
D118	分析	Curtzwiler, Greg W; Silva, Paulo; Hall, Alexander; Ivey, Alexandra; Vorst, Keith	Significance of Perfluoroalkyl Substances (PFAS) in Food Packaging	2021	Integr Environ Assess Manag. 2021 Jan;17(1):7-12. doi: 10.1002/ieam.4346. Epub 2020 Oct 22.	Food safety authorities and the food industry are focused on uses of perfluoroalkyl substances (PFAS) in various food-contact packaging applications. Not widely known until recently, certain PFAS occur in paper-based packaging materials typically at parts- per-billion to parts-per-million concentrations. These substances are nonintentionally added substances (NIAS) and are attributed to residues from recycled fiber and paperboard used in the manufacture of new food packaging products. Low concentration PFAS detection has generated debate in the food industry and among scientific and governmental organizations about understanding their significance in food-contact products because certain PFAS are intentionally added to some food packaging materials. Distinguishing between both sources of PFAS in food packaging is essential for regulatory compliance purposes. In this paper, we describe ongoing research using contact angle measurement analysis to determine limits of performance (LOP) for perfluorocarboxylic acids (PFCAs) (C4, C6, C8, and C10) on the surface of recycled paper packaging materials. We find that the LOP concentrations for PFCAs ranged from 37 ppm (C10) to higher than 1238 ppm (C4). Because there is no economic justification for the presence of PFAS that do not provide functional performance, these LOP concentrations can reliably be considered as NIAS thresholds. This analytical method and the resulting test data are able to differentiate the source of PFAS in food packaging. Future research will broaden the test method to include measurements of fluorotelomer, sulfonamide, and fluoropolymer substances to develop a more comprehensive understanding of PFAS performance and NIAS concentration thresholds. Integr Environ Assess Manag 2021;17:7-12. © 2020 SETAC.		-

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 象抽 ① ラ ② ラ
D119	分析	Da Silva, Bianca Ferreira; Ahmadireskety, Atiye; Aristizabal- Henao, Juan J; Bowden, John A	A rapid and simple method to quantify per- and polyfluoroalkyl substances (PFAS) in plasma and serum using 96-well plates	2020	MethodsX. 2020 Oct 17;7:101111. doi: 10.1016/j.mex.2020.101111. eCollection 2020.	Per- and polyfluoroalkyl substances (PFAS) are synthetic organic compounds that over the past several years, have witnessed a dramatic increase in scientific attention. As PFAS are predominantly accumulated in plasma, monitoring individual burden levels in plasma are typically achieved via some combination of protein precipitation and/or solid phase extraction (SPE), either in online or offline modes. This work describes an updated PFAS extraction workflow, using 96-well plate technology and protein precipitation that is rapid, simple, inexpensive, and amenable for large cohort studies. In brief, plasma proteins were precipitated using methanol and the resulting centrifuged supernatant was directly analyzed using UHPLC-MS/MS. We monitored 51 PFAS, which were quantified via isotope dilution and the effectiveness of the method was demonstrated by using NIST blood-based Standard Reference Materials (SRMs). This method resulted in recoveries ranging between 70 and 89% for all analytes. The 96-well design exhibited low limits of detection and only required sample volumes of 100 μL, thus resulting in an amenable method for high-throughput plasma/serum PFAS screening. • PFAS were directly quantified in plasma and serum samples; • No SPE needed after protein precipitation; • SRMs can be used to validate PFAS measurement in plasma/serum.		-
D120	分析	Zhao, Yanfang; Li, Huizhi; Xu, Guiju; Boukherroub, Rabah; Yu, Xiang; Chen, Xiangfeng	Fluorinated boron nitride nanosheets as an inorganic matrix for the MALDI mass spectrometry analysis of perfluoroalkyl acids	2022	Talanta. 2022 Jun 1;243:123365. doi: 10.1016/j.talanta.2022.123365. Epub 2022 Mar 3.	We report, for the first time, the application of fluorinated hexagonal boron nitride nanosheets (F-BNNs) as an effective inorganic matrix for matrix-assisted laser desorption and ionization mass spectrometry (MALDI-MS) analysis of per fluoroalkyl acids (PFAAs). Fluoride modification of F-BNNs increases both enrichment ability and ionization efficiency. The method was validated using environmental water, milk, human serum samples, and zebrafish imaging that has been previously exposed to PFAAs. The method provided in this work holds considerable promise in term of rapid analysis, sample requirement, and practicability.		-
D121	分析	Kang, Qiyue; Li, Qiang; Wang, Lei; Jia, Yingting; Zhang, Xiaohua; Hu, Jianying	Comment on "Suspect and Nontarget Screening of Per- and Polyfluoroalkyl Substances in Wastewater from a Fluorochemical Manufacturing Park"	2021	Environ Sci Technol. 2021 Apr 20;55(8):5589-5592. doi: 10.1021/acs.est.0c06917. Epub 2021 Mar 29.	No abstract available		-
D122	分析	Weed, Rebecca A; Boatman, Anna K; Enders, Jeffrey R	Recovery of per- and polyfluoroalkyl substances after solvent evaporation	2022	Environ Sci Process Impacts. 2022 Oct 25. doi: 10.1039/d2em00269h. Online ahead of print.	Per- and polyfluoroalkyl substances (PFAS) are persistent, bioaccumulative chemicals that can be toxic at very low levels. Many of these compounds have unusual chemical properties that can have a large impact on analytical methods intended to quantitate them. When analyzing environmental samples, concentrating extraction eluents can greatly increase the sensitivity of PFAS extraction and analysis workflows. However, data on PFAS stability when evaporated under vacuum drying conditions are lacking. In this study two common sample preparation methods were replicated (methanol or methanolic ammonium hydroxide) to determine if PFAS material would undergo any observable loss during vacuum evaporation. Standards containing 49 different analytes from 7 different PFAS classes were evaporated to dryness under vacuum either with or without heat and reconstituted using one of two methods. It was found that recovery of some classes (e.g. PFSA, PFESA, FTS) was not greatly impacted by evaporation conditions or reconstitution method. Some analytes such as the very long chain PFCAs were not affected by evaporation conditions but saw drastic differences in recovery depending on the reconstitution method. Others analytes, for example PFSAms, experienced significant loss during evaporation that could not be mitigated by the chosen reconstitution method. This difference could be due to the number of fluorines present on the compound which correlated with a compound's hydrophobicity. Due to these findings, it is recommend that researchers consider PFAS class, chain length, and fluorine number when designing concentration and reconstitution protocols for PFAS to ensure conditions are optimal for the specific analytes of interest.		-
D123	分析	Wang, Yuqin; Darling, Seth B; Chen, Junhong	Selectivity of Per- and Polyfluoroalkyl Substance Sensors and Sorbents in Water	2021	ACS Appl Mater Interfaces. 2021 Dec 29;13(51):60789- 60814. doi: 10.1021/acsami.1c16517. Epub 2021 Dec 15.	Per- and polyfluoroalkyl substances (PFAS) are a large group of engineered chemicals that have been widely used in industrial production. PFAS have drawn increasing attention due to their frequent occurrence in the aquatic environment and their toxicity to animals and humans. Developing effective and efficient detection and remediation methods for PFAS in aquatic systems is critical to mitigate ongoing exposure and promote water reuse. Adsorption-based removal is the most common method for PFAS remediation since it avoids hazardous byproducts; in situ sensing technology is a promising approach for PFAS monitoring due to its fast response, easy operation, and portability. This review summarizes current materials and devices that have been demonstrated for PFAS adsorption and sensing. Selectivity, the key factor underlying both sensor and sorbent performance, is discussed by exploring the interactions between PFAS and various probes. Examples of selective probes will be presented and classified by fluorinated groups, cationic groups, and cavitary groups, and their synergistic effects will also be analyzed. This review aims to provide guidance and implication for future material design toward more selective and effective PFAS sensors and sorbents.		-

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D124	分析	Ganesan, Sunantha; Chawengkijwanic h, Chamorn; Gopalakrishnan, Mohan; Janjaroen, Dao	Detection methods for sub-nanogram level of emerging pollutants - Per and polyfluoroalkyl substances	2022	Food Chem Toxicol. 2022 Oct;168:113377. doi: 10.1016/j.fct.2022.113377. Epub 2022 Aug 19.	Per- and polyfluoroalkyl substances (PFAS) are organofluorine compounds has been manufactured for more than five decades and used in different purposes. Among persistent organic pollutants, PFAS are toxic, bioaccumulative in humans, wildlife, and global environment. As per environmental protection agency (EPA) guidelines, the perfluorooctanoate and perfluorooctane sulfonate permissible limit was 0.07 ng/L in drinking water. When the concentration exceeds the acceptable limit, it has negative consequences for humans. In such a case, PFAS monitoring is critical, and a quick detection technique are highly needed. Health departments and regulatory agencies have interests in monitoring of PFAS presences and exposures. For the detection of PFAS, numerous highly precise and sensitive chromatographic methods are available. However, the drawbacks of analytical techniques include timely sample preparations and the lack of on-site applicability. As a result, there is an increasing demand for simple sensor systems for monitoring of PFAS in real field samples. In this review, we first describe the sample pre-treatment and analytical techniques for the detection of PFAS. Second, we broadly discussed available sensor system for the quantification of PFAS in different filed samples. Finally, future trends in PFASs sensor are also presented.		-
D125	分析	Yu, Nanyang; Wang, Xuebing; Li, Yuqian; Jiao, Zhaoyu; Wei, Si	Response to Comment on "Suspect and Nontarget Screening of Per- and Polyfluoroalkyl Substances in Wastewater from a Fluorochemical Manufacturing Park"	2021	Environ Sci Technol. 2021 Apr 20;55(8):5593-5596. doi: 10.1021/acs.est.1c01254. Epub 2021 Mar 30.	No abstract available		-
D126	分析	Yuan, Jiahao; Ye, Li; Zhang, Jieyi; Du, Xiaotong; Ma, Ande; Pan, Jialiang	Nonaqueous Electroextraction with Tunable Selectivity for Direct, Fast, and Exhaustive Enrichment of Per- and Polyfluoroalkyl Acids from Oils and Food Contact Materials	2022	Anal Chem. 2022 Nov 15;94(45):15663-15670. doi: 10.1021/acs.analchem.2c02727. Epub 2022 Nov 2.	Widespread concerns have been raised due to the ever-increasing number of novel per- and polyfluoroalkyl acids (PFAAs) and the ever-decreasing level of legacy PFAAs. Most analytical methods for PFAAs suffer from a narrow range of analyzable PFAAs, insufficient sensitivity, poor performance for oil samples, and defective quantification without internal standards or blank matrices. To solve these challenges, a highly selective method for multiple PFAAs from oils and food contact materials (FCMs) was developed based on nonaqueous electroextraction (NE). Through theoretical derivation and experimental investigation, the selectivity of NE was discovered to be tunable, and the range of extractable analytes could be tuned by adjusting the dielectric constant of the sample solution. For PFAAs, the selectivity was attributed to the pK(a)-based differential migration mechanism, as PFAAs exhibited less variable pK(a) values in different solvents compared to interference components. The method achieved nonmatrix-matched calibration without internal standards and integration of sample cleanup, selective extraction, and exhaustive enrichment into a fast and convenient operation. The method provided low limits of detection (0.002-0.03 μ g·kg(-1)), satisfactory accuracy (88.0-107.8%), and RSDs (<11.7%). Migration experiments from 33 FCMs to oils were further investigated. PFBS (<0.05-2.34 μ g·kg(-1)) and PFBA (<0.2-0.398 μ g·kg(-1)) were detected from most FCMs. This was the first attempt at PFAA analysis as well as oil sample analysis using an electric field-assisted extraction technique and also the first report on PFAA migration from FCMs into edible oils.		-
D127	分析	Kidd, Justin; Fabricatore, Emily; Jackson, Dennis	Current and future federal and state sampling guidance for per- and polyfluoroalkyl substances in environmental matrices	2022	Sci Total Environ. 2022 Aug 25;836:155523. doi: 10.1016/j.scitotenv.2022.155523. Epub 2022 Apr 30.	Per- and polyfluoroalkyl substances (PFAS) are a class of emerging contaminants composed of an estimated 5000 to 10,000 human-made, fluorinated, organic chemicals. Due to the complexity of PFAS, the need for multiple environmental matrix considerations and the absence of a promulgated federal standard for environmental sampling and analysis, U.S. states have begun developing health-based regulatory and/or guidance values for a limited number of PFAS in environmental matrices. As there is a growing body of science to inform PFAS sampling guidance standard development, it is important to understand which U.S. states are implementing sampling guidelines and how they plan to handle emerging PFAS. This critical review discusses the current and impending federal and state sampling guidelines for PFAS in environmental matrices, the data gaps surrounding PFAS sampling guidance in U.S. states, and the future impacts of impending guidance documents and regulations. Ten federal guidance documents is 25 analytes spanning across 8 unique media. While the EPA has developed several different sampling and analytical guidelines for PFAS, there is no formal regulation of PFAS or requirements of states to enforce these guidelines. As a result, only 31 states have informally adopted sampling guidelines by the EPA, as well as updated analytical guidelines that target more PFAS or total organofluoride, is expected to continuously shift the landscape of federal and state guidance for PFAS sampling moving forward.		-

別添-2	文献データベース文献リスト

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D128	分析	Álvarez-Ruiz, Rodrigo; Picó, Yolanda; Campo, Julián	Multi-residue extraction to determine organic pollutants in mussel hemolymph	2021	J Sep Sci. 2021 Apr;44(8):1641-1651. doi: 10.1002/jssc.202001211. Epub 2021 Feb 2.	This study assesses the extraction of eleven pharmaceuticals, five pesticides, five perfluoroalkyl substances, and two illicit drugs in hemolymph from (Mytilus Galloprovincialis). Four extraction procedures using Phree TM Phospholipid Removal cartridges were tested using different volumes of methanol (400 and 600 μ L) and acetonitrile (300 and 450 μ L). The pollutants were determined by high-performance liquid chromatography-tandem mass spectrometry. The use of methanol gave several problems during the extraction procedure, such as longer times and sample loss. Three methods (acetonitrile 300 and 450 μ L; and methanol 600 μ L) were validated. Recoveries at three concentration levels (5, 50, and 100 ng/mL) ranged 35.1-129.0 and 29.3-133.0% for acetonitrile 300 and 450 μ L, respectively, while recoveries for methanol 600 μ L ranged 52.2-166.0%. Limits of detection were < 10 ng/mL for most analytes using any of the methods. Methanol 600 μ L was the only method capable to extract the illicit drug 4- methoxyphencyclidine and provided a better peak shape and higher signal-noise ratio. When applied to non-spiked samples from local markets salicylic acid and diclofenac were detected at 33.50-97.79 and 28.30-30.31 ng/mL respectively. To our knowledge, there are no methods to determine organic contaminants in hemolymph and this is the first application of Phree TM cartridges for mussel hemolymph extraction.		-
D129	分析	Piva, Elena; Ioime, Pasquale; Dall'Ara, Sonia; Fais, Paolo; Pascali, Jennifer P	Per- and polyfluoroalkyl substances (PFAS) determination in shellfish by liquid chromatography coupled to accurate mass spectrometry	2022	Drug Test Anal. 2022 Sep;14(9):1652-1659. doi: 10.1002/dta.3282. Epub 2022 May 20.	No abstract available		-
D130	分析	Li, Shuang; Ma, Jiping; Guan, Jing; Li, Jinhua; Wang, Xiaoyan; Sun, Xiyan; Chen, Lingxin	Selective cationic covalent organic framework for high throughput rapid extraction of novel polyfluoroalkyl substances	2023	J Hazard Mater. 2023 Jan 15;442:130125. doi: 10.1016/j.jhazmat.2022.130125. Epub 2022 Oct 4.	Novel per- and polyfluoroalkyl substances (PFASs) raise global concerns due to their toxic effects on environment and human health. However, researches on analytical methods of novel PFASs are lacking. Here, a kind of selective cationic covalent organic framework (iCOF) was designed and loaded on the surface of cotton as an adsorbent. Then, a simple solid-phase extraction (SPE) method based on the cotton@iCOF was developed for high throughput rapid extraction of six novel PFASs in water samples, coupled with ultrahigh-performance liquid chromatography-tandem mass spectrometry (UHPLC-MS/MS) determination. Several important SPE parameters, such as the amount of iCOF, sample pH, desorption conditions and salinity were systematically investigated. Under optimal conditions, the limits of detection and quantification of this SPE-UHPLC-MS/MS method were as low as 0.08-2.14 ng/L and 0.28-7.15 ng/L, respectively. The recoveries were 77.9-117.6 % for the tap water and surface water, and F-53 B in surface water were detected. Notably, this SPE process was rapid (1 h for 500 mL water sample) compared with commercial SPE (normal 2-3 h), owing to little resistance of cotton@iCOF and omission of nitrogen blowing process, and high throughput with 12 samples concurrently extracted. Additionally, various characterization means and density functional theory (DFT) calculations showed that ion-exchange effect, hydrophobic interaction, hydrogen bonding and ordered channel structure synergistically contributed to the PFASs adsorption on cotton@iCOF. The cotton@iCOF-based SPE method with simplicity, rapidity, selectivity and efficiency provided new research ideas for the analysis and control of ionic emerging pollutants in water.		-
D131	分析	Wu, Rongben; Lin, Huiju; Yamazaki, Eriko; Taniyasu, Sachi; Sörengård, Mattias; Ahrens, Lutz; Lam, Paul K S; Eun, Heesoo; Yamashita, Nobuyoshi	Simultaneous analysis of neutral and ionizable per- and polyfluoroalkyl substances in air	2021	Chemosphere. 2021 Oct;280:130607. doi: 10.1016/j.chemosphere.2021.130607. Epub 2021 Apr 28.	A new method is preliminarily validated for the simultaneous analysis of ionic and neutral per- and polyfluoroalkyl substances (PFASs) in both particulate and gaseous phases in air using a nanosampler-20 air sampler (NS20) composed of quartz fiber filters (QFFs), polyurethane foam (PUF) and artificial activated charcoal (GAIAC [™]). Perfluoroalkane sulfonamido ethanols (FOSEs) mainly remained in PUF, whereas the other neutral analytes were mainly found in GAIAC. Satisfactory recoveries were obtained for FOSEs, fluorotelomer alcohols (FTOHs), fluorotelomer iodides (FTIs), ranging fron 70%-120%, moderate recoveries were achieved for perfluorinated iodine alkanes (FIAs) and diiodofluoroalkanes (FDIAs), ranging from 50%-70%, while poor recoveries were found for perfluoroalkane sulfonamides (FOSAs). Breakthrough experiments revealed that almost all the target analytes were well trapped in GAIAC [™] , including the very volatile 4:2 FTOH. Applying to real sampling, our results showed that 6:2 and 8:2 FTOH were the most abundant species, with levels detected at 190 pg/m(3) and 160 pg/m(3). To the best of our knowledge, FDIAs were detected in ambient air for the first time at an average level of 8.3 pg/m(3). Overall, the profiles observed from the real air samples reflected current industrial transition from longer chain to shorter chain in PFAS production. Our results revealed that the current method is promising for a more comprehensive understanding on the fates of PFASs in air.		-
D132	分析	Getzinger, Gordon J; Higgins, Christopher P; Ferguson, P Lee	Structure Database and In Silico Spectral Library for Comprehensive Suspect Screening of Per- and Polyfluoroalkyl Substances (PFASs) in Environmental Media by High-resolution Mass Spectrometry	2021	Anal Chem. 2021 Feb 9;93(5):2820-2827. doi: 10.1021/acs.analchem.0c04109. Epub 2021 Jan 26.	Per and polyfluoroalkyl substances (PFASs) are an important class of organic pollutants. Many diverse PFASs are used in commerce and most are not amenable to conventional targeted chemical analysis due to lack of reference standards. Therefore, methods for elucidating the chemical structure of previously unreported or unexpected PFASs in the environment rely extensively on high-resolution mass spectrometry (HRMS). High-throughput structure identification by HRMS is hindered by a lack of PFAS molecular databases and tandem mass spectral libraries. Here, we report a new approach for generating an environmentally relevant PFAS molecular database constructed from curated structure lists and biotic/abiotic in silico predicted transformation products. Further, we have generated a predicted tandem mass spectral library using computational mass spectrometry tools. Results demonstrate the utility of the generated database and approach for identifying PFASs in HRMS-enabled suspect- and nontarget screening studies.		-

分野 タイトル 発行年 書誌情報 要旨 (原文) No 著者 (参考) The extent of unidentified Per- and Poly-fluoroalkyl substances (PFASs) found in environme development of non-targeted screening methods. The study presented here reports the use with high resolution mass spectrometry to detect and identify unknown and unexpected PFA exploring all ion fragmentation spectra for several characteristic fragments including C(n)F(3)(-), C(n)F(2n-7)(-), C(n)F(2n-11)(-) and C(n)F(2n+1)O(-) the presence of widely different Hensema, Thijs without the need for targeted screening methods. These fragments are then related to their J; Berendsen, Non-targeted identification of per- and polyfluoroalky Chemosphere. 2021 Feb;265:128599. doi: matching and subsequently identified. With this methodology 40 PFASs were (tentatively) id D133 分析 substances at trace level in surface water using Biorn I A: van 2021 10.1016/j.chemosphere.2020.128599. Epub 2020 Oct 10. sampled throughout the Netherlands. To the best of the authors' knowledge, four PFASs fou Leeuwen, Stefan fragment ion flagging species and have not been mentioned in any database or literature. This methodology elimir ΡI reported full scan feature selection techniques such as mass defect filtering, homologous se filtering, allowing the identification of PFASs at trace levels. Additionally, eight of the (tentat nomologous series, stressing the shortcomings of commonly reported non-targeted PFASs s the importance of more effective identification strategies such as FIF. Moreover, we like to applicable to real-life environmental samples with PFASs at background concentration levels The identification of xenobiotics in nontargeted metabolomic analyses is a vital step in unde metabolism, transformation, excretion, and coexistence with other endogenous molecules, h nterpretation of features detected in nontargeted studies. While mass spectrometry (MS)-b Foster, MaKavla metabolomic measurements, deconvoluting endogenous metabolites from xenobiotics is als Rainey, Markace xenobiotic parent and metabolite standards as well as the numerous isomers possible for ea Watson, we evaluate a xenobiotic structural annotation workflow using ion mobility spectrometry cou Chandler; Dodds, Uncovering PFAS and Other Xenobiotics in the Dark filtering, and machine learning to uncover potential xenobiotic classes and species in large Environ Sci Technol. 2022 Jun 21;56(12):9133-9143. doi: D134 分析 James N; Metabolome Using Ion Mobility Spectrometry, Mass 2022 classes examined included those of known high toxicities, including per- and polyfluoroalkyl 10.1021/acs.est.2c00201. Epub 2022 Jun 2. Kirkwood, Kaylie Defect Analysis, and Machine Learning aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), polybrominated diphenyl I; Fernández, Specifically, when the workflow was applied to identify PFAS in the NIST SRM 1957 and 909 Facundo M; reduced the hundreds of detected liquid chromatography (LC)-IMS-MS features by utilizing Baker, Erin S versus IMS collision cross sections relationships. These potential PFAS features were then entries, and while some matched within specific m/z tolerances, there were still many unknow nontargeted studies for detecting new molecules with known chemical characteristics. Add utilized to evaluate other xenobiotics and enable more confident annotations from nontarge The novel amino-functionalized magnetic covalent organic framework nanocomposites (Fe(fabricated at room temperature, which were explored as a magnetic adsorbent for magnetic Lu. Yuan-Yue: the basis of the hydrophobic surfaces of magnetic nanocomposites and introduction of prim Wang, Xiao-Li; Fe(3)O(4)@[NH(2)]-COFs displayed excellent enrichment capacity in "catching" ultratrace p Room-temperature synthesis of amino-functionalized Wang, Lei-Lei; nagnetic covalent organic frameworks for efficient J Hazard Mater. 2021 Apr 5;407:124782. doi: water samples because of the synergistic combination of hydrophobic and electrostatic inte D135 分析 Zhang, Wen; 2021 extraction of perfluoroalkyl acids in environmental 10.1016/j.jhazmat.2020.124782. Epub 2020 Dec 11. Fe(3)O(4)@[NH(2)]-COFs. Under the optimized pretreatment and instrumental parameters, Wei, Jinjian; Lin which hybridized MSPE using Fe(3)O(4)@[NH(2)]-COFs and HPLC-MS/MS, displayed favor water samples Jin-Ming; Zhao R(2) (0.9990-0.9999), low limits of detection (0.05-0.38 ng L(-1)), and excellent repeatability Ru-Song approach was successfully utilized to determine PFAAs in real water samples with spiked re 115.4%. Results indicated that Fe(3)O(4)@[NH(2)]-COFs would be a potential alternative for Per- and polyfluoroalkyl substances (PFASs) have been widely used since the 1940s in indu They also persist in the environment and bioaccumulate in humans and wildlife. Despite the MacNeil, Amber PFASs in environmental and biological samples are unknown. Herein, we describe a novel cy Li, Xiaolei; Amir (cIMS), hyphenated with gas chromatography (GC) atmospheric pressure chemical ionization Roshanak; Muir unknown PFASs on the basis of the ratio of their mass and collision cross section (CCS). Pre Gas Chromatography-(Cyclic) Ion Mobility Mass Derek C G; Anal Chem. 2022 Aug 9;94(31):11096-11103. doi: chemicals used in industry and commerce indicates that most compounds characterized by 2022 10.1021/acs.analchem.2c02325. Epub 2022 Jul 31 D136 分析 Spectrometry: A Novel Platform for the Discovery of Simpson, Andre of 100 Å(2) and one-fifth of their mass are either PFASs or polybrominated flame retardants Unknown Per-/Polyfluoroalkyl Substances Simpson, Myrna cIMS data collected from a set of 20 indoor dust samples, PFAS compounds are revealed wi J: Dorman, Frank occurrence. Validation of this approach was performed using SRM 2585, a standard reference comparing the PFASs detected with those (tentatively) identified in previous studies. Chloro L; Jobst, Karl J identified previously were confirmed with a synthesized standard. The method also reveals as an emerging class of "forever chemicals" that contaminate the indoor environment.

	備考	出 対 象 抽	ン 文 ク 献 ① ラ	ン 文 ク 献 ② ラ
ental samples has led to the of liquid chromatography hyphenated ASs by fragment ion flagging (FIF). By 2n+1)(-), C(n)F(2n-1)(-), C(n)F(2n- PFAS species can be anticipated precursor ion by retention time lentified in four surface water samples and through FIF are newly discovered mates the dependence on commonly eries detection and intensity threshold cively) identified PFASs are not part of screening methods and demonstrating emphasise that this approach is s.			-	
arstanding human exposure. Xenobiotic however, greatly complicate the lased platforms are commonly used in o often challenged by the lack of ach small molecule m/z feature. Here, upled with MS (IMS-MS), mass defect metabolomic feature lists. Xenobiotic substances (PFAS), polycyclic ethers (PBDEs), and pesticides. Oc human serum samples, it greatly both mass defect filtering and m/z compared to the EPA CompTox powns illustrating the importance of tionally, this workflow can also be ted studies.			-	
3)O(4)@[NH(2)]-COFs) were solid-phase extraction (MSPE). On ary amines into the COFs shell, perfluoroalkyl acids (PFAAs) from ractions between PFAAs and the proposed pretreatment approach, rable linearity (10-10,000 ng L(-1)) with r (3.7-9.2%). Moreover, the established proveries ranging from 72.1% to r MSPE of PFAAs at ultra-low levels.			-	
stry and everyday household products. see concerns, the identities of most yclic ion mobility mass spectrometer n, that can reveal the presence of ediction of the CCS of ca. 20,000 CCS values that are less than the sum of When this filter is applied to GC- thout prior knowledge of their ce material of household dust, by fluoro phthalimides tentatively the presence of chlorofluoro n-alkanes			-	

引添-2 文献データベース文献リスト	
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No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 情 対 報 劫	ン 文 ン 文 ク 献 ク 献 ① ラ ② ラ
D137	分析	Rodowa, Alix E; Reiner, Jessica L	Utilization of a NIST SRM: a case study for per- and polyfluoroalkyl substances in NIST SRM 1957 organic contaminants in non-fortified human serum	2021	Anal Bioanal Chem. 2021 Apr;413(9):2295-2301. doi: 10.1007/s00216-021-03241-7. Epub 2021 Mar 2.	The National Institute of Standards and Technology (NIST) generates and maintains thousands of Standard Reference Materials (SRMs) to serve commerce worldwide. Many SRMs contain metrologically traceable mass fractions of known organic chemicals and are commercially available to aid the analytical chemistry community. One such material, NIST SRM 1957 Organic Contaminants in Non-Fortified Human Serum, was one of the first materials issued by NIST with measurements for per- and polyfluoroalkyl substances (PFAS) listed on the Certificate of Analysis and was commercially available in 2009. Since the release of SRM 1957, nearly 400 units have been sold to date, and over 50 publications related to PFAS measurements have included this material for multiple analytical purposes, such as a quality control material, for interlaboratory comparison, as an in-house comparison tool, for inter- and intra-day measurement accuracy, as an indicator of isomeric patterns of PFAS, and for other uses. This perspective details the ways SRM 1957 is utilized by the analytical community and how data have been reported in the literature. A discussion on accurately comparing SRM data to generated data is included. Furthermore, we conducted an in-depth investigation around additional applications for NIST SRMs, such as a matrix-matched reference material, and for the identification of targeted compounds during high-resolution mass spectrometry data collection. Ultimately, this manuscript illustratively describes the ways to utilize a NIST SRMs for chemicals of emerging concern.			-
D138	分析	MacKeown, Henry; Magi, Emanuele; Di Carro, Marina; Benedetti, Barbara	Unravelling the role of membrane pore size in polar organic chemical integrative samplers (POCIS) to broaden the polarity range of sampled analytes	2022	Anal Bioanal Chem. 2022 Feb;414(5):1963-1972. doi: 10.1007/s00216-021-03832-4. Epub 2022 Jan 14.	Polar organic chemical integrative samplers (POCIS) are widely used in their standard configuration for sampling contaminants in water bodies. A wider polyethersulfone (PES) membrane pore size was employed in POCIS exposed in a static calibration experiment to investigate the uptake of 21 emerging contaminants ranging from hydrophilic (perfluoroalkyl compounds, xanthines, an artificial sweetener) to more hydrophobic compounds (pharmaceuticals, oestrogens, UV filters). Compared to standard POCIS with 0.1-µm pore size PES membranes, the POCIS with 5-µm pore size PES membranes did not increase sampling rates for compounds of relatively low and mid-hydrophobicity. However, the uptake of more hydrophobic and anionic compounds, which either poorly diffuse through or are retained within the standard 0.1-µm PES membrane, showed a marked increase. This led to the first ever recorded sampling rates for triclosan (0.249 L day(-1)) and two UV filters (0.075-0.123 L day(-1)). Based on these results, more attention should be placed on the choice of the appropriate membrane for each POCIS application. The most suitable configuration depends on the studied compound physico-chemical characteristics-such as the polarity and the compound membrane-to-sorbent partitioning coefficient-but also on the site conditions (deployment time, fouling, flow variations, et.).			-
D139	分析	Jia, Yuqian; Qian, Jieshu; Pan, Bingcai	, Dual-Functionalized MIL-101(Cr) for the Selective Enrichment and Ultrasensitive Analysis of Trace Per- and Poly-fluoroalkyl Substances	2021	Anal Chem. 2021 Aug 17;93(32):11116-11122. doi: 10.1021/acs.analchem.1c01489. Epub 2021 Aug 4.	The presence of per- and poly-fluoroalkyl substances (PFASs) even at trace levels poses a potential threat to ecological safety and human health. PFASs often require an extraction pretreatment for enrichment before detection and analysis, which is still challenged by the relatively low efficiency because of the limited specific interactions involved. Here, we deliberately introduced multiple interactions into the solid-phase microextraction (SPME) process via a dual-functional modification of MIL-101(Cr), i.e., amination and subsequent fluorination, which is then used as an adsorbent for the efficient enrichment of PFASs. In combination with ultra-high-performance liquid chromatography-tandem mass spectrometry (UHPLC-MS/MS), ultrasensitive quantitative analysis is available for nine selected PFASs with high linearities above 0.9941 in the ranges of 0.5-1500 ng/L, low limits of detection of 0.004-0.12 ng/L, satisfactory repeatability and reproducibility with a relative standard deviation (RSD) < 11.6%, as well as excellent performance in complicated real water samples (recovery ratio of 76.2-108.6%). This work represents a rational design of a solid extractant with the desired structure and functionality for the selective enrichment and analysis of PFASs at trace concentrations in real applications.			-
D140	分析	Gonzalez de Vega, Raquel; Cameron, Alex; Clases, David; Dodgen, Tyren M; Doble, Philip A; Bishop, David P	"Simultaneous targeted and non-targeted analysis of per- and polyfluoroalkyl substances in environmental samples by liquid chromatography-ion mobility- quadrupole time of flight-mass spectrometry and mass defect analysis"	2021	J Chromatogr A. 2021 Sep 13;1653:462423. doi: 10.1016/j.chroma.2021.462423. Epub 2021 Jul 22.	Per- and polyfluoroalkyl substances (PFAS) represent a large group of synthetic organic compounds which exhibit unique properties and have been extensively used for consumer and industrial products, resulting in a widespread presence in the environment. Regulation requiring PFAS monitoring has been implemented worldwide due to their potential health and eco-toxicological effects. Targeted methods are commonly used to monitor between twenty to forty PFAS compounds, representing only a small fraction of the number of compounds that may be present. Consequently, there is an increasing interest in complementary non-targeted methods to screen and identify unknown PFAS compounds with the aim to improve knowledge and to generate more accurate models regarding their environmental mobility and persistence. This work details the development of a method that simultaneously provided targeted and non-targeted PFAS analysis. Ultra-high performance liquid chromatography (UHPLC) was coupled to ion mobility-quadrupole time of flight-mass spectrometry (IMS-QTOF-MS) and used to quantify known and screen unknown PFAS in environmental samples collected within the greater Sydney basin (Australia). The method was validated for the quantification of 14 sulfonate-based PFAS, and a non-targeted data analysis workflow was developed using a combination of mass defect analysis with common fragment and neutral loss filtering to identify fluorine-containing species. The optimised method was applied to the environmental samples and enabled the determination of 3-7 compounds from the targeted list and the detection of a further 56-107 untargeted PFAS load in environmental samples.			-
分野 著者 タイトル 発行年 書誌情報 要旨 (原文) No. (参考) Per- and polyfluoroalkyl substances (PFAS) are difficult to analyze in environmental media of recovery and lack of analytical standards. The total oxidizable precursor (TOP) assay and su semiquantitative (SQ) concentration estimates are two approaches to assess total PFAS in needed to optimize workstreams for total PFAS analysis. This study applied two soil extracti analysis to three aqueous film-forming foams (AFFFs) and three AFFF-impacted soils. In so results from an extraction method utilizing sequential acidic and basic solvents led to a 35% Shojaei, Marzieh assay relative to results from a basic solvent only extraction in one of three soils tested, but Environ Sci Technol. 2022 Oct 18;56(20):14517-14527. doi: An Integrated Approach for Determination of Total significantly in remaining soils. Furthermore, sample-specific dilution schemes were require Kumar, Naveen: D141 分析 Guelfo, Jennifer Per- and Polyfluoroalkyl Substances (PFAS) 10.1021/acs.est.2c05143. Epub 2022 Oct 5. by the acidic extraction step that influenced estimates of total PFAS by SQ analysis. The res advantage to routine application of an acid extraction step in PFAS-impacted soils. In three samples identified eight classes of PFAS present after oxidation. Concentrations of three cla new TOP end points. Concentrations of the remaining five classes either remained constant decreases. As a result, combined TOP and SQ workstreams may yield the most representativ composition and concentration. The eight classes of PFAS present after TOP did not degrad structurally similar to PFCAs and PFSAs and are known to occur in the environment, sugges and a need for more routine monitoring. RATIONALE: The ability to perform absolute quantitation and non-targeted analysis on a sin would be advantageous to many researchers studying per- and polyfluoroalkyl substances ((HRAM) instrumentation (typically deployed for non-targeted work) carries several advantag workflows when performing absolute quantitation. Processing this data using a vendor-neut collaboration for these environmental studies. METHODS: LC-MS (Orbitrap Exploris 240) wa Enders, Jeffrey PFAS using precursor (MS1) peak areas for quantitation, whereas isotope pattern matching R: Weed. Development and validation of a high resolving power matching were used for qualitative identification. In addition, a fluorinated chromatographic 2022 Rapid Commun Mass Spectrom. 2022 Jun 15;36(11):e9295. doi: 10.1002/rcm.9295. Rebecca A; absolute quantitative per- and polyfluoroalkyl D142 分析 compared to the typical C18 columns typically used in PFAS analyses. This method was vali Griffith, Emily H substances method incorporating Skyline data classes using recommended guidelines found in EPA Method 537.1 and Skyline data process Muddiman, processing validated limits of all 45 compounds, as well as metrics or accuracy and reproducibility, are David C limits of quantitation in the range of 2-50 ng/L. Four newly released Chemours-specific con and PFO5DoA) were also validated. Aspects of data analysis specific to high resolving power as are the details of processing these data via Skyline. CONCLUSIONS: This method shows reproducible absolute quantitation of PFAS on an HRAM platform and does so using an ope processing software to facilitate sharing of data across labs and institutions. Instances of food contamination with per- and polyfluoroalkyl substances (PFAS) continue t preparation and analytical methods are quite limited and often monitor for a small percentage to evaluate, validate, and compare performance of two instruments with the recently develo rugged, safe, efficient, and robust" (QuEChERSER) sample preparation mega-method - a me over a broad range of physicochemical properties. Initial evaluation of the QuEChERSER me Comparison and validation of the QuEChERSER megain food demonstrated recoveries, matrix interferences, and co-extractive removal comparabl method for determination of per- and polyfluoroalkyl Drug Administration (FDA) and USDA Food Safety and Inspection Service (FSIS) methods. S Taylor, Raegyn Anal Chim Acta, 2022 Oct 16:1230:340400, doi: 2022 10.1016/j.aca.2022.340400. Epub 2022 Sep 15. B; Sapozhnikova D143 分析 substances in foods by liquid chromatography with in beef, catfish, chicken, pork, liquid eggs, and powdered eggs on a high-resolution mass spi Yelena high-resolution and triple quadrupole mass recoveries (70-120%) and precision (RSDs \leq 20%) for all 33 target analytes at the 1 and 5 ng spectrometry the 0.1 ng g(-1) level, depending on the matrix. Additional validation was performed by tande guadrupole instrument. This approach provided no non-detects and better recoveries at the method but exhibited more variability at 1 and 5 ng g(-1) spiking levels. Analysis of NIST SR 70-117%. These results demonstrate the capability of combining PFAS analysis with a mega analytes, while collecting non-target data for future retrospective analysis of emerging alter spectrometry method.

	備考	出 情 対 報 象 抽	ン 文 ク 献 ① ラ	ン 文 ク 献 ② ラ
due challenges such as extraction ispect screening analysis coupled with environmental media, but studies are for methods, TOP assay, and SQ ils, the total PFAS estimated with increase in precursors during TOP concentrations did not increase d to overcome matrix effects caused sults highlight that there is not an AFFFs, suspect screening of post-TOP asses increased, suggesting they are after TOP or exhibited slight ve assessment of total PFAS e in harsh conditions. Some are ting a similar degree of persistence			_	
gle mass spectrometry instrument PFAS). High-resolution accurate mass ges over traditional triple quadrupole ral software would promote as used for absolute quantitation of 45 and fragmentation (MS2) pattern column achieved superior separation dated across eight different chemical sing software. RESULTS: The reported. Most compounds achieved npounds (PEPA, PFO3OA, PFO4DA, r absolute quantitation are reviewed the feasibility of performing n-source vendor-neutral data			_	
o occur globally, but sample ge of known PFAS. This study aimed ped "quick, easy, cheap, effective, ethod developed to monitor chemicals ga-method for determination of PFAS e to (or better than) US Food and Subsequent validation of QuEChERSER ectrometer achieved acceptable g g(-1) levels and 67-88% of analytes at em mass spectrometry on a triple 0.1 ng g(-1) level than the HRMS Ms 1946 and 1947 gave accuracies of I-method previously validated for 350 natives with a high-resolution mass			_	

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 対報 象抽 ① ラ	ン 文 ク 献 ② ラ
D144	分析	Roesch, Philipp; Vogel, Christian; Huthwelker, Thomas; Wittwer, Philipp; Simon, Franz- Georg	Investigation of per- and polyfluoroalkyl substances (PFAS) in soils and sewage sludges by fluorine K- edge XANES spectroscopy and combustion ion chromatography	2022	Environ Sci Pollut Res Int. 2022 Apr;29(18):26889-26899. doi: 10.1007/s11356-021-17838-z. Epub 2021 Dec 3.	For the first time, fluorine K-edge X-ray absorption near-edge structure (XANES) spectroscopy was applied to detect per- and polyfluoroalkyl substances (PFAS) in various soil and sewage sludge samples. The method can be used to determine the speciation of inorganic and organic fluorides, without pre-treatment of solid samples. Therefore, XANES spectra of several inorganic fluorides as well as selected fluorinated organic compounds were recorded. While inorganic fluorides partially exhibit a variety of sharp spectral features in the XANES spectrum, almost all inspected organofluorine compounds show two distinct broad features at 688.5 and 692.0 eV. Moreover, the peak intensity ratio 688.5 eV/692.0 eV in the PFAS XANES spectrum can be inversely correlated to the chain length of the perfluoro sulfonic acid group. The detection of targeted PFAS by bulk-XANES spectroscopy in combination with linear combination fitting in soils and sewage sludges was not applicable due to the low organic fluorine to total fluorine ratio of the samples (0.01-1.84%). Nonetheless, direct analysis of pure PFAS revealed that analysis of organofluorine species might be achieved in higher concentrated samples. Furthermore, quantitative measurements by combustion ion chromatography (CIC) evaluated as sum parameters extractable organically bound fluorine (EOF) and total fluorine (TF) emphasize that besides soils, sewage sludges are a significant source of organic fluorine in agriculture (154-7209 μ g/kg).		-	
D145	分析	Borrull, Josep; Colom, Agustí; Fabregas, Josepa; Pocurull, Eva; Borrull, Francesc	A liquid chromatography tandem mass spectrometry method for determining 18 per- and polyfluoroalkyl substances in source and treated drinking water	2020	J Chromatogr A. 2020 Oct 11;1629:461485. doi: 10.1016/j.chroma.2020.461485. Epub 2020 Aug 13.	Per- and polyfluoroalkyl substances (PFASs) have been determined in waters intended for human consumption, causing concern due to their potential toxic effects in humans and the environment. Drinking water is acknowledged to be one of the major routes of exposure to PFASs, which has led to the implementation of regulatory guidelines for PFASs in drinking water. In this study a fast, simple, sensitive and cost-effective method is developed for the determination of 18 PFASs in river and drinking water. The proposed method consists of directly injecting 900 µL of sample into a liquid chromatograph coupled to a triple quadrupole mass analyser, which involves minimal sample treatment as the sample only needs to be filtered. The method was validated in influent and effluent water from a drinking water treatment plant. Strong matrix effects were found for some of the target PFASs, and matrix-matched calibration curves were performed to enable accurate (87-114%) and precise (%RSD between 3 and 18%) quantification (n = 5, at 5 and 75 ng·L(-1)) with very good sensitivity (method quantitation limits between 0.1 and 2.0 ng·L(-1)). The method was applied to water samples from the influent and effluent of a drinking water treatment plant located in Catalonia (Spain), as well as in tap water and bottled water. The most abundant PFAS in all the types of water was PFBA, which represents 48%, 49%, 66% and 69% of total PFASs found in influent, effluent, tap and bottled water respectively. Relative mean abundances and the sum of mean concentrations in influent and effluent water suggests poor removal of PFASs during drinking water treatment. The concentrations of PFASs in bottled waters were generally lower than those in tap waters.		-	
D146	分析	Ji, Yongyan; Cui, Zongyan; Wang, Zhibin; Cao, Yanzhong; Li, Xuemin; Li, Adan	Simultaneous determination of seven perfluoroalkyl carboxylic acids in water samples by 2,3,4,5,6- pentafluorobenzyl bromide derivatization and gas chromatography-mass spectrometry	2020	Environ Pollut. 2020 Nov;266(Pt 3):115043. doi: 10.1016/j.envpol.2020.115043. Epub 2020 Jun 21.	A new derivatization reagent, 2,3,4,5,6-pentafluorobenzyl bromide (PFBBr), was employed to determine seven perfluoroalkyl carboxylic acids (PFCAs) simultaneously in tap water with gas chromatography-mass spectrometry (GC-MS) technique in this study. Firstly, seven PFCAs were derivatized to their corresponding esters under alkaline condition. The derivatization conditions including the amount of PFBBr and K(2)CO(3), derivatization temperature and time were optimized to increase the derivatization efficiency. The 14 tap water samples collected from different places of China were enriched and purified through solid phase extraction pretreatment. The limits of detection (LODs) and the limits of quantitation (LOQs) ranged from 0.1 ng/L to 0.28 ng/L and from 0.3 ng/L to 0.84 ng/L, respectively. The new method offers a linear relationship in the range from 2 ng/L to 2000 ng/L, and the correlation coefficients ranged from 0.9938 to 0.9994. The results showed that GC-MS combined with pre-column derivatization is a reliable method for the analysis of PFCAs in the aqueous environment.		-	
D147	分析	Frigerio, Gianfranco; Cafagna, Simone; Polledri, Elisa; Mercadante, Rosa; Fustinoni, Silvia	Correction to: Development and validation of an LC- MS/MS method for the quantitation of 30 legacy and emerging per- and polyfluoroalkyl substances (PFASs) in human plasma, including HFPO-DA, DONA, and cC6O4	2022	Anal Bioanal Chem. 2022 Mar;414(6):2315. doi: 10.1007/s00216-022-03873-3.	No abstract available		-	

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 村 報 教 抽	ン 文 ン 文 ク 献 ク 献 ① ラ ② ラ
D148	分析	Nassazzi, Winnie; Lai, Foon Yin; Ahrens, Lutz	A novel method for extraction, clean-up and analysis of per- and polyfluoroalkyl substances (PFAS) in different plant matrices using LC-MS/MS	2022	J Chromatogr B Analyt Technol Biomed Life Sci. 2022 Oct 22;1212:123514. doi: 10.1016/j.jchromb.2022.123514. Online ahead of print.	Per- and polyfluoroalkyl substances (PFAS) are chemicals of concern due to their persistence, bioaccumulation, and toxic properties. PFAS accumulation in plants poses a risk of human and animal exposure due to consumption of the affected plants, but also allows plants to be used in remediation of PFAS-contaminated soils and groundwater. Therefore, effective extraction, cleanup, and analytical methods for measuring PFAS concentrations in plants are fundamental for research on animal and environmental health. PFAS analysis in plant matrices is complex, due to high matrix interference, and scarcity of methods for analyzing different classes of PFAS. In this study, a simple sample preparation method for PFAS analysis in various plant tissues (leaves, needles, twigs, stems, roots from 10 different species) was developed and validated. Instrumental analysis was performed using liquid chromatography coupled to tandem mass spectrometry (LC-MS/MS). The method was optimized considering six different extraction conditions and three different cleanup techniques. Methanol as extraction solvent, combined with 1 g ENVI carb cartridges, showed best performance among all extraction conditions and cleanup techniques tested. Method validation showed good recovery (90-120%), high within-day and between-day precision (<20% relative standard deviation), and low method detection limit (0.04-4.8 ng g(-1) dry weight (dw)) for different plant matrices. In tests of the method on soil and different plant tissues of silver birch (Betula pendula) and Norway spruce (Picea abies) at a PFAS-contaminated site, 16 of 24 target PFAS were detected in plants and 17 in soil. ΣPFAS concentration in soil was 43 ng g(-1) dw. PFAS distribution in silver birch tissues ranged from 7.1 ng g(-1) dw in roots to 64 ng g(-1) dw in leaves, and in Norway spruce from 14 ng g(-1) dw in roots to 16 ng g(-1) dw in needles. This novel method for PFAS analysis in plants can be valuable in future monitoring, process understanding, remediation, and risk assessments.			-
D149	分析	Lang, Johnsie R; McDonough, Jeffery; Guillette, T C; Storch, Peter; Anderson, John; Liles, David; Prigge, Robert; Miles, Jonathan A L; Divine, Craig	Characterization of per- and polyfluoroalkyl substances on fire suppression system piping and optimization of removal methods	2022	Chemosphere. 2022 Dec;308(Pt 2):136254. doi: 10.1016/j.chemosphere.2022.136254. Epub 2022 Sep 12.	Fire suppression systems are known to be impacted with residual, entrained per- and polyfluoroalkyl substances (PFASs) because of historical use of aqueous film forming foam (AFFF) and fluoroprotein foam. Amphiphilic PFASs aggregate at liquid:solid interfaces creating a hydrophobic layer which reduces the effectiveness of water to remove PFAS from layered surfaces. When fire suppression systems are transitioned to fluorine free foam (F3) without appropriate cleaning, residual PFASs associated with the surfaces of the fire suppression system can contaminate the replacement F3. Release of residual PFASs from fire suppression systems into F3 has been documented; however, little is known about the residual PFASs associated with the surfaces of the fire suppression systems. More information is needed to develop methods to appropriately remove PFASs from fire suppression systems to prevent costly and inefficient foam transitioning and preserve the PFAS-free benefit of F3. The objective of this work was to evaluate the distribution and composition of PFASs on hangar piping exposed to PFAS-containing firefighting foam for a prolonged period. Two assessment methods were used: 1) extractions with methanol, water, and a proprietary aqueous organic solvent (Fluoro Fighter TM); and 2) direct imaging methods of the surface. Extractions were analyzed with mass spectrometry and combustion ion chromatography. Results indicate pipe in contact with PFAS-containing firefighting foam can amass approximately 10 μ g/cm(2) of surface-associated PFAS residual following decades of exposure. Fluoro Fighter demonstrated higher PFAS removal per surface area of pipe than methanol (p = 0.007) or water extraction (p < 0.0001). Scanning electron microscope (SEM) images of the hangar piping reveal deposits suspected to be self-assembled PFAS layers, as evidenced by examination of pipe surfaces using X-ray photoelectron spectroscopy (XPS), which revealed atomic fluorine on the surface of the pipe.			-
D150	分析	Valdiviezo, Alan; Aly, Noor A; Luo, Yu-Syuan; Cordova, Alexandra; Casillas, Gaston; Foster, MaKayla; Baker, Erin S; Rusyn, Ivan	Analysis of per- and polyfluoroalkyl substances in Houston Ship Channel and Galveston Bay following a large-scale industrial fire using ion-mobility- spectrometry-mass spectrometry	2022	J Environ Sci (China). 2022 May;115:350-362. doi: 10.1016/j.jes.2021.08.004. Epub 2021 Aug 22.	Per- and polyfluoroalkyl substances (PFAS) are persistent organic pollutants of concern because of their ubiquitous presence in surface and ground water; analytical methods that can be used for rapid comprehensive exposure assessment and fingerprinting of PFAS are needed. Following the fires at the Intercontinental Terminals Company (ITC) in Deer Park, TX in 2019, large quantities of PFAS-containing firefighting foams were deployed. The release of these substances into the Houston Ship Channel/Galveston Bay (HSC/GB) prompted concerns over the extent and level of PFAS contamination. A targeted liquid chromatography-tandem mass spectrometry (LC-MS/MS)-based study of temporal and spatial patterns of PFAS associated with this incident revealed presence of 7 species; their levels gradually decreased over a 6-month period. Because the targeted LC-MS/MS analysis was focused on about 30 PFAS molecules, it may have missed other PFAS compounds present in firefighting foams. Therefore, we utilized untargeted LC-ion mobility spectrometry-mass spectrometry (LC-IMS-MS)-based analytical approach for a more comprehensive characterization of PFAS in these water samples. We analyzed 31 samples from 9 sites in the HSC/GB that were collected over 5 months after the incident. Our data showed that additional 19 PFAS were detected in surface water of HSC/GB, most of them decreased gradually after the incident. PFAS features detected by LC-MS/MS correlated well in abundance with LC-IMS-MS data; however, LC-IMS-MS identified a number of additional PFAS, many known to be components of firefighting foams. These in complex environmental samples.			-

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 多抽 ① ラ ② ラ
D151	分析	Kabiri, Shervin; Tucker, William; Navarro, Divina A; Bräunig, Jennifer; Thompson, Kristie; Knight, Emma R; Nguyen, Thi Minh Hong; Grimison, Charles; Barnes, Craig M; Higgins, Christopher P; Mueller, Jochen F; Kookana, Rai S; McLaughlin, Michael J	Comparing the Leaching Behavior of Per- and Polyfluoroalkyl Substances from Contaminated Soils Using Static and Column Leaching Tests	2022	Environ Sci Technol. 2022 Jan 4;56(1):368-378. doi: 10.1021/acs.est.1c06604. Epub 2021 Dec 21.	Soil contaminated with aqueous film-forming foams (AFFFs) containing per- and polyfluoroalkyl substances (PFASs) at firefighting training sites has become a major concern worldwide. To date, most studies have focused on assessing soil-water partitioning behavior of PFASs and the key factors that can affect their sorption, whereas PFASs leaching from contaminated soils have not yet been widely investigated. This study evaluated the leaching and desorption of a wide range of PFASs from twelve contaminated soils using the Australian Standard Leaching Procedure (ASLP), the U.S. EPA Multiple Extraction Procedure (MEP), and Leaching Environmental Assessment Framework (LEAF). All three leaching the spovided a similar assessment of PFAS leaching behavior. Leaching of PFASs from soils was related to C-chain lengths and their functional head groups. While short-chain (CF($2) \le 6$) PFASs were easily desorbed and leached, long-chain PFASs were more difficult to desorb. PFASs with a carboxylate head group were leached more readily and to a greater extent than those with a sulfonate or sulfonamide head group. Leaching of long-chain PFASs was pH-dependent where leaching increased at high pH, while leaching of short-chain PFASs was less sensitive to pH. Comparing different leaching tests showed that the results using the alkaline ASLP were similar to the cumulative MEP data and the former might be more practical for routine use than the MEP. No single soil property was adequately able to describe PFAS leaching from the soils. Overall, the PFAS chemical structure appeared to have a greater effect on PFAS leaching from soil than soil physicochemical properties.		-
D152	分析	Luo, Yu-Syuan; Aly, Noor A; McCord, James; Strynar, Mark J; Chiu, Weihsueh A; Dodds, James N; Baker, Erin S; Rusyn, Ivan	Rapid Characterization of Emerging Per- and Polyfluoroalkyl Substances in Aqueous Film-Forming Foams Using Ion Mobility Spectrometry-Mass Spectrometry	2020	Environ Sci Technol. 2020 Dec 1;54(23):15024-15034. doi: 10.1021/acs.est.0c04798. Epub 2020 Nov 11.	Aqueous film-forming foams (AFFF) are mixtures formulated with numerous hydrocarbon- and fluoro-containing surfactants. AFFF use leads to environmental releases of unknown per- and polyfluoroalkyl substances (PFAS). AFFF composition is seldom disclosed, and their use elicits concerns from both regulatory agencies and the public because PFAS are persistent in the environment and potentially associated with adverse health effects. In this study, we demonstrate the use of coupled liquid chromatography, ion mobility spectrometry, and mass spectrometry (LC-IMS-MS) to rapidly characterize both known and unknown PFAS in AFFF. Ten AFFF formulations from seven brands were analyzed using LC-IMS-MS in both negative and positive ion modes. Untargeted analysis of the formulations was followed by feature identification of PFAS-like features utilizing database matching, mass defect and homologous series evaluation, and MS/MS fragmentation experiments. Across the tested AFFF formulations, we identified 33 homologous series; only ten of these homologous series have been previously reported. Among tested AFFF, the FireStopper (n = 85) contained the greatest number of PFAS-like features and Phos-Check contained zero. This work demonstrates that LC-IMS-MS-enabled untargeted analysis of complex formulations, followed by feature identification using data-processing algorithms, can be used for rapid exposure characterization of known and putative PFAS during fire suppression- related contamination events.		-
D153	分析	Li, Jinhong; Li, Qiang; Li, Jiufeng; Zhang, Yunhui	Simultaneous determination of poly- and perfluoroalkyl substances and organophosphorus flame retardants in serum by ultra-performance liquid chromatography/tandem mass spectrometry	2022	Rapid Commun Mass Spectrom. 2022 Jul 30;36(14):e9312. doi: 10.1002/rcm.9312.	RATIONALE: Poly- and perfluoroalkyl substances (PFASs) and organophosphorus flame retardants (OPFRs) are two types of emerging organic pollutants with potential human health hazards. Here, a rapid and sensitive method was developed for the determination of sixteen PFASs and seven OPFRs in human serum by ultra-performance liquid chromatography/tandem mass spectrometry (UPLC/MS/MS). METHODS: After optimizing the chromatographic and mass spectrometric conditions, respectively, 100 μ L of serum sample was liquid-liquid extracted using 8 mL of methyl tert-butyl ether. The 23 targets were quantified within 8 min. All targets were quantified by the isotope-internal standard method in both negative- and positive-ion mode by UPLC/MS/MS. RESULTS: The method was validated in terms of sensitivity, linearity, precision, and accuracy. The limit of detection ranged between 0.004 and 0.650 ng/mL. Recoveries ranged from70.0% to 118.9% with a relative standard deviation lower than 20%. The developed method was successfully applied to analyze targeted analytes in human serum samples. A total of 13 of 23 analytes were detected in over 50% of samples. CONCLUSIONS: A sensitive and rapid method was developed to quantify sixteen PFASs and seven OPFRs in serum. Sensitivity, linearity, recovery, and precision were validated and found to be satisfactory. This method can be a valuable tool for evaluation of exposure to both PFASs and OPFRs with high separation efficiency and sensitivity.		-
D154	分析	Dodds, James N; Alexander, Nancy Lee M; Kirkwood, Kaylie I; Foster, MaKayla R; Hopkins, Zachary R; Knappe, Detlef R U; Baker, Erin S	From Pesticides to Per- and Polyfluoroalkyl Substances: An Evaluation of Recent Targeted and Untargeted Mass Spectrometry Methods for Xenobiotics	2021	Anal Chem. 2021 Jan 12;93(1):641-656. doi: 10.1021/acs.analchem.0c04359. Epub 2020 Nov 2.	No abstract available		-

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 村 報 抽	ン 文 ン 文 ク 献 ク 献 ① ラ ② ラ
D155	分析	Srivastava, Prashant; Williams, Mike; Du, Jun; Navarro, Divina; Kookana, Rai; Douglas, Grant; Bastow, Trevor; Davis, Greg; Kirby, Jason K	Method for extraction and analysis of per- and poly- fluoroalkyl substances in contaminated asphalt	2022	Anal Methods. 2022 May 5;14(17):1678-1689. doi: 10.1039/d2ay00221c.	The legacy use of aqueous film-forming foam (AFFF) has led to the generation of large volumes of per- and poly-fluoroalkyl substances (PFAS)-contaminated asphalt materials, especially at airports and fire training areas. The management of such PFAS-contaminated asphalt materials requires an understanding of PFAS concentrations in these materials. This study, therefore, aimed to develop a suitable extraction methodology for the analysis of 22 target PFAS (i.e., carboxylic acids, sulfonic acids and fluorotelomers) in asphalt materials. A series of experiments was conducted to optimise extraction solvent composition, as well as to assess the performance of the chosen method under various conditions (i.e., sonication temperature, PFAS contamination level, asphalt core composition and timing of stable isotope addition used as internal standard). The methanol-based extractants performed best due to their accuracy and precision, which were within the acceptable range (extraction efficiency between 70 and 130% and RSD < 20%). The method which involved three successive extractions with methanol/1% NH(3) by ultrasonication at 25 ° C was selected due to its performance and ease of operation. The mean recovery of a vast majority of PFAS was found to be in the acceptable range. Tests on the timing of addition of stable isotope (SI)-labelled PFAS internal standards indicate that the recoveries obtained, regardless of when the stable isotopes were added, were within the acceptable range for PFAS. The accuracy and precision of asphalt material in the field). Low RSDs were achieved for asphalt cores collected from a contaminated site covering a wide range of concentrations (from LOQ to 2135 mg kg(-1)), demonstrating the suitability of the sample preparation method for real-world samples. The results from the interlaboratory testing were also in good agreement and validated the proposed PFAS extraction and analytical approach.			-
D156	分析	Adamson, David T; Nickerson, Anastasia; Kulkarni, Poonam R; Higgins, Christopher P; Popovic, Jovan; Field, Jennifer; Rodowa, Alix; Newell, Charles; DeBlanc, Phil; Kornuc, John J	Mass-Based, Field-Scale Demonstration of PFAS Retention within AFFF-Associated Source Areas	2020	Environ Sci Technol. 2020 Dec 15;54(24):15768-15777. doi: 10.1021/acs.est.0c04472. Epub 2020 Dec 3.	Transport of poly- and perfluoroalkyl substances (PFAS) at aqueous film-forming foam (AFFF)-impacted sites is limited by various processes that can retain PFAS mass within the source area. This study used concentration data obtained via a high-resolution sampling and analytical protocol to estimate the PFAS mass distribution in source and downgradient areas of a former firefighter training area. The total PFAS mass present at the site was approximately 222 kg, with 106 kg as perfluoroalkyl acids (PFAAs) and 116 kg as polyfluorinated precursors. Zwitterionic and cationic PFAS represented 83% of the total precursor mass and were found primarily in the source and up/side-gradient areas (75%), likely due to preferential hydrophobic partitioning, electrostatic interactions, and diffusion into lower-permeability soils. Based on the release history and the high percentage of total PFAS mass represented by precursors (primarily electrochemical fluorination-derived compounds), the estimated conversion rate of precursors to PFAAs was less than 2% annually. Eighty-two percent of the total PFAS mass was encountered in lower-permeability soils, which limited the potential for advection and transformation. This contributed to a 99% decrease in the mass discharge rate at the far-downgradient plume (0.048 kg/yr compared to the near-source area (3.6 kg/yr)). The results provide field-scale evidence of the importance of these PFAS retention processes at sites where AFFF has been released.			-
D157	分析	Charbonnet, Joseph A; McDonough, Carrie A; Xiao, Feng; Schwichtenberg, Trever; Cao, Dunping; Kaserzon, Sarit; Thomas, Kevin V; Dewapriya, Pradeep; Place, Benjamin J; Schymanski, Emma L; Field, Jennifer A; Helbling, Damian E; Higgins, Christopher P	Communicating Confidence of Per- and Polyfluoroalkyl Substance Identification via High-Resolution Mass Spectrometry	2022	Environ Sci Technol Lett. 2022 Jun 14;9(6):473-481. doi: 10.1021/acs.estlett.2c00206. Epub 2022 May 26.	Per- and polyfluoroalkyl substances (PFASs) are important environmental contaminants, yet relatively few analytical reference standards exist for this class. Nontarget analyses performed by means of high-resolution mass spectrometry (HRMS) are increasingly common for the discovery and identification of PFASs in environmental and biological samples. The certainty of PFAS identifications made via HRMS must be communicated through a reliable and harmonized approach. Here, we present a confidence scale along with identification criteria specific to suspect or nontarget analysis of PFASs by means of nontarget HRMS. Confidence levels range from level 1a-"Confirmed by Reference Standard," and level 1b-"Indistinguishable from Reference Standard," to level 5-"Exact Masses of Interest," which are identified by suspect screening or data filtering, two common forms of feature prioritization. This confidence scale is consistent with general criteria for communicating confidence in the identification of small organic molecules by HRMS (e.g., through a match to analytical reference standards, library MS/MS, and/or retention times) but incorporates the specific conventions and tools used in PFAS classification and analysis (e.g., detection of homologous series and specific ranges of mass defects). Our scale clarifies the level of certainty in PFAS identification and, in doing so, facilitates more efficient identification.			-

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D158	分析	Jones, Jenifer L; Burket, S Rebekah; Hanley, Adrian; Shoemaker, Jody A	Development of a standardized adsorbable organofluorine screening method for wastewaters with detection by combustion ion chromatography	2022	Anal Methods. 2022 Sep 22;14(36):3501-3511. doi: 10.1039/d2ay01121b.	Per- and polyfluoroalkyl substances (PFAS) are man-made organofluorine chemicals that can contaminate environmental waters and have gained worldwide attention over the past two decades. PFAS are most frequently detected by mass spectrometric targeted analysis methods which may not detect all the PFAS in samples. This report describes the investigation of adsorbable organofluorine (AOF) with detection by combustion ion chromatography (CIC) for detection of PFAS in surface waters and wastewaters that adsorb to granular activated carbon (GAC) with the recognition that this technique measures more than just PFAS. Overall mean recoveries of 77-120% were obtained in 17 of the 18 tested surface water and wastewater matrices spiked with perfluoropentane sulfonate (PFPeS) and 55-119% mean recoveries were obtained in 11 of the 12 surface water and wastewater. Method detection limits of 1.4-2.2 μ g L(-1) were achieved using 100 mL sample volumes adsorbed onto commercially available GAC. This report demonstrates that this AOF technique can be a useful screening tool for estimating organofluorine concentrations when PFAS contamination is suspected.			-
D159	分析	Heuckeroth, Steffen; Nxumalo, Tengetile N; Raab, Andrea; Feldmann, Joerg	Fluorine-Specific Detection Using ICP-MS Helps to Identify PFAS Degradation Products in Nontargeted Analysis	2021	Anal Chem. 2021 Apr 27;93(16):6335-6341. doi: 10.1021/acs.analchem.1c00031. Epub 2021 Apr 13.	Although several per- and polyfluoroalkyl substances (PFAS) have been banned and classified as substances of very high concern by the European Chemicals Agency, similar chemicals remain widely used compounds to date. Even though more than 4700 PFASs may occur in the environment, only 40-50 compounds are routinely determined in targeted analysis by ESI-MS using isotopically labeled standards. Nontargeted analysis using high resolution (HR) molecular mass spectrometry suffers from a lack of data mining algorithms for identification and often low ionization efficiency of the compounds. An additional problem for quantification is the potential lack of suitable species specific standards. Here, we demonstrate the usefulness of a hard ionization source (ICP- MS/MS) as a fluorine-specific detector in combination with ESI-MS for the identification of fluorine containing compounds. Simultaneous hyphenation of HPLC-ICP-MS/MS with HR-ESI-MS is applied to evaluate biodegradation products of organofluorine compounds by sewage sludge. The data are analyzed in a nontarget approach using MZmine. Due to the fluorine-specific detection by ICP-MS/MS, more than 5000 peaks (features) of the ESI-MS were reduced to 15 features. Of these, one was identified as a PFAS degradation compound of fluorotelomer alcohol (8:2 FTOH) without using targeted analysis. The feasibility of the detection of organofluorine metabolites using a fluorine-specific detection was demonstrated using a model compound and can thus be applied to new experiments and unknown organofluorine containing samples in the future.			-
D160	分析	Jacob, Paige; Barzen-Hanson, Krista A; Helbling, Damian E	Target and Nontarget Analysis of Per- and Polyfluoralkyl Substances in Wastewater from Electronics Fabrication Facilities	2021	Environ Sci Technol. 2021 Feb 16;55(4):2346-2356. doi: 10.1021/acs.est.0c06690. Epub 2021 Jan 26.	The goals of this study were to improve our understanding of the types of per- and polyfluoroalkyl substances (PFASs) that occur in wastewater from electronics fabrication facilities (fabs) and to assess the relative concentrations of PFAS species. We collected wastewater samples from three fabs in the United States, analyzed the samples by means of high-resolution mass spectrometry, and implemented complementary target and nontarget analyses. Twelve of 25 target PFASs were quantified in at least one sample, and five perfluorocarboxylates and perfluorobutane sulfonate (PFBS) were quantified in all samples. PFBS was quantified at the highest concentration among the samples (8040 ng L(-1)) and we expect that its presence is related to the use of photoacid generators during photolithography. The sum concentrations of the target PFASs in the diluted discharge samples from each fab were 623, 394, and 376 ng L(-1). Nontarget analysis revealed the presence of 41 homologous series of PFASs comprising 133 homologues. We proposed structures for 15 homologous series of nontarget PFASs, six of which are reported here for the first time. Using an approach for semiquantification of nontarget PFASs, we estimated that the sum concentrations of target and nontarget PFASs in the diluted discharge samples from each fab were 1490, 78 700, and 2170 ng L(-1). Our findings are essential for developing alternative photolithography chemicals or informing the implementation of advanced wastewater treatment technologies at fabs.			-
D161	分析	Chiumiento, Francesco; Bellocci, Mirella; Ceci, Roberta; D'Antonio, Silvia; De Benedictis, Alfonso; Leva, Manuela; Pirito, Luigi; Rosato, Roberta; Scarpone, Rossana; Scortichini, Giampiero; Tammaro, Giulio; Diletti, Gianfranco	A new method for determining PFASs by UHPLC- HRMS (Q-Orbitrap): Application to PFAS analysis of organic and conventional eggs sold in Italy	2023	Food Chem. 2023 Feb 1;401:134135. doi: 10.1016/j.foodchem.2022.134135. Epub 2022 Sep 8.	Per- and polyfluoroalkyl substances (PFASs) are ubiquitous environmental pollutants with the ability to uptake to food and feed. Among food, fish, fruits and eggs are considered as major contributors to human dietary exposure. A new method was developed and validated for the simultaneous determination of 18 PFASs in eggs using isotope dilution followed by ultrahigh performance liquid chromatography coupled to high resolution mass spectrometry. The analysis of 132 samples (organic, barn and caged eggs) was performed. Levels were always close to the detection limits and no significant difference emerged among the 3 groups. The highest PFAS concentration in eggs was used to estimate the dietary exposure of different Italian population groups. As expected, children were more highly exposed than adults due to lower body weight. This data suggests that the recent tolerable weekly intake of 4.4 ng kg(-1)b.w. could be exceeded when the cumulative intake arising from other food products is considered.			-

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D162	分析	Jacob, Paige; Wang, Ri; Ching, Casey; Helbling, Damian E	Evaluation, optimization, and application of three independent suspect screening workflows for the characterization of PFASs in water	2021	Environ Sci Process Impacts. 2021 Oct 20;23(10):1554-1565. doi: 10.1039/d1em00286d.	Suspect screening is a valuable tool for characterizing per- and polyfluoroalkyl substances (PFASs) in environmental media. Although a variety of data mining tools have been developed and applied for suspect screening of PFAS, few suspect screening workflows have undergone a comprehensive performance evaluation or optimization. The goals of this research were to: (1) evaluate and optimize three independent suspect screening workflows for the detection of PFASs in water samples; and (2) apply the optimized suspect screening workflows to an environmental sample to determine the extent to which suspect screening results converge. We evaluated and optimized suspect screening workflows using Compound Discoverer v3.2, enviMass v4.2, and FluoroMatch v2.4 using test samples containing 33 target PFASs. The average sensitivity (Sen) and selectivity (Sel) for each workflow across the test samples was: Compound Discoverer Sen = 71%, Sel = 85%; enviMass Sen = 89%, Sel = 80%; FluoroMatch Sen = 51%, Sel = 82%. We then applied the optimized workflows to a contaminated groundwater sample containing an unknown number of PFASs. Each workflow managed to annotate unique PFASs that were not annotated by the other workflows including 2 by Compound Discoverer and 19 each by enviMass and FluoroMatch. Thirty-two enviMass hits and 28 of the Compound Discoverer and FluoroMatch hits were annotated by at least one of the other workflows. Sixteen PFASs were annotated by all three of the optimized workflows. This work provides a basis for conducting suspect screening for PFASs that will		
D163	分析	Drábová, Lucie; Dvořáková, Darina; Urbancov á, Kateřina; Gramblička, Tom áš; Hajšlová, Jana; Pulkrabov á, Jana	Critical Assessment of Clean-Up Techniques Employed in Simultaneous Analysis of Persistent Organic Pollutants and Polycyclic Aromatic Hydrocarbons in Fatty Samples	2022	Toxics. 2022 Jan 1;10(1):12. doi: 10.3390/toxics10010012.	lead to more consistent reporting of suspect screening data. Interference of residual lipids is a very common problem in ultratrace analysis of contaminants in fatty matrices. Therefore, quick and effective clean-up techniques applicable to multiple groups of analytes are much needed. Cartridge and dispersive solid- phase extraction (SPE and dSPE) are often used for this purpose. In this context, we evaluated the lipid clean-up efficiency and performance of four commonly used sorbents-silica, C18, Z-Sep, and EMR-lipid-for the determination of organic pollutants in fatty fish samples (10%) extracted using ethyl acetate or the QuEChERS method. Namely, 17 polychlorinated biphenyls (PCBs), 22 organochlorine pesticides (OCPs), 13 brominated flame retardants (BFRs), 19 per- and polyfluoroalkyl substances (PFAS), and 16 polycyclic aromatic hydrocarbons (PAHs) were determined in this study. The clean-up efficiency was evaluated by direct analysis in real time coupled with time-of-flight mass spectrometry (DART-HRMS). The triacylglycerols (TAGs) content in the purified extracts were significantly reduced. The EMR-lipid sorbent was the most efficient of the dSPE sorbents used for the determination of POPs and PAHs in this study. The recoveries of the POPs and PAHs obtained by the validated QuEChERS method followed by the dSPE EMR-lipid sorbent ranged between 59 and 120%, with repeatabilities ranging between 2 and 23% and LOQs ranging between 0.02 and 1.50 μg-kg(-1).		-
D164	分析	Zweigle, Jonathan; Bugsel, Boris; Zwiener, Christian	FindPF∆S: Non-Target Screening for PFAS— Comprehensive Data Mining for MS(2) Fragment Mass Differences	2022	Anal Chem. 2022 Aug 2;94(30):10788-10796. doi: 10.1021/acs.analchem.2c01521. Epub 2022 Jul 22.	The limited availability of analytical reference standards makes non-target screening approaches based on high-resolution mass spectrometry increasingly important for the efficient identification of unknown PFAS (per- and polyfluoroalkyl substances) and their TPs. We developed and optimized a vendor-independent open-source Python-based algorithm (FindPF Δ S = FindPolyFluoroDeltas) to search for distinct fragment mass differences in MS/MS raw data (.ms2-files). Optimization with PFAS standards, two pre-characterized paper and soil samples (iterative data-dependent acquisition), revealed Δ (CF(2))(n), Δ HF, Δ C(n)H(3)F(2n-3), Δ C(n)H(2)F(2n-4), Δ C(n)HF(2n-5), Δ C(n)F(2n)SO(3), Δ CF(3), and Δ CF(2)O as relevant and selective fragment differences depending on applied collision energies. In a PFAS standard mix, 94% (36 of 38 compounds from 10 compound classes) could be found by FindPF Δ S. The use of fragment differences was applicable to a wide range of PFAS classes and appears as a promising new approach for PFAS identification. The influence of mass tolerance and intensity threshold on the identification efficiency and on the detection of false positives was systematically evaluated with the use of selected HR- MS(2)-spectra (20,998) from MassBank. To this end, with the use of FindPF Δ S, we could identify different unknown PFAS homologues in the paper extracts. FindPF Δ S is freely available as both Python source code on GitHub (https://github.com/JonZwe/FindPFAS) and as an executable windows application (https://doi.org/10.5281/zenodo.6797353) with a graphical user interface on Zenodo.		-
D165	分析	Kaufmann, Anton; Butcher, Patrick; Maden, Kathryn; Walker, Stephan; Widmer, Mirjam	Simplifying Nontargeted Analysis of PFAS in Complex Food Matrixes	2022	J AOAC Int. 2022 Sep 6;105(5):1280-1287. doi: 10.1093/jaoacint/qsac071.	BACKGROUND: Per- and polyfluoroalkyl substances (PFAS) are a class of toxic environmental contaminants that are characterized by their high chemical stability and enormous structural diversity. OBJECTIVE: The limited availability of PFAS reference standards is the main motivation for developing nontargeted analytical methods. Current concepts are complex and rely on multiple filtering steps (e.g., assumption of homologous series, detection of mass defects, generic fragments, and spectra obtained from web-based sources). METHOD: High-resolution mass spectrometry (HRMS)-based chromatograms of fish liver extracts were deconvoluted. Based on the ion abundance between the monoisotopic and the first isotopic peak, the number of carbons (C) was estimated for each extracted feature. A mass over carbon (m/C) and mass defect over carbon (md/C) ratio was calculated. RESULTS: PFAS-related peaks are strongly discriminated from matrix peaks when plotting m/C versus md/C. This enables nontarget detection of PFAS present at low µg/kg concentration in complex food matrixes. CONCLUSIONS: The proposed concept is highly selective by revealing a relatively small number of high-probability PFAS candidates (features). The small number of surviving candidates permits the MS/MS-based confirmation of each feature. This strategy led to the finding of one PFAS not present in the reference standard solution, as well as the detection of an unexpected set of PFAS adducts. HIGHLIGHTS: The proposed concept of mass over carbon versus mass defect over carbon is suited for the nontarget detection of low amounts of PFAS in complex matrixes. It should be capable of detecting any PFAS (F/H ratio should be >1:1) regardless of the ionization mode.		

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D166	分析	Vitale, Dyana; Picó, Yolanda; Á Ivarez-Ruiz, Rodrigo	Determination of organic pollutants in Anguilla anguilla by liquid chromatography coupled with tandem mass spectrometry (LC-MS/MS)	2021	MethodsX. 2021 Apr 15;8:101342. doi: 10.1016/j.mex.2021.101342. eCollection 2021.	One of the aspects considered about the presence of contaminants in the aquatic ecosystems is their possible effect on critically endangered species, as the case of European eel, Anguilla anguilla. However, there is a lack of analytical methods to determine these contaminants due to the complexity of eel matrix (contains 5-20 % of lipids and 5-15 % of proteins). Thus, a multi-residue method using QuEChERS extraction a clean-up based on new specific sorbents (to eliminate lipids) and liquid chromatography tandem mass spectrometry (LC-MS/MS) was developed to determine a mix of 21 contaminants. Compared to the previously reported methods (Degani et al., 1986), which were developed for mussels, in this study, one of the proposed extraction methods were adapted to different fish tissues of higher complexity, such as liver and muscle of A. anguilla.•The effectivity of dispersive solid phase extraction (dSPE) using new specific Enhanced Matrix Removal (EMR-lipid) as clean-up for lipid removal was tested.• Clean extracts of matrices with high protein (5-15 %) and lipid (5-20 %) content were obtained ensuring robustness and durability of the analytical systems.•Emerging contaminants extractable by this procedure comprise four different families (pesticides, perfluoroalkyl substances (PFASs), pharmaceuticals and drugs of abuse). Then, it could be further applied to wide scope screening strategies.			-
D167	分析	Nason, Sara L; Koelmel, Jeremy; Zuverza-Mena, Nubia; Stanley, Chelli; Tamez, Carlos; Bowden, John A; Godri Pollitt, Krystal J	Software Comparison for Nontargeted Analysis of PFAS in AFFF-Contaminated Soil	2021	J Am Soc Mass Spectrom. 2021 Apr 7;32(4):840-846. doi: 10.1021/jasms.0c00261. Epub 2020 Nov 23.	Per- and polyfluoroalkyl substances (PFAS) are an emerging class of toxic environmental contaminants. Over 7500 PFAS exist, but reference standards are available for less than 2% of compounds. Nontargeted analysis using liquid chromatography-high-resolution tandem mass spectrometry is therefore an essential technique for increasing the analytical coverage of PFAS present in environmental samples. However, typical nontargeted data analysis is laborious and has a steep learning curve. Recently, FluoroMatch, a new open source, vendor neutral software, was published specifically for automating data processing for nontargeted analysis of PFAS and generating PFAS libraries. Here, we analyze soil contaminated with PFAS based aqueous film forming foam (AFFF) and compare the results produced by data analysis workflows using FluoroMatch and Compound Discoverer, an established nontargeted analysis program. High-confidence PFAS annotations were nearly identical between the methods, with 27 out of 32 compounds found using both Compound Discoverer and the modular version of FluoroMatch. Twenty-two high-confidence annotations were found using the comprehensive FluoroMatch Flow. The FluoroMatch method was faster and required significantly less manual curation than the Compound Discoverer method. Both platforms produced high-quality data that were useful for assessing PFAS contamination in the soil.			-
D168	分析	Yang, Liping; Sun, Binbin; Cui, Haochen; Zhu, Lingyan; Shan, Guoqiang	Precolumn Derivatization High-Performance Liquid Chromatography for Determination of Perfluorocarboxylic Acids in Catalytic Degradation Solutions	2022	Int J Anal Chem. 2022 May 19;2022:3482759. doi: 10.1155/2022/3482759. eCollection 2022.	Perfluoroalkyl carboxylic acids (PFCAs), a series of ubiquitous contaminants in the global environment, attracted much attention due to their potential for high bioaccumulation and toxicity to various organisms. There are a lot of measurement requests in currently increasing degradation studies of PFCAs, which usually rely on expensive liquid chromatography-mass spectrometry (LC-MS). The degradation solutions containing high-concentration PFCAs can easily cause the pipeline pollution of the LC/MS instrument, which is usually used for trace analysis of environmental samples. In this study, a simple and reliable precolumn derivatization LC method coupled with an ultraviolet detector (UV) was developed for the determination of the main PFCAs (C(4- 9)) of environmental concern. These PFCAs in degradation solutions were crosslinked to UV-responsive 3, 4-diphenylamine (DCA) by a carbodiimidization method, followed by a simple solid-phase extraction (SPE) cleanup, and quantitatively measured using a conventional LC-UV instrument. Compared to previously reported precolumn derivatization methods, this new derivatization approach has the advantages such as mild reaction conditions, easy operation, enhanced stability of derivatives, and low cost. The instrumental limits of detection (ILDs) for the targeted PFCAs in organic and aqueous mediums were 0.2-0.5 and 0.6-1.5 mg/L, respectively. The method has been successfully applied to the determination of PFCAs in catalytic degradation solutions and recommended for use in other assays involving relatively high-concentration PFCAs.			-
D169	分析	Becanova, Jitka; Saleeba, Zachary S S L; Stone, Aidan; Robuck, Anna R; Hurt, Robert H; Lohmann, Rainer	A graphene-based hydrogel monolith with tailored surface chemistry for PFAS passive sampling	2021	Environ Sci Nano. 2021 Oct 1;8(10):2894-2907. doi: 10.1039/d1en00517k. Epub 2021 Aug 10.	Aquatic contamination by per- and polyfluorinated alkyl substances (PFAS) has attracted global attention due to their environmental and health concerns. Current health advisories and surface water regulatory limits require PFAS detection in the parts per trillion (ppt) range. One way to achieve those low detection limits is to use a reliable passive sampling-based monitoring tool for PFAS, as exists for numerous nonpolar persistent organic pollutants. Here we introduce a new graphene-based hydrogel monolith and describe its synthesis, chemical functionalization, property characterization, and testing as a PFAS equilibrium passive sampler. The graphene monoliths were self-assembled by hydrothermal treatment from graphene oxide (GO) aqueous dispersions to produce free standing cylinders of ~563 mm(3) volume consisting of ~4 wt-% thin-walled porous graphene and ~96 wt-% water. The uptake of 23 PFAS was measured on the as-produced monoliths, and equilibrium partition coefficients (K(SW)), were derived for longer chain (C≥8) perfluoroalkyl acids (PFAA) and neutral precursors such as sulfonamides (log K(SW) range 1.9 - 3.6). To increase the K(SW) for shorter chain PFAA, the monoliths were chemically modified by a new diazonium-based grafting reaction that introduces positive surface charge without damage to the graphenic backbone. Introduction of benzylamine moieties through the diazonium intermediate switches zeta potential at pH 7 from -45mV (as-produced graphene) to + 5mV. This modification increased the sorption of short and middle chain PFAA by ten-fold (e.g. log K(SW) for PFBA increased from 1.3 to 2.2), thereby improving the functionality of the passive sampler device for a wider range of PFAS. Field deployments demonstrated that the graphene monoliths were capable of detecting key PFAS in the Delaware River.			-

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D170	分析	Savage, Dustin T; Hilt, J Zach; Dziubla, Thomas D	Leveraging the thermoresponsiveness of fluorinated poly(N-isopropylacrylamide) copolymers as a sensing tool for perfluorooctane sulfonate	2021	Analyst. 2021 Jun 7;146(11):3599-3607. doi: 10.1039/d1an00144b. Epub 2021 Apr 30.	Due to mounting evidence of the negative health effects of persistent perfluoroalkyl acids (PFAAs) with long (i.e., >C(7)) tails, there is a need for convenient systems capable of sensing these contaminants at dilute aqueous concentrations. To address this concern, a thermoresponsive polymeric network composed of poly(N-isopropylacrylamide) copolymerized with fluorinated comonomers was studied to characterize the gel's physical response to fluorosurfactants in solution. Incorporating fluorinated comonomers into the polymer backbone raised their swelling in fluorocontaminant solutions relative to water - gels synthesized with 10.0 mol% 2,2,2-trifluoroethyl acrylate (TFEA) displayed a heightened maximum water-analyte swelling difference of 3761 \pm 147% compared to 3201 \pm 466% for non-fluorinated gels in the presence of 1 mM tetraethylammonium perfluoroctane sulfonate (TPFOS). The normalized area under the curve for gels with 12.5 mol% TFEA was further raised to 1.77 \pm 0.09, indicating a broadened response window for the contaminant, but at the cost of reducing the overall swelling ratio to 3227 \pm 166% and elongating the time required to reach swelling equilibrium. Overall, a copolymer fed with 10.7 mol% TFEA was predicted to maximize both the swelling and response window of the polymer toward TPFOS. Equilibration times followed a logarithmic increase as the percentage of comonomer was raised, noting gradual fluorosurfactant penetration into the gels impeded by initial gel compaction caused by the addition of fluorinated comonomers. Comparative study of gels containing 1H,1H,7H-dodecafluoroheptyl acrylate, TFEA, or 1,1,1,3,3,3-hexafluoroisopropyl acrylate identified careful selection of fluorinated comonomers.		-
D171	分析	Backe, Will J	Suspect and non-target screening of reuse water by large-volume injection liquid chromatography and quadrupole time-of-flight mass spectrometry	2021	Chemosphere. 2021 Mar;266:128961. doi: 10.1016/j.chemosphere.2020.128961. Epub 2020 Nov 12.	comonomers and their feed ratios as useful tools for tailoring the network's swelling response to TPFOS. Eight samples were obtained to characterize the chemical loads in water recycled for reuse applications. The sources included stormwater, rooftop runoff, wastewater, mixed water, and drinking water as a comparison. The water was reused for irrigation, cleaning, toilet flushing, and cooling purposes. Large-volume injection ($650 \ \mu$ L) high-performance liquid chromatography and quadrupole time-of-flight mass spectrometry were employed to separate and detect features by suspect and non-target screening. The instrumental method had the advantage that no sample extractions were required prior to analysis. Two chromatographic methods were developed to separate positive- and negative-ionizing compounds and retention time models were developed for both. Retention time models provide an additional measure of confidence for probable and tentative identifications. The two models had predictive R(2)-which indicates how well the models predicts new observations-of 0.87. After data-reduction, the number of features detected in the samples ranged from 304 to 1513. Feature metrics such as the average response-per- feature provided a simple method to characterize similarities and differences between samples. Additionally, a statistical comparison was performed by principal component analysis. Of the 97 suspect-screening compounds, 20 were positively identified. Benzotriazole/benzothiazole-derivatives and per- and poly-fluoroalkyl substances were the most frequently detectedcompounds during suspect screening. Other compounds detected included pharmaceuticals, drug metabolites, and sucralose. Features were prioritized for non-target analysis based on in-house library matches, magnitude of response, and frequency of occurrence. Fifty-five unique compounds were positively identified via non-target analysis. The identified compounds included 17 pharmaceuticals, 17 pesticides, 13 industrial compounds, four perso		-
D172	分析	Abafe, Ovokeroye A; Macheka, Linda R; Olowoyo, Joshua O	Confirmatory Analysis of Per and Polyfluoroalkyl Substances in Milk and Infant Formula Using UHPLC- MS/MS	2021	Molecules. 2021 Jun 16;26(12):3664. doi: 10.3390/molecules26123664.	An ultra-high performance liquid chromatography tandem mass spectrometry method was developed and validated for the sensitive determination and unambiguous confirmation of residues of per and polyfluorinated alkyl substances (PFAS) in breastmilk, retail milk and infant formulas following two sample preparation methods. Sample pre-treatment was carried out by a simplified QuEChERS method without requiring dSPE or any further clean-up. The method was validated in accordance with the requirements of Commission Decision 657/2002/EC with slight modifications. The method displayed good linearity with R(2) ranging from 0.9843-0.9998 for all target PFAS. The recovery and within-laboratory reproducibility of the method (n = 63) were in the range 60-121% and 5-28%, respectively. The decision limit, detection capability and limit of quantitation ranged from 30-60 ng kg(-1) to 40-100 ng kg(-1) and 5-50 ng kg(-1), respectively. Acceptable matrix effect values in the range -45-29% were obtained with uncertainty of measurement lower than 25% for all target PFAS. The method displays its suitability for the sensitive and high-throughput confirmatory analysis of C(4)-C(14) PFAS in breastmilk, dairy milk and infant formulas.		-

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D173	分析	Belova, Lidia; Caballero- Casero, Noelia; van Nuijs, Alexander L N; Covaci, Adrian	Ion Mobility-High-Resolution Mass Spectrometry (IM- HRMS) for the Analysis of Contaminants of Emerging Concern (CECs): Database Compilation and Application to Urine Samples	2021	Anal Chem. 2021 Apr 27;93(16):6428-6436. doi: 10.1021/acs.analchem.1c00142. Epub 2021 Apr 12.	Ion mobility mass spectrometry (IM-MS)-derived collision cross section (CCS) values can serve as a valuable additional identification parameter within the analysis of compounds of emerging concern (CEC) in human matrices. This study introduces the first comprehensive database of (DT)CCS(N2) values of 148 CECs and their metabolites including bisphenols, alternative plasticizers (AP), organophosphate flame retardants (OP), perfluoroalkyl chemicals (PFAS), and others. A total of 311 ions were included in the database, whereby the (DT)CCS(N2) values for 113 compounds are reported for the first time. For 105 compounds, more than one ion is reported. Moreover, the (DT)CCS(N2) values of several isomeric CECs and their metabolites are reported to allow a distinction between isomers. Comprehensive quality assurance guidelines were implemented in the workflow of acquiring (DT)CCS(N2) values to ensure reproducible experimental conditions. The reliability and reproducibility of the complied database were investigated by analyzing pooled human urine spiked with 30 AP and OP metabolites at two concentration levels. For all investigated metabolites, the (DT)CCS(N2) values measured in urine showed a percent error of <1% in comparison to database values. (DT)CCS(N2) values of OP metabolites showed an average percent error of 0.12% (50 ng/mL in urine) and 0.15% (20 ng/mL in urine). For AP metabolites, these values were 0.10 and 0.09%, respectively. These results show that the provided database can be of great value for enhanced identification of CECs in environmental and human matrices, which can advance			-
D174	分析	Wang, Po; Challis, Jonathan K; He, Zi-Xuan; Wong, Charles S; Zeng, Eddy Y	Effects of biofouling on the uptake of perfluorinated alkyl acids by organic-diffusive gradients in thin films passive samplers	2022	Environ Sci Process Impacts. 2022 Feb 23;24(2):242-251. doi: 10.1039/d1em00436k.	Tuture suspect screening studies on CECs. While organic-diffusive gradients in thin films (o-DGT) passive samplers have been used to assess organic contaminants in water, the effects of biofouling on accurate analyte quantification by o-DGT are poorly understood. We evaluated the effects of biofouling on the uptake of six common perfluoroalkyl substances (PFAS) using a previously developed polyacrylamide-WAX (weak anion exchange) o-DGT without a filter membrane. Linear uptake (R(2) > 0.91) over 21 days was observed in fouled samplers. The measured sampling rates (R(s)) and accumulated masses of PFAS in pre-fouled o-DGT were significantly lower (p < 0.05, 20-39% relative error) than in control-fouled samplers. However, compared to clean o-DGT (no biofouling), the R(s) of most PFAS in control-fouled samplers (i.e., those with clean diffusive and binding gels initially) were not affected by biofouling. Under flowing (~ 5.8 cm s(-1)) and static conditions, the measured diffusive boundary layer (DBL) thicknesses for clean o-DGT were 0.016 and 0.082 cm, respectively, whereas the effective in situ biofilm thicknesses for fouled o-DGT were 0.018 and 0.14 cm, respectively. These results suggest that biofilm growth does not have significant effects on target PFAS sampling by o-DGT under typical flowing conditions (≥2 cm s(-1)). However, rapid surface growth of biofilm on o-DGT deployed in quiescent waters over long periods of time may exacerbate the adverse effects of biofilms, necessitating the estimation of biofilm thickness in situ. This study provides new insights for evaluating the capability of o-DGT samplers when biofilm growth can be significant.			_
D175	分析	Aly, Noor A; Dodds, James N; Luo, Yu-Syuan; Grimm, Fabian A Foster, MaKayla; Rusyn, Ivan; Baker, Erin S	Utilizing ion mobility spectrometry-mass spectrometry ; for the characterization and detection of persistent ; organic pollutants and their metabolites	2022	Anal Bioanal Chem. 2022 Jan;414(3):1245-1258. doi: 10.1007/s00216-021-03686-w. Epub 2021 Oct 20.	Persistent organic pollutants (POPs) are xenobiotic chemicals of global concern due to their long-range transport capabilities, persistence, ability to bioaccumulate, and potential to have negative effects on human health and the environment. Identifying POPs in both the environment and human body is therefore essential for assessing potential health risks, but their diverse range of chemical classes challenge analytical techniques. Currently, platforms coupling chromatography approaches with mass spectrometry (MS) are the most common analytical methods employed to evaluate both parent POPs and their respective metabolites and/or degradants in samples ranging from d rinking water to biofluids. Unfortunately, different types of analyses are commonly needed to assess both the parent and metabolite/degradant POPs from the various chemical classes. The multiple time-consuming analyses necessary thus present a number of technical and logistical challenges when rapid evaluations are needed and sample volumes are limited. To address these challenges, we characterized 64 compounds including parent per- and polyfluoroalkyl substances (PFAS), pesticides, polychlorinated biphenyls (PCBs), industrial chemicals, and pharmaceuticals and personal care products (PPCPs), in addition to their metabolites and/or degradants, using ion mobility spectrometry coupled with MS (IMS-MS) as a potential rapid screening technique. Different ionization sources including electrospray ionization (ESI) and atmospheric pressure photionization (APPI) were employed to determine optimal ionization for each chemical. Collectively, this study advances the field of exposure assessment by structurally characterizing the 64 important environmental pollutants, assessing their best ionization sources, and evaluating their rapid screening potential with IMS-MS.			-
D176	分析	Taniyasu, Sachi; Yeung, Leo W Y; Lin, Huiju; Yamazaki, Eriko; Eun, Heesoo; Lam, Paul K S; Yamashita, Nobuyoshi	Quality assurance and quality control of solid phase extraction for PFAS in water and novel analytical techniques for PFAS analysis	2022	Chemosphere. 2022 Feb;288(Pt 1):132440. doi: 10.1016/j.chemosphere.2021.132440. Epub 2021 Oct 6.	An inter-laboratory trial (ILT) has been performed to validate ISO 21675 method for the measurement of per-and polyfluoroalkyl substances (PFAS) in water samples using solid phase extraction method and high-performance liquid chromatography-tandem mass spectrometry. A total of twenty-seven laboratories from eleven countries (Belgium: 1, Canada: 2, China: 2, France: 1, Germany: 3, Italy: 2, Japan: 6, Netherlands: 2, South Korea: 1, Sweden: 4, and USA: 3) participated in the ILT. Results of the homogeneity of ILT water samples showed that the repeatability tended to increase from short-chain to long-chain of PFAS. Results of stability of PFAS in Milli-Q water stored at 5 ± 3 ° C ranged from 75% to 121% including those ultra-short-chain compounds, except for N-MeFOSA (44%), N-EtFOSA (44%), and 8:2 FTOH (30%) at 168 days. As for stability of PFAS in environmental waters, they were in acceptable range (between 70 and 125%) for most of PFAS, except for 8:2 FTUCA in the river water, seawater, and wastewater, and 8:2 FTSA and 8:2 FTOH in wastewater. Based on the performance data (reproducibility (CV(R)): <40%, recoveries (η): 70-125%) of the ILT, current ISO 21675 is validated for up to 30 PFAS depending on water type. Novel analytical techniques namely "In-situ Solid Phase Extraction" and the "Purge and Trap Extraction" were developed and explored to measure volatile PFAS. Preliminary results showed acceptable recoveries for volatile PFAS such as fluorotelomer alcohols and iodides in spiked Milli-Q water.			-

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D177	分析	Wang, Po; Challis, Jonathan K; Luong, Kim H; Vera, Trisha C; Wong, Charles S	Calibration of organic-diffusive gradients in thin films (o-DGT) passive samplers for perfluorinated alkyl acids in water	2021	Chemosphere. 2021 Jan;263:128325. doi: 10.1016/j.chemosphere.2020.128325. Epub 2020 Sep 12.	The application of the organic-diffusive gradients in thin films (o-DGT) passive sampling technique for the monitoring of per- and polyfluoroalkyl substances (PFAS) in the environment is still limited. Six common PFAS with different chain lengths were evaluated in water by o-DGT. Measured diffusion coefficients (D) in agarose and polyacrylamide diffusive gels ranged from 4.55- $8.63 \times 10(-6) \text{ cm}(2) \text{ s}(-1)$ and $3.85-7.00 \times 10(-6) \text{ cm}(2) \text{ s}(-1)$ at $23 \degree$ C, respectively. Experimental sampling rates (Rs) for both agarose- and polyacrylamide-WAX sampler configurations were within 22% relative error of D-based Rs for four of the PFAS. Larger differences for perfluorobutanesulfonic acid (PFBS) and perfluoroundecanoic acid (PFUnDA) ranged from 36% to 56%. In general, in-situ Rs can be predicted using measured D-values for perfluorinated alkyl acids. The mass accumulation of six PFAS in two o-DGT configurations was linear over 21 days (R(2) ≥ 0.97). Diffusion and uptake of o-DGT depended on the gel type and specific PFAS. Field demonstrations of o-DGT with WAX and HLB binding gels and polyacrylamide diffusive gels (not prone to biodegradation) found 0.3-19.5 ng L(-1) of PFAS in rivers near industrial areas around Guangzhou and Foshan, China, with no apparent differences between the two co-deployed samplers. This study demonstrates that the configurations of o-DGT tested provide a cost-effective monitoring tool for measuring perfluorinated alkyl acids in aquatic systems, in particular the four PFAS for which reasonable correlations were observed.		-
D178	分析	Renai, Lapo; Del Bubba, Massimo; Samanipour, Saer; Stafford, Rebecca; Gargano, Andrea F G	Development of a comprehensive two-dimensional liquid chromatographic mass spectrometric method for the non-targeted identification of poly- and perfluoroalkyl substances in aqueous film-forming foams	2022	Anal Chim Acta. 2022 Nov 1;1232:340485. doi: 10.1016/j.aca.2022.340485. Epub 2022 Oct 6.	In this research, we developed an online comprehensive two-dimensional liquid chromatographic (LC × LC) method hyphenated with high-resolution mass spectrometry (HRMS) for the non-targeted identification of poly- and perfluorinated compounds (PFASs) in fire-fighting aqueous-film forming foams (AFFFs). The method exploited the combination of mixed-mode weak anion exchange-reversed phase with a octadecyl stationary phase, separating PFASs according to ionic classes and chain length. To develop and optimize the LC × LC method we used a reference training set of twenty-four anionic PFASs, representing the main classes of compounds occurring in AFFFs and covering a wide range of physicochemical properties. In particular, we investigated different modulation approaches to reduce injection band broadening and breakthrough in the second dimension separation. Active solvent and stationary phase assisted modulations were compared, with the best results obtained with the last approach. In the optimal conditions, the predicted peak capacity corrected for undersampling was higher than three-hundred in a separation space of about 60 min. Subsequently, the developed method was applied to the non-targeted analysis of two AFFF samples for the identification of homologous series of PFASs, in which it was possible to identify up to thirty-nine potential compounds of interest utilizing Kendrick mass defect analysis. Even within the samples, the features considered potential PFAS by mass defect analysis elute in the chromatographic regions discriminating for the ionic group and/or the chain length, thus confirming the applicability of the method presented for the analysis of AFFF mixtures and, to a further extent, of environmental matrices affected by the AFFF.		-
D179	分析	Álvarez-Ruiz, Rodrigo; Picó, Yolanda; Sadutto, Daniele; Campo, Julián	Development of multi-residue extraction procedures using QuEChERS and liquid chromatography tandem mass spectrometry for the determination of different types of organic pollutants in mussel	2021	Anal Bioanal Chem. 2021 Jun;413(15):4063-4076. doi: 10.1007/s00216-021-03363-y. Epub 2021 May 3.	This study aimed to develop multi-residue methods for the extraction of organic pollutants in mussels (Mytilus galloprovincialis), including 11 pharmaceuticals, 5 pesticides, 5 perfluoroalkyl substances (PFASs) and 2 illicit drugs. The combination of 4 different QuEChERS methods and 12 clean-ups (a total of 44 combinations) was tested. QuEChERS included acidified (AQ), non-acidified (SQ) and their miniaturized versions. The clean-ups included 6 different conventional dispersive solid phase extraction (dSPE) plus 2 enhanced matrix removal (EMR-Lipid) and 4 SPE procedures (including sorbents focused on phospholipid removal and polymer-based). After sample analysis via HPLC-MS/MS, the three methods that provided the best results were validated in terms of linearity, accuracy, precision, sensitivity and matrix effect. The methods selected were the combination of (i) SQ and EMR-Lipid, (ii) AQ and Z-sep+ bulk-based dSPE and (iii) AQ and graphitized carbon black (GCB)-based dSPE. Recoveries at two concentration levels (50 and 500 ng/g) ranged 54-124%, 59-124% and 60-127%, respectively, and limits of quantification (LOQs) were < 30 ng/g for most analytes using any of the methods. The three methods were tested in non-spiked mussel samples purchased in local markets, but organic pollutants were not detected in any sample. However, the methods probed to successfully extract a wide range of organic pollutants families in mussel samples from the market and from bioaccumulation trials.		-

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D180	分析	Young, Anna S; Zoeller, Thomas; Hauser, Russ; James-Todd, Tamarra; Coull, Brent A; Behnisch, Peter A; Brouwer, Abraham; Zhu, Hongkai; Kannan, Kurunthachalam; Allen, Joseph G	Assessing Indoor Dust Interference with Human Nuclear Hormone Receptors in Cell-Based Luciferase Reporter Assays	2021	Environ Health Perspect. 2021 Apr;129(4):47010. doi: 10.1289/EHP8054. Epub 2021 Apr 14.	BACKGROUND: Per- and polyfluoroalkyl substances (PFAS), organophosphate esters (OPEs), and polybrominated diphenyl ethers (PBDEs) are hormone-disrupting chemicals that migrate from building materials into air and dust. OBJECTIVES: We aimed to quantify the hormonal activities of 46 dust samples and identify chemicals driving the observed activities. METHODS: We evaluated associations between hormonal activities of extracted dust in five cell-based luciferase reporter assays and dust concentrations of 42 measured PFAS, OPEs, and PBDEs, transformed as either raw or potency-weighted concentrations based on Tox21 high-throughput screening data. RESULTS: All dust samples were hormonally active, showing antagonistic activity toward peroxisome proliferator-activated receptor (PPAR γ 2) (100%; 46 of 46 samples), thyroid hormone receptor (TR β) (89%; 41 samples), and androgen receptor (AR) (87%; 40 samples); agonist activity on estrogen receptor (ER α) (96%; 44 samples); and binding competition with thyroxine (T4) on serum transporter transthyretin (TTR) (98%; 45 samples). Effects were observed with as little as 4 μ g of extracted dust. In regression models for each chemical class, interquartile range increases in potency-weighted: $\Sigma PFAS - TR\beta$, $\uparrow 28\%$, $p < 0.05$; $\Sigma OPEs - TR\beta$, $\uparrow 27\%$, $p = 0.08$; $\Sigma PBDEs - TR\beta$, $\uparrow 20\%$, $p < 0.05$; $\Sigma PBDEs - ER \alpha$, $\uparrow 7.7\%$, $p = 0.08$; unknown-potency: $\Sigma OPEs - TTR$, $\uparrow 34\%$, $p < 0.05$; $\Sigma OPEs - AR$, $\uparrow 13\%$, $p = 0.06$), adjusted for chemicals with active, inactive, and unknown Tox21 designations. DISCUSSION: All indoor dust samples exhibited hormonal activities, which were associated with PFAS, PBDE, and OPE levels. Reporter gene cell-based assays are relatively inexpensive, health-relevant evaluations of toxic loads of chemical mixtures that building occupants are exposed to.		-
D181	分析	Ofrydopoulou, Anna; Nannou, Christina; Evgenidou, Eleni; Lambropoulou, Dimitra	Sample preparation optimization by central composite design for multi class determination of 172 emerging contaminants in wastewaters and tap water using liquid chromatography high-resolution mass spectrometry	2021	J Chromatogr A. 2021 Aug 30;1652:462369. doi: 10.1016/j.chroma.2021.462369. Epub 2021 Jun 29.	Multi-residue analysis is highly desirable for water quality control. To this end, a comprehensive workflow for the quantitative analysis of 172 anthropogenic organic compounds belonging to emerging contaminants (pharmaceuticals and personal care products, illicit drugs, organophosphate flame retardants and perfluoroalkyl substances) has been developed for application to wastewater and tap water, based on solid phase extraction (SPE) and Orbitrap high resolution mass spectrometry (HRMS). Due to the large number of analytes with various physicochemical characteristics that should be efficiently extracted, the response surface methodology (RSM) employing a central composite design (CCD) and desirability function (DF) approach was exploited to optimize the sample preparation process, instead of the conventional single-factor analysis. The factors included in the design of experiments (DoE) were sample pH, eluent solvents composition and volume. Statistical analysis (ANOVA) proved the adequacy of the proposed model (2- factor interaction) as p-value < 0.05 followed by different diagnostic tests confirmed the good fitting. The best values to acquire DF close to 1 were pH 3.5, methanol/ethyl acetate ratio 87:13 and eluent volume 6 mL. The streamlined method was validated in terms of accuracy, linearity, method limits, reproducibility, and matrix effect. The proposed workflow combines sensitivity and robustness, with recoveries over 70%, method quantification limits <1 ng/L, and relative standard deviations <20% for most of the compounds. Slight matrix effect (ME) was observed for most of PPCPs, IDs and PFAs, in contrast with most of the OPFRs, for which strong ME was calculated. Method applicability was tested over wastewater collected from a municipal wastewater treatment plant in Thessaloniki (Greece), revealing the presence of 69 and 40 compounds in influents and effluents, respectively, at varying concentrations.		-
D182	分析	Koelmel, Jeremy P; Stelben, Paul; McDonough, Carrie A; Dukes, David A; Aristizabal- Henao, Juan J; Nason, Sara L; Li, Yang; Sternberg, Sandi; Lin, Elizabeth; Beckmann, Manfred; Williams, Antony J; Draper, John; Finch, Jasen P; Munk, Jens K; Deigl, Chris; Rennie, Emma E; Bowden, John A; Godri Pollitt, Krystal J	FluoroMatch 2.0-making automated and comprehensive non-targeted PFAS annotation a reality	2022	Anal Bioanal Chem. 2022 Jan;414(3):1201-1215. doi: 10.1007/s00216-021-03392-7. Epub 2021 May 20.	Because of the pervasiveness, persistence, and toxicity of per- and polyfluoroalkyl substances (PFAS), there is growing concern over PFAS contamination, exposures, and health effects. The diversity of potential PFAS is astounding, with nearly 10,000 PFAS catalogued in databases to date (and growing). The ability to detect the thousands of known PFAS, and discover previously uncatalogued PFAS, is necessary to understand the scope of PFAS contamination and to identify appropriate remediation and regulatory solutions. Current non-targeted methods for PFAS analysis require manual curation and are time-consuming, prone to error, and not comprehensive. FluoroMatch Flow 2.0 is the first software to cover all steps of data processing for PFAS discovery in liquid chromatography-high-resolution tandem mass spectrometry samples. These steps include feature detection, feature blank filtering, exact mass matching to catalogued PFAS, mass defect filtering, homologous series detection, retention time pattern analysis, class-based MS/MS screening, fragment screening, and predicted MS/MS from SMILES structures. In addition, a comprehensive confidence level criterion is implemented to help users understand annotation certainty and integrate various layers of evidence to reduce overreporting. Applying the software to aqueous film forming foam analysis, we discovered over one thousand likely PFAS including previously unreported species. Furthermore, we were able to filter out 96% of features which were likely not PFAS. FluoroMatch Flow 2 increased coverage of likely PFAS by over tenfold compared to the previous release. This software will enable researchers to better characterize PFAS in the environment and in biological systems.		

別添-2 文献データベース文献リスト

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 象抽 ① ラ ② ラ
D183	分析	Mottaleb, M Abdul; Ding, Qunxing X; Pennell, Kelly G; Haynes, Erin N; Morris, Andrew J	Direct injection analysis of per and polyfluoroalkyl substances in surface and drinking water by sample filtration and liquid chromatography-tandem mass spectrometry	2021	J Chromatogr A. 2021 Sep 13;1653:462426. doi: 10.1016/j.chroma.2021.462426. Epub 2021 Jul 21.	We developed and validated a method for direct determination of per- and polyfluoroalkylated substances (PFASs) in environmental water samples without prior sample concentration. Samples are centrifuged and supernatants passed through an Acrodisc Filter (GXF/GHP 0.2 um, 25 mm diameter). After addition of ammonium acetate, samples are analyzed by UPLC- MS/MS using an AB Sciex 6500 plus Q-Trap mass spectrometer operated in negative multiple reaction-monitoring (MRM) mode. The instrument system incorporates a delay column between the pumps and autosampler to mitigate interference from background PFAS. The method monitors eight short-/long-chain PFAS which are identified by monitoring specific precursor product ion pairs and by their retention times and quantified using isotope mass-labeled internal standard based calibration plots. Average spiked recoveries (n = 8) of target analytes ranged from 84 to 110% with 4-9% relative standard deviation (RSD). The mean spiked recoveries (n = 8) of four surrogates were 94-106% with 3-8% RSD. For continuous calibration verification (CCV), average spiked recoveries (n = 8) for target analytes ranged from 88 to 114% with 4-11% RSD and for surrogates ranged from 104-112% with 3-11% RSD. The recoveries (n = 6) of matrix spike (MX), matrix spike duplicate (MXD), and field reagent blank (FRB) met our acceptance criteria. The limit of detection for the target analytes was between 0.007 and 0.04 ng/mL. The method was used to measure PFAS in tap water and surface water.		-
D184	分析	Muensterman, Derek J; Titaley, Ivan A; Peaslee, Graham F; Minc, Leah D; Cahuas, Liliana; Rodowa, Alix E; Horiuchi, Yuki; Yamane, Shogo; Fouquet, Thierry N J; Kissel, John C; Carignan, Courtney C; Field, Jennifer A	Disposition of Fluorine on New Firefighter Turnout Gear	2022	, Environ Sci Technol. 2022 Jan 18;56(2):974-983. doi: 10.1021/acs.est.1c06322. Epub 2021 Dec 27.	Firefighter turnout gear is essential for reducing occupational exposure to hazardous chemicals during training and fire events. Per-and polyfluoroalkyl substances (PFASs) are observed in firefighter serum, and possible occupational sources include the air and dust of fires, aqueous film-forming foam, and turnout gear. Limited data exist for nonvolatile and volatile PFASs on firefighter turnout gear and the disposition of fluorine on the individual layers of turnout gear. Further implications for exposure to fluorine on turnout gear are not well understood. Three unused turnout garments purchased in 2019 and one purchased in 2008, were analyzed for 50 nonvolatile and 15 volatile PFASs by liquid chromatography quadrupole time-of-flight mass spectrometry (LC- qTOF-MS) and gas chromatography-mass spectrometry (GC-MS), respectively. Particle-induced gamma ray emission (PIGE), a surface technique, and instrumental neutron activation analysis (INAA), a bulk technique, were used to measure total fluorine. Bulk characterization of the layers by pyrolysis-GC/MS (py-GC/MS) was used to differentiate fluoropolymer (e.g., PTFE) films from textile layers finished with side-chain polymers. The outer layer, moisture barrier, and thermal layers of the turnout gear all yielded measured concentrations of volatile PFASs that exceeded nonvolatile PFAS concentrations, but the summed molar concentrations made up only a small fraction of total fluorine (0.0016-6.7%). Moisture barrier layers comprised a PTFE film, as determined by py-GC-MS, and gave the highest individual nonvolatile (0.159 mg F/kg) and volatile PFAS (20.7 mg F/kg) as well as total fluorine (122,000 mg F/kg) concentrations. Outer and thermal layers comprised aromatic polyamide-based fibers (aramid) treated with side-chain fluoropolymers and had lower levels of individual nonvolatile and volatile PFASs. Equal concentrations of total fluorine by both PIGE and INAA on the outer and thermal layers is consistent with treatment with a side-chain fluoropolymer coating. New tu		-
D185	分析	勝又 常信, 中田 彩子, 岩崎 雄介, 伊藤 里恵, 斉藤 貢一, 中澤 裕之	超臨界流体抽出 – 高速液体クロマトグラフィー/タンデ ム質量分析法によるハウスダスト中パーフルオロ化合物 の定量	2006	,分析化学, 55 巻 12 号 955-961, doi: 10.2116/bunsekikagaku.55.955	パーフルオロ化合物 (PFCs) は、テフロン加工や撥水剤などとして日常で広く使われているが、催奇形性や甲状腺ホルモン撹乱作用な どが報告されており、ヒトへの暴露影響が懸念されている。本研究では、PFCsのヒトへの暴露源としてハウスダストに着目し、超臨界 流体抽出法と高速液体クロマトグラフィー/タンデム質量分析法による、パーフルオロオクタンスルホン酸 (PFOS) など4種類を測定対 象とした高感度分析法の構築を検討した。本法によるハウスダスト中PFCsの検出限界は、0.58~0.72 ng/gであった。また添加回収試 験の結果は、平均回収率97.9% 以上(相対標準偏差<5.8%)と良好な結果が得られた。本法を一般家庭で得られたハウスダスト20検体 の分析に適用したところ、PFOS、パーフルオロオクタン酸及びパーフルオロノナン酸がすべての検体から検出された。		-
D186	分析	古川 浩司, 橋本 真, 萩尾 珠世, 木 村 貴明, 本澤 大 生, 大谷 美怜, 平 田 紗希, 小林 珠 美, 松田 彰子, 辻 加奈枝, 金子 聡	水道水中のPFOS, PFOA, PFHxS 及び PFHxA 同時分 析法の検討	2020	/ 環境技術, 49 巻 3 号 154-159, doi: 10.5956/jriet.49.154	液体クロマトグラフィー/タンデム型質量分析法(LC/MS/MS)による水道水中のPFOS, PFOA, PFHxS及びPFHxA 同時分析法の検討 を行った. 検討の結果,各物質の標準液の検量線は0.05~2.0 µg/L の濃度範囲で,良好な直線性と良好な妥当性評価結果が得られた.疑似水道 水(ミネラルウォーター:添加濃度0.1ng/L)への添加回収試験をn=5,5日間で実施し妥当性を評価した結果,併行精度5.0~12%, 室内精度5.8~14%,真度95.9~112%であり,PFOS,PFOA,PFHxS及びPFHxA共に良好な妥当性評価結果が得られた.また,水道 水(添加濃度:1.0 ng/L)への添加回収試験をn=5で実施した結果,併行精度1.5~10%,真度96.0~112%であった. 本検討結果は、本分析法がPFOS,PFOA,PFHxS及びPFHxAの水道水質検査法として有効であることを示している.		-
D187	分析	橋口 亜由未, 藤川 陽子, 米田 稔, 谷 口 省吾, 尾崎 博 明	炭素鎖長の異なるペルフルオロ化合物の電解処理効率の 比較	2015	,環境技術, 44 巻 7 号 391-401, doi: 10.5956/jriet.44.391	本研究では、白金電極を用いた電解法で水中のペルフルオロ化合物 (PFCs) を分解する方法を検討した. 生成可能性のある分解産物の 同定を妨害しない電解質としてNaHCO3を選定して試験を行った. C8 (PFOS とPFOA) や今後利用される可能性があるC6とC7の直鎖 ペルフルオロカルボン酸 (PFHpAおよびPFHxA) およびC6の直鎖ペルフルオロスルホン酸 (PFHxS) を対象とした. PFOS, PFOA, PFHxA, PFHxS, PFHpS は電解により分解することがわかった. PFOS およびPFOA は特に難分解性であるが,ホウ素ドープダイヤモ ンド等のアノードに比べ酸化力が弱い白金のアノードでもこれらPFCsを酸化できた. PFHxA, PFHxS は通電時間に比例してゼロ次反 応で電解が進み, PFHpS の分解の電流効率は今回試験したPFCsの中で最も高かった. また,下水二次処理水についても電解実験を行 い, PFOS について高い除去率をえた. 電解法による実処理では促進酸化法などで共存有機物を除去するとともに,予め膜分離などで PFCsを濃縮しておくことが重要と考えられた.		-

分野 発行年 著者 タイトル 書誌情報 要旨 (原文) No. (参考) 水道中のPFOS とPFOA を含むペルフルオロおよびポリフルオロアルキル化合物(PFASs)を分 相および内部標準物質の検討を行った。その結果、標準品の中には直鎖以外の化合物も含まれて 高木 総吉, 吉田 水道水中におけるペルフルオロおよびポリフルオロアル D188 2021 水道協会雑誌, 90 巻 6 号 2-15, doi: 10.34566/jwwa.90.6_2 分析 容器には炭素鎖の長いPFASs が吸着した。抽出用の固相は弱アニオン交換系の固相が最も多種 キル化合物の分析法検討 質の使用により、前処理時の経路等への吸着による回収率の低下を補正できた。水道水を用い 価のガイドラインの目標を満たした。水道水にPFOS・PFOA 以外のPFASs も存在していること Our modern society has created a large number of chemicals that are used for the productio toys, food packaging, cosmetic products, and building materials. We enjoy a comfortable and these items. In addition, in specialized areas, such as experimental science and various med devices that are manufactured using a wide range of chemical substances are also extensive Hiroyuki between human exposure to trace hazardous chemicals and an increased incidence of endo Analytical Sciences, 30 巻 1 号 25-34, doi: NAKAZAWA. Analytical Methods for the Quantification of Bispheno However, the evaluation of human exposure to such endocrine disrupting chemicals is there D189 分析 Yusuke A, Alkylphenols, Phthalate Esters, and Perfluoronated 10.2116/analsci.30.25 of exposure levels requires the analysis of human biological materials, such as blood and uri IWASAKI, Rie Chemicals in Biological Samples possible from limited sample sizes, highly sensitive and reliable analytical methods are also ITO The present review focuses on effective analytical methods for the quantification of bisphen phthalate esters (PEs), and perfluoronated chemicals (PFCs), which are chemicals used in t commodities. Using data obtained from liquid chromatography/mass spectrometry (LC/MS) assessments of the risks to humans were also presented based on the estimated levels of e In this study, an analytical method for perfluorinated compounds (PFCs) in granular activate 竹峰 秀祐, 高田 investigation of analysis was conducted by using GAC which adsorbed PFCs from artificial w 光康,山本 勝也 amount. As results, it was confirmed that Accelerated solvent extraction (ASE) method using D190 松村 千里, 藤森 分析 粒状活性炭中の有機フッ素化合物の分析 2013 環境化学, 23 巻 1 号 55-60, doi: 10.5985/jec.23.55 appropriate for the extraction of PECs in GAC -男,渡辺信久 PFCs in used GAC samples, regenerated GAC samples, and a new GAC sample were analyze 中野 武, 近藤 明 The concentration of PFCs in the regenerated GAC was decreased by more than 99.9% comp may transform and/or desorb at regeneration processes. ペルフルオロオクタン酸をはじめとするペルフルオロアルキル化合物(PFASs)の一般環境水中 るが、一方で外洋海水分析報告は現在でもまれである。外洋海水分析データが乏しい原因の一つ 山崎 絵理子, 谷保 トリッジの性能が海水分析に最適化されていないことが考えられるため、本論文では現在流通し 佐知,島村 紘大, 外洋海水中ペルフルオロ化合物微量分析のための固相抽 分析化学, 64 巻 10 号 759-768, doi: D191 分析 2015 -般的なC18系固相と陰イオン交換能を有する固相を検討し,後者について充填量と粒子径を5 佐々木 俊哉,山下 出法の開発 10.2116/bunsekikagaku.64.759 中PFASs微量分析に最適化した固相抽出カートリッジである「WAXsea」を開発した.マトリク 信義 含め、ここで明らかになった精度管理条件を用いることで、1 pg L-1前後で外洋海水中に存在 でも可能となり、ストックホルム条約外洋汚染モニタリング計画等に貢献が期待される。 A simultaneous determination method of trace amounts of perfluorinated compounds, such perfluorooctane sulfonate (PFOS) in packaging materials and textiles, has been developed, (PLE) with gas chromatography-mass spectrometry (GC/MS). The perfluorinated compound Gang LV, Libing Determination of Perfluorinated Compounds in samples by a PLE procedure, in which the parameters were optimized by response surface r WANG. Packaging Materials and Textiles Using Pressurized Analytical Sciences, 25 巻 3 号 425-429, doi: D192 分析 2009 removed by blowing nitrogen and a silylation step was carried out with N,N-bis(trimethylsilyl 10.2116/analsci.25.425 Shaocong LIU, Liquid Extraction with Gas Chromatography-Mass compounds were identified and quantified by GC/MS. The proposed method was applied to Shufen LI Spectrometry polytetrafluoroethylene packaging materials and textiles, where the detection limits of the tw mL-1, respectively. The results showed that the concentrations of PFOA and PFOS in the p from 17.5 to 45.9 and 33.7 to 81.3 ng g – 1, respectively. 近年,新たな環境汚染物質として注目されているパーフルオロオクタンスルホン酸(PFOS)及 仲田 尚生, 中田 しょう試料中の一斉分析法について検討した。本研究では、試料前処理法にカラムスイッチング 彩子, 岡田 文雄, オンライン固相抽出-高速液体クロマトグラフィー/タン 分析化学, 54 巻 9 号 877-884, doi: 採用することで、除タンパクした血しょう試料中のパーフルオロ化合物(PFCs)を簡便な操作 D193 分析 伊藤 里恵, 井之上 デム質量分析計を用いるヒト血しょう中有機フッ素系化 ヒト血しょう試料中PFCsの分析へ応用した結果,検出限界は,0.08~0.14 ng/ml (S/N=3) て 10.2116/BUNSEKIKAGAKU.54.877 合物の一斉分析法の開発 浩一,斉藤 貢一, 量限界は、すべての測定対象化合物において0.50 ng/mlとした.また、内標準物質にパーフルオ 中澤 裕之 により、回収率93.3%以上 {相対標準偏差(RSD) ≦8.9%} と良好な回収率を得ることができ しょう試料中のPFCsの定量に応用できることが明らかとなった.

	備考	出 情 対 報 象 抽	ン 文 ク 献 ① ラ	ン 文 刻 司
が析するために、標準品、容器、抽出固 ているものがあった。プラスチック製の 類のPFASs を回収できた。内部標準物 て妥当性評価を実施した結果、妥当性評 がわかった。			-	
n of everyday commodities including d convenient lifestyle with access to ical fields, laboratory equipment and ely employed. The association crine disease has been recognized. fore imperative, and the determination ne. To obtain as much information as required for exposure assessments. ol A (BPA), alkylphenols (APs), he production of everyday and LC/MS/MS analyses, xposure to PFCs.			-	
d carbon (GAC) was investigated. The vaste water containing PFCs of known g acetone as the solvent was ed by using the investigated method. pared with the used one. PFCs in GAC			_	
 Pモニタリングは近年活発に行われてい Oとして、市販の固相抽出(SPE)カー しているSPEの問題点を検証した。特に 00 mg、30 μmとすることで、外洋海水 マ効果の低減に有効な脱塩操作技術も するPFASsの高精度分析が一般分析機関 			-	
as perfluorooctanoic acid (PFOA) and using pressurized liquid extraction Is were primarily extracted from the nethodology. The solvent was then I)trifluoroacetamide. The silylated determine the PFOA and PFOS in vo compounds were 1.6 and 13.9 ng wackaging materials and textiles ranged			-	
びPFOS関連化合物を対象としたヒト血 が方式を用いたオンライン固相抽出法を で測定することが可能となった.本法を やあり、ヒト血しょう試料中における定 トロヘプタン酸(PFHpA)を用いること た.このことから、本法は、ヒト血			-	

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D194	分析	Xiaming CHEN, Hiroaki OZAKI, Rabindra Raj GIRI, Shogo TANIGUCHI, Ryohei TAKANAMI	Distribution and Diffusion Behaviors of Perfluorinated Compounds with Low Pressure Reverse Osmosis Membranes	2012	Journal of Water and Environment Technology, 10 巻 4 号 449-461, doi: 10.2965/jwet.2012.449	Low pressure reverse osmosis (LPRO) membrane filtration has emerged as the best alternative to ordinary reverse osmosis (RO) membrane filtration due to very low operating pressure involved with the former resulting in low cost. However, behaviors of perfluorinated compounds (PFCs) with LPRO membrane filtration are not known since the compounds as water/wastewater contaminants have only a very short history. Therefore, adsorption and diffusion behaviors of selected perfluoroalkyl carboxylate (PFAC) and perfluoroalkyl sulfonate (PFAS) compounds with a tight and a loose LPRO membranes were tested in laboratory experiments. Distribution coefficient (logKmw) and diffusion coefficient (Dp) values for the compounds were experimentally determined for the first time. The Dp values were about three orders of magnitude larger than those for pharmaceutical and endocrine disrupting compounds. The compounds exhibited similar behaviors to those of pharmaceutical and endocrine disrupting chemicals reported earlier. Adsorption of PFCs to membranes was directly correlated to molecular weight (MW) and carbon-chain length, while their diffusion through membrane pores showed inverse correlations with the parameters. Similarly, their rejections were directly correlated to their logKmw values and MW. However, significance of carbon-chain length on diffusion was not well understood, and hence further investigations should be devoted to elucidate on the point.		-
D195	分析	Masaki OHNO, Yuta KUBO, Esteban R Mino A, Tomohiro KOSE, Satoshi NAKAI, Wataru NISHIJIMA, Kuniaki KAWATA	Effect of pH and Coexisting Species on the Photochemical Decomposition of Perfluorooctanoic Acid by Iron (III) Sulphate	2012	Journal of Water and Environment Technology, 10 巻 2 号 129-140, doi: 10.2965/jwet.2012.129	Perfluorinated compounds including perfluorooctanoic acid (PFOA), which have been detected globally in the environment and in wildlife, have recently received a great deal of attention as environmental contaminants because they are ubiquitous in the environment. In this study, the effect of pH and coexisting ions on the decomposition of PFOA was evaluated under a combined treatment of ferric ion and ultraviolet radiation. The defluorination ratio at pH 2.0 after 72 hr was 101% of the initial PFOA concentration (48 μ M). The defluorination rate constant of PFOA during the initial 4 hr at pH 2.0 was 56 × 10-3 hr-1. Furthermore, SO42- ions might have interfered with the complexation of PFOA with Fe3+. Moreover, hydroxyl radical was detected in the sample solution of pH 2.0, 3.0, and 3.5 using electron spin resonance spectroscopy. The hydroxyl radical oxidized Fe2+ to Fe3+, which was reduced by the PFOA decomposition. The strongest absorbance at 250 nm was observed at the sample solution at pH 2.0. Consequently, the photochemical decomposition for PFOA was more efficient at pH 2.0 due to the strong UV absorbance and the influence of the hydroxyl radical.		-
D196	分析	繁泉 恒河, 丸尾 知佳子, 野村 宗 弘, 相川 良雄, 西 村 修, 中野 和典	道路流出水中のペルフルオロオクタンスルホン酸 (PFOS)の吸着に及ぼす共存陰イオンの影響評価	2012	日本水処理生物学会誌, 48 巻 4 号 133-140, doi: 10.2521/jswtb.48.133	道路流出水中の存在濃度であるng/lオーダーにおけるPFOSの吸着による除去において、異なる濃度オーダーで道路流出水中に共存する 陰イオンが及ぼす影響について検討を行った。PFOSが陰イオン系界面活性剤である事から、陰イオン交換による除去が期待された が、陰イオン交換性資材によるPFOSの除去率は活性炭による除去率よりも低く、PFOSの陰イオン交換による除去が難しい事が示され た。活性炭によるPFOSの除去は、PFOSが単独で存在する場合だけでなく、道路流出水中の共存陰イオンが存在する条件下においても 有効であった。さらにNO3-およびCr2O72-の吸着は他の陰イオンとの競合により除去性能が低下したのに対し、その存在濃度がNO3 -、PO43-およびCr2O72-と比較して10-104オーダー低いPFOSの吸着による除去は、共存陰イオンの影響を受けなかった。活性炭 による除去率が高い事およびPFOSの吸着が共存陰イオンの影響を受けない事から、ng/lオーダーという極低濃度で存在する道路流出水 中のPFOSの除去において、PFOSの疎水性が強く影響する事が示された。		-
D197	分析	eisuke Nakai, Hideya Kawasaki, Atsushi Yamamoto, Ryuichi Arakawa, Robert N. Grass, Wendelin J. Stark	Sensitive Detection of Aromatic Hydrophobic Compounds in Water and Perfluorooctane Sulfonate in Human Serum by Surface-Assisted Laser Desorption/Ionization Mass Spectrometry (SALDI-MS) with Amine Functionalized Graphene-Coated Cobalt	2014	Mass Spectrometry, 3 巻 1 号 A0028, doi: 10.5702/massspectrometry.A0028	In this article, we describe the application of surface-assisted laser desorption/ionization mass spectrometry (SALDI-MS) with the use of amine functionalized graphene-coated cobalt nanoparticles (CoC–NH2 nanoparticles) to analyse aromatic hydrophobic compounds that are known environmental contaminants, including polycyclic aromatic hydrocarbons (PAHs) and pentachlorophenol (PCP). Our results demonstrated that SALDI-MS can detect PCP, anthracene, and pyrene in water. In particular, the CoC–NH2 nanoparticles proved to be an efficient means of capturing PCP in water because of the high adsorption capacity of the nanoparticles for PCP, which resulted in a detectability of 100 ppt. Furthermore, the CoC–NH2 nanoparticles also functioned as an adsorbent for solid-phase extraction of perfluoroctane sulfonate (PFOS) from human serum, displaying good performance with a detectability of 10 ppb by SALDI-MS.		-
D198	分析	和田 彩佳	工業材料中のハロゲンの高精度定量と標準に関する調査 研究	2016	計測と制御, 55 巻 1 号 71-80, doi: 10.11499/sicejl.55.71	RoHS 指令1) が 2006 年に施行されて以来,材料中のハロゲン濃度について強い関心がもたれている. RoHS 指令だけでなく,近年さ まざまな条約等によってハロゲン濃度に関する制限が設けられている. その結果,環境残留性や人体への毒性を示す複数の有機ハロゲ ン化合物の規制が進み,工業材料等に有機ハロゲン化合物を使用しない「ハロゲンフリー」が世界的に進んでいる2).新たに製造され る材料のハロゲンフリーが進んだとしても,工業材料にはプラスチックのように環境負荷軽減のためにリサイクルや再利用が推進され ているものがあり,かつて製造された工業材料中に現在の規制物質が使われていた場合,リサイクルや再利用によって新たな製品に規 制物質が混入する可能性がある. 材料中の有害物質の分析は産業にとって非常に重要であり,ハロゲンについても閾値が定められ,ハ ロゲン分析についての公定法が複数制定されている. しかしながら,公定法に定められた分析法に対応する標準物質が整備されている とは言い難い. 今後どのようなハロゲン分析法が重要になるか,そのためにどんな標準物質が必要となるかを探るため,本調査研究を 行った. まず関心をもたれている有機ハロゲン化合物を調べ,工業材料中のハロゲン濃度についての規制,ハロゲン分析法を定めた規 格等について調査した. つぎに各ハロゲン分析法の特徴を調査し,今後需要が高まると考えられるハロゲン分析法についてその要件を 考察した.また,分析現場における分析結果の評価には分析法のバリデーションが欠かせないことから,材料中のハロゲン分析のバリ デーションに用いる材料組成標準物質の現状を調査し,今後必要とされる標準物質を考察した		-

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D199	分析	中澤 裕之	安全と安心を求めて:生活関連化学物質の薬学における 分析	2014	YAKUGAKU ZASSHI, 134 巻 3 号 413-426, doi: 10.1248/yakushi.13-00241	An association between exposure to trace hazardous chemicals such as endocrine disrupting chemicals and an increased incidence of human endocrine disease might be continued to study. The accurate and sensitive analytical methods for determination of various chemicals in human biospecimen such as urine, blood and breast milk have been studied by techniques including chromatography. In order to obtain the safe and secure life, the pharmaceutical analytical approaches might be applicable with the hopes of realizing scientific risk assessment of the chemicals derived from daily life products as regulatory sciences.		-
D200	分析	高田 光康, 山本 周作, 西岡 良太, 竹峰 秀祐, 田中 周平, 藤井 滋穂, 渡辺 信久	最終処分場余水処理工程で活性炭に吸着保持された有機 フッ素化合物の熱処理による挙動	2013	廃棄物資源循環学会論文誌, 24 巻 6 号 105-112, doi: 10.3985/jjsmcwm.1130101	最終処分場余水中の有機フッ素化合物(PFCs)が吸着した活性炭を,空気気流中で熱処理した後,酸素気流中で燃焼分解させ,ガス吸 収液に捕集される無機フッ素(F)を調べた。空気気流中では,熱処理温度600°Cまでは温度上昇とともにFの捕集量は増加したが,熱処 理温度700°C以上では燃焼分解と合わせた総捕集量が低下した。この理由は,活性炭表面の炭酸カルシウム等のアルカリ成分が熱処理 温度の上昇に伴い活性化し,Fを固相に保持するためであると考え,活性炭を精製水もしくは希硫酸で洗浄した後,Fを計測する実験を 実施した。その結果,精製水洗浄ではF回収量は熱処理温度の上昇に伴い低下したが,希硫酸洗浄では500~800°Cの熱処理で変化はな く106~114 μgg-1であった。この量は活性炭に捕集された総PFCsと見なされ,同地点での採取試料で定量された同定可能なPFCsの 濃度5~14 μgg-1の約10倍となった。		-
D201	分析	Shigeru Suzuki	Recent Advance in Liquid Chromatography/Mass Spectrometry Techniques for Environmental Analysis in Japan	2014	Mass Spectrometry, 3 巻 Special_Issue_3 号 S0047, doi: 10.5702/massspectrometry.S0047	The techniques and measurement methods developed in the Environmental Survey and Monitoring of Chemicals by Japan's Ministry of the Environment, as well as a large amount of knowledge archived in the survey, have led to the advancement of environmental analysis. Recently, technologies such as non-target liquid chromatography/high resolution mass spectrometry and liquid chromatography with micro bore column have further developed the field. Here, the general strategy of a method developed for the liquid chromatography/mass spectrometry (LC/MS) analysis of environmental chemicals with a brief description is presented. Also, a non-target analysis for the identification of environmental pollutants using a provisional fragment database and "MsMsFilter," an elemental composition elucidation tool, is presented. This analytical method is shown to be highly effective in the identification of a model chemical, the pesticide Bendiocarb. Our improved micro-liquid chromatography injection system showed substantially enhanced sensitivity to perfluoroalkyl substances, with peak areas 32–71 times larger than those observed in conventional LC/MS.		-
D202	分析	北本 靖子, 伊藤 理彩, 東海 明宏	水道水源における化学物質流出事故に対する高度浄水処 理及び対策オプションの評価	2022	環境科学会誌, 35 巻 3 号 121-136, doi: 10.11353/sesj.35.121	 化学物質が突発的に水源へ流出することは、水道水の安全に対する大きな脅威である。浄水場へ流入した場合は化学物質を浄水処理によって低減する必要があるが、対応能力が不足する場合は追加の対策、すなわち、更なる対策オプションを検討することになる。このため、水源における存在量やその物性から高リスクであると予想される化学物質が、水道水に混入した場合の影響や浄水処理による低減能力を可能な限り事前に評価しておくことが望ましい。 このため、オゾン処理及び粒状活性炭(GAC)処理を含む高度浄水処理を有する浄水場に対し、発生頻度や影響の大きさによって過去に発生した水源水質事故事例を抽出し、浄水処理による低減が十分であるかを調べ、浄水場で可能な対策オプションによる対応戦略について検討した。揮発性有機化合物検出事故の原因物質であるジクロロメタン(DCM)を取り上げ、現在の粒状活性炭処理による除去率を求め、対策オプションとしてGACの更新周期を短縮した場合、粉末活性炭を注入した場合、及びエアレーション処理を導入した場合の除去率と比較した。 本研究で扱った事例において、原水における流入濃度が水質基準値を超過した日の平均濃度、0.036 mg/LのDCMを水質基準値(0.020 mg/L)以下に低減するために要する費用を算出したところ、粒状活性炭の更新周期を現行の5年から1年短縮して4年とすることが最も費用対効果に優れていた。他の化学物質の流出に対してもオゾン処理の強化等を含めて同様の方法で評価することが可能で、平常時に高リスク物質から優先的に事前評価を進めておくことで、有事においても迅速な浄水処理の対応が可能であると推察した。 		-
D203	分析	Misaki Endoh, Hiroki Konno	Amino-functionalized UiO-66 as a Novel Adsorbent for Removal of Perfluorooctane Sulfonate from Aqueous Solution	2021	Chemistry Letters, 50 巻 8 号 1592-1596, doi: 10.1246/cl.210233	Perfluorinated compounds are a class of emerging organic water contaminants that pose risk to human health and the natural environment. Perfluorooctane sulfonate (PFOS) is the most extensively used perfluorinated compound worldwide owing to its applications in various fields. In this study, UiO-66 and UiO-66-NH2 were synthesized via a solvothermal method that uses hydrochloric acid. These were evaluated as potential adsorbents to remove PFOS from an aqueous solution. UiO-66-NH2 showed the highest adsorption capacity because its affinity for PFOS anions in water is improved despite the decrease in specific surface area caused by the introduction of amino groups. Previous studies have reported that a UiO-66 type framework is an effective PFOS adsorbent. This study presents a novel approach to enhance its adsorption performance by amino group modification.		-
D204	分析	竹峰 秀祐, 高田 光康, 山本 周作, 渡辺 信久, 松村 千里, 藤井 滋穂, 田中 周平, 近藤 明	粒状活性炭に吸着されたペルフルオロオクタン酸の加熱 時の挙動	2013	分析化学, 62 巻 2 号 107-113, doi: 10.2116/bunsekikagaku.62.107	In this study, an experiment to investigate the thermal behavior of perfluorooctanoic acid (PFOA) adsorbed on granular activated carbon (GAC) was carried out. PFOA of a known amount adsorbed by GAC was heated by an electric furnace with a gas mixture of oxygen and nitrogen being used for the carrier gas. The samples were analyzed by using LC/MS/MS, an ion chromatograph, and an atmospheric pressure helium- radiofrequency barrier plasma discharge-atomic emission spectrometry (He-rfBD-AES) to analyze the behavior of PFOA from form changes and the mass balance of F. A heating experiment of PFOA was also carried for a comparison. When PFOA was heated, it evaporated at 150° C and 300° C. The generation of fluoride and decomposition compounds along with the combustion was confirmed at 500° C. When PFOA adsorbed by GAC was heated, PFOA and the homologues did not evaporate at 150° C. Additionally, the generation of fluoride was confirmed at 150° C and 300° C. It was indicated that GAC inhibits the evaporation of PFOA, and facilitates the combustion reaction of PFOA compared with when PFOA was heated without using GAC.		-

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No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン文 ン文 ク献 ① ラ ② ラ
D205	分析	Jin Cheng, Shinji Kanehashi, Kenji Ogino	Introduction of β -Diketone Unit to Polyfluorene Side Chain for Improving Color Stability and Electron Transporting Property	2022	Chemistry Letters, 51 巻 4 号 448-450, doi: 10.1246/cl.220029	Poly[9,9-bis(2,4-octanedionyl)-9',9'-di-n-octyl[2,2'-bi-9H-fluorene]-7,7'-diyl] (PFOA) was prepared with a β -diketone structure incorporated in the side chain and the optimal octyl length remained. Compared with poly(9,9-di-n-octylfluorene) (PFO) with a similar degree of polymerization, we found that the introduction of β -diketone brought about superior fluorescent, electrochemical and electron transporting properties, which suggested improved color stability and electron mobility. Cyanocobalamin (vitamin B12) was selectively extracted from a biological sample by the homogeneous liquid–liquid extraction			-
D206	分析	Yoshitaka Takagai, Shukuro Igarashi	Selective Extraction and Isolation of Vitamin B12 Using Homogeneous Liquid?Liquid Extraction with Perfluoro Surfactant	2003	Bulletin of the Chemical Society of Japan, 76 巻 8 号 1595- 1600, doi: 10.1246/bcsj.76.1595	based on a pH-dependent phase separation with perfluorooctanoate ion (PFOA –). When the experimental conditions were [PFOA –]T = $2.86 \times 10-3 \text{ mol } L-1$, [HCI]T = $0.66 \text{ mol } L-1$, and [Acetone]T = $2.86 \text{ vol }\%$, $8.46 \times 10-7 \text{ mol } L-1$ (1.14 ppm) of vitamin B12 was selectively extracted at 95.2% (sample solution; $35 \text{ mL} \rightarrow a$ liquid sedimented phase; 30μ L). This liquid sedimented phase consisted of large amounts of HPFOA. When microliter levels of THF and water were added to this sedimented phase, vitamin B12 is completely and rapidly back-extracted from the sedimented phase to the water phase. Vitamin B12 was then extracted into the water phase at 96.2% and all HPFOA remained in the sedimented phase. The rest of the sedimented phase after the back-extraction was dried and completely recovered as a powder of HPFOA. Consequently, this method was able to recycle HPFOA as a separation medium. Vitamin B12 in a water phase was also crystallized by the addition of excess THF. Moreover, this method was applied to the extraction from rare oysters. As a result, a few micrograms of vitamin B12 were recovered.			-
D207	分析	Shukuro Igarashi, Tohru Kyuwa, Masaya Matsuura, Takao Yotsuyanagi	A Novel Homogeneous Liquid-liquid Extraction Based on Three-phase Formation with Perfluorosurfactant and Amine Compounds	1994	↓ Chemistry Letters, 23 巻 7 号 1189-1190, doi: 10.1246/cl.1994.1189	A new type of three-phase separation phenomenon was found by the charge neutralization of perfluorooctanate ion {PFOA $-$, CF3(CF2)6-COO $-$ } with amylammonium ion (R-N+H3). For example, a three-phase system was formed at pH = 6.8 and [PFOA]T/[amine]T = 0.5. The partition behaviors of solutes such as water-soluble porphyrin and compounds in vivo into each liquid phase were examined.			-
D208	分析	Hiroaki Ozawa, Natsuko Ide, Tsuyohiko Fujigaya, Yasuro Niidome, Naotoshi Nakashima	One-pot Separation of Highly Enriched (6,5)-Single- walled Carbon Nanotubes Using a Fluorene-based Copolymer	2011	Chemistry Letters, 40 巻 3 号 239-241, doi: 10.1246/cl.2011.239	We now describe the finding that a copolymer of 9,9-dioctylfluorenyl-2,7-diyl and bipyridine (BPy) can extract in "one-pot" ≈96– 97%-enriched (6,5)-SWNTs in m-xylene and p-xylene not containing metallic SWNTs, which was revealed by vis–near IR absorption, photoluminescence, and Raman spectroscopies.			-
D209	分析	古川 浩司, 川口 寿之, 工藤 清惣, 一 中澤 智子, 佐藤 亮平, 船坂 鐐三, 奥村 明雄	LC/MS/MSによる水道水中の塩素酸分析法	2017	7 環境科学会誌, 30 巻 6 号 365-372, doi: 10.11353/sesj.30.365	液体クロマトグラフィー/タンデム型質量分析法(LC/MS/MS法)による水道水中の塩素酸分析法の検討と水道水質検査としての妥当 性を検証した。分析法としては,試料を精製水で100倍(V/V)に希釈調製し,LC/MS/MS測定を行った。検討の結果,塩素酸の検量 線は,標準液濃度0.2~10 µg/L(試料濃度:20~1000 µg/L)の濃度範囲で良好な直線性が得られた。0.5 µg/L塩素酸標準液(n=5) の繰り返し測定の併行精度(RSD)は,4.56%と良好であった。さらに,水道水の添加回収試験(50 µg/L,n=5,5 days)を行った結 果,併行精度(RSD)8.99%,室内精度(RSD)9.47%,真度(回収率)105%と良好な結果が得られ、厚生労働省が通知した「水道 水質検査方法の妥当性評価ガイドライン」の目標値の範囲内であった。LC/MS/MS法は、イオンクロマトグラフ法では分離が困難な水 道水中の塩素酸のピークを適切に検出すること可能であり,選択性の高い分析法であることが確認できた。			-
D210	分析	穂積 篤, 浦田 千 尋	低環境負荷表面処理技術の開発 — 有機フッ素化合物お よび凹凸加工を用いない新規はつ液処理の実用化を目指 し —	2014	Synthesiology English edition, 7 巻 3 号 185-193, doi: 10.5571/synth.7.190	Development of non-adhesive and dewetting solid surfaces has attracted much attention in a wide variety of industrial applications, because such surfaces can prevent staining, corrosion and clogging, and also permit control of droplet motion. In this paper, we introduce our strategy for R&D, including classification and analysis of previous work, and establishment of a guiding principle for R&D towards practical and rapid realization of our novel oleophobic coatings. Our R&D strategy successfully reduced the transition period from Type 1 to Type 2 Basic Research and its practical realization. Furthermore, by means of seeds-needs matching between AIST and industrial companies, through PR activities and sample offers, we were able to establish our coating technology on a commercial scale within one year.			-
D211	分析	竹峰 秀祐, 茂木 守, 野尻 喜好	ダンシルクロリド誘導体化LC/MS/MS法による大気中 フッ素テロマーアルコール類の分析	2018	分析化学, 67 巻 6 号 341-348, doi: } 10.2116/bunsekikagaku.67.341	本研究では、ダンシルクロリド (DNS-Cl) による誘導体化を大気中のフッ素テロマーアルコール類 (FTOHs) の分析に応用すること を目指し、検討を行った.対象としたFTOHsは、4:2 FTOH、6:2 FTOH、8:2 FTOH、10:2 FTOHである. 固相抽出用カートリッ ジとミニボンプを用いて大気中のFTOHsの捕集を行い、溶媒で溶出した後、DNS-CIを添加し誘導体化を行った. 誘導体化後、クリー ンアップを行い、高速液体クロマトグラフィー/タンデム質量分析 (LC/MS/MS) の測定に供した. 平均回収率は、93% (6:2 FTOH) ~110% (4:2 FTOH) であり、2017年11月に環境大気(埼玉県、加須市)を調査した結果、濃度範囲はND (10:2 FTOH) ~300 pg m - 3 (6:2 FTOH) であった. DNS-CIで誘導体化しLC/MS/MSで分析することで、少量の試料(約1.4 m3、24時間採取) で大気中のFTOHsが検出可能であることを示した.			-
D212	分析	Yu BAI, Hai-Jian YANG	Metal Ion Extraction Using Newly-synthesized Bipyridine Derivative as a Chelating Reagent in Supercritical CO2	2006	Analytical Sciences, 22 巻 11 号 1469-1471, doi: 10.2116/analsci.22.1469	4,4' -Bis(dihexylaminocarbonyl)-2,2' -bipyridine (BDC-Bipy) was synthesized and studied systematically as a chelating reagent for metal ions extraction in supercritical CO2. The compound showed high extraction efficiency for Co2+ (100%), Cu2+ (100%), Cd2+ (98.2%), and Zn2+ (100%) ions and good extraction efficiency for Sr2+ (79.4%) and Pb2+ (89.8%) when the extraction was performed in supercritical CO2 at 313 K and 25 MPa with the system of BDC-Bipy, deionized water and perfluoro-1-octanesulfonic acid tetraethylammonium salt. The recoveries of mixed metal ions were also measured; unfortunately, the system of extraction has no selectivity for the metal ions.			-

パーフルオロ化合物に係る国際機関等の評価及び科学的知見の情報収集並びに整理 別添-2 文献データベース文献リスト

分野 発行年 著者 タイトル 書誌情報 要旨 (原文) No. (参考) High-performance liquid chromatography/mass spectrometry (LC/MS) is the most useful too 芳本 有史, 元木 chemical analysis in the life sciences. However, sample preparation and LC separation dema Journal of the Mass Spectrometry Society of Japan, 57 巻 2 2009 _____ 翔一, 森脇 悠介, 脱離エレクトロスプレーイオン化質量分析用イオン源の and effort. Desorption electrospray ionization (DESI) and direct analysis in real time (DART) D213 分析 試作と迅速分析への応用 号 109-115, doi: 10.5702/massspec.57.109 川崎 英也, 荒川 of samples without difficulty have been developed in recent years. We connected a home-bu 隆mass spectrometer and examined its performance. In this paper, we report the application of (TLC)/DESI-MS in rapid analysis of medicines in serum and concentrated analysis with a so We report the application of tapping-mode scanning probe electrospray ionization (t-SPESI) Rvo Shimazu. industrial materials. The t-SPESI parameters including tapping solvent composition, solvent Yoshinari Application of Tapping-Mode Scanning Probe spot, and step-size were optimized using a quadrupole mass spectrometer to improve mass Mass Spectrometry, 3 巻 Special_Issue_3 号 S005, doi: Yamoto, Tomoya 2015 10.5702/massspectrometry.S0050 D214 分析 Electrospray Ionization to Mass Spectrometry Imaging layer chromatography (TLC) and additives in polymer films. Spatial resolution of approximate Kosaka, Hideya of Additives in Polymer Films imaging mass spectrometry using a fused-silica capillary (50 μ m i.d., 150 μ m o.d.) with th Kawasaki allowed us to obtain discriminable MS imaging profiles of three dyes separated by TLC and Ryuichi Arakawa model film depleted by UV irradiation. 近年、食品の安全性に対する消費者の関心は高まっており、製造者は、製品のみでなく、原料、 要求されている、最終的に分離、除去できる工程があったとしても、原料に混入がないことは、 これらのことから,公益財団法人塩事業センター(以下,当センター)では,塩の原料およびり いる.装置材料や包装材料の溶出に対する基準,衛生環境に対する微生物の基準などが規定され 麻田 拓矢,野田 日本海水学会誌, 73 巻 5 号 265-270, doi: になっている. 原料の海水については、当センターは、環境省の水質汚濁に係る人の健康の保護 D215 分析 製塩における原料海水の水質評価法 2019 10.11457/swsj.73.5_265 準)を設定している。原料海水の基準に適用されている環境基準は、環境に対する基準であるこ しい、海水を食品として考えた規格、基準の例としては、食品衛生法施行規則加工基準 2)にお 海水について,殺菌した海水を使用しなければならないことが規定されるが,他に例はほとんと ていないのが現状である。そこで、海水や食品中の有害物質の文献調査および実際の沿岸海水お する可能性がある物質を検討することにより、塩の原料となる海水の食品原料としての水質評価 本研究では,環境水中に残留する水田施用農薬の時間加重平均濃度(TWAC)の測定手法としての (POCIS)の適用性を検証した。琵琶湖流域の3水田群 (2.8~70 ha) と1つの流入河川で7~21日間 水環境中に残留する水田施用農薬のPolar Organic POCISの浸漬と高頻度グラブサンプリング (2回 日-1以上) を同時に行った。POCIS法とグラブサ 須戸 幹. 梶原 暢 D216 分析 Chemical Integrative Sampler (POCIS) とグラブサンプ 2022 水環境学会誌, 45 巻 2 号 41-5, doi: 10.2965/jswe.45.41 係があり、その差が0.5~2.0倍の範囲に14データセット中11データセットが含まれた。採水頻度 人, 岩間 憲治 リングによる時間加重平均濃度の比較 プリング法とPOCIS法でTWACを比較した結果,採水期間中の濃度変動が小さいデータセット(C プリングでPOCIS法と同等の結果が得られたが,採水期間中の濃度変動が大きいデータセット(C 日毎以上であったと考えられた。 液滴が残りにくい固体表面の開発は、汚れ付着防止、防食性の向上、目詰まり防止、液流制御等 低環境負荷表面処理技術の開発一 有機フッ素化合物およ る。この論文では、新規はつ液処理技術の短期実用化を目指した我々の研究戦略を紹介する。思 穂積 篤, 浦田 千 D217 分析 び凹凸加工を用いない新規はつ液処理の実用化を目指し 2014 Synthesiology, 7 巻 3 号 190-198, doi: 10.5571/synth.7.190 な戦略を立てることで、第1種基礎研究から第2種基礎研究、実用化への移行時間を大幅に短縮 業への試料提供を通じ、我々が開発したはつ液処理技術を活かすことが可能な要素技術を持つ企 ずで量産規模でのコーティング技術を確立するに至った。 In recent years, adverse effects on the environment caused by the tire rubber additives listed a great concern. Therefore, it is important to evaluate the fate and behavior of these chemica the effects of analytical conditions on the stability and extraction recoveries of them in the e nvestigated to establish simultaneous analytical methods of these compounds. Four hour ultrasonic extraction bellow 40° C was found effective to extract the tire rubber a 三島 聡子,田中 D218 分析 タイヤ添加剤の安定性と環境試料の分析法検討 2013 環境化学, 23 巻 1 号 9-18, doi: 10.5985/jec.23.9 rubber additives contained in the atmosphere particles were stable after 4days aeration, the 達也,北野大 Dehydration of solid phase cartridges for the analysis of water samples by centrifuge was me method. In order to obtain sufficient recovery rates, water samples should be adjusted at pH and extracted on the sampling day. Both the recovery rates of tire rubber additives in pure a up with Florisil cartridge was necessary for the analysis of these chemicals in sediments by The recovery rates of tire rubber additives in sediments were over 91%.

	備考	出 情 対 報 象 抽	ン 文 ク 献 ① ラ	ン 文 ク 献 ② ラ
ol for qualitative and quantitative and an extraordinary amount of time techniques that obtain mass spectra uilt DESI ion source to an existing f DESI to thin-layer chromatography ulid-phase extraction disk.			-	
to mass spectrometry imaging of flow rate, number of tapping at each spectrometry (MS) imaging of thin- ely 100 μ m was achieved by t-SPESI e flow rate set at 0.2 μ L/min. This the additive stripe pattern of a PMMA			-	
製造工程に至るまでの安全性が併せて リスクを大きく低減できると考える. 製造工程において,製造基準を規定して れ,製造工程の安全性が確認できるよう 獲に関する環境基準1)(以下,環境基 ととから,食品原料に適した基準が望ま らいて,生食用の鮮魚介類などに用いる どなく,海水は食品原料として評価され および河川水の測定を行い,海水に混入 両法を策定した.			-	
極性有機化学物質集積サンプラー 間,除草剤2成分と殺菌剤1成分を対象に ナンプリング法のTWACには高い相関関 を1,2,3,4,7日毎と仮定したグラブサン CV ≥ 100%)では7日毎以上のグラブサン CV > 100%)で必要であった採水頻度は3 等、さまざまな工業分野で望まれてい 既存技術を類型化し、研究開始前に綿密 することができた。また、広報活動や企			-	
d up as PRTR chemicals has become als in the environment. In this study, environmental samples were dditives from tire rubber particles. Tire ir recovery rates were over 87%. ore effective than N2 gas purge 16 ~8, preserved in cool and dark place nd river water were over 85%. Clean LC/MS/MS to get high peak intensity				

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)		出 情 対 報 象 抽	ン 文 ク 献 ① ラ	ン 文 ク 献 ② ラ
D219	分析	和田 彩佳, 三浦 勉, 大畑 昌輝, 日 置 昭治	燃焼イオンクロマトグラフィーによるプラスチック中の 塩素及び臭素の定量	2015	分析化学, 64 巻 7 号 543-549, doi: 10.2116/bunsekikagaku.64.543	Accurate and precise determinations of chlorine and bromine in plastic samples were examined using combustion ion chromatography (CIC). The concentration of H2O2 as an absorption solution as well as the analytical methods with and without an internal standard of phosphate ion was optimized by a recovery test using standard solutions and certified reference materials (BCR-681 and NMIJ CRM 8137-a). When concentrated of H2O2 such as 1000 mg kg – 1, was applied to CIC analysis, quantitative recovery could be obtained. Since the internal standard of the phosphate ion was lost by gas bubbling during the combustion process, the analytical results revealed higher values beyond those expected. On the other hand, the analytical results involving the calibration method without any internal standard were in good agreement with the certified values. The developed method was applied to analyze for chlorine and bromine in certified reference materials made by ABS resin (NMIJ CRM 8155-a). The analytical results obtained by CIC were in good agreement with these by an instrumental neutron activation analysis (INAA) as a complimentary analytical method. The uncertainty for each of chlorine and bromine by CIC analysis of NMIJ CRM 8155-a was 1.6%, which was consistent with that obtained by INAA. The limits of quantification for CIC analysis with 30 mg of plastic sample were 1 mg kg – 1 for chlorine and 5 mg kg – 1 for bromine.			-	
D220	分析	Hiromichi Nakahara, Aya Ohmine, Shoko Kai, Osamu Shibata	Monolayer Compression Induces Fluidization in Binary System of Partially Fluorinated Alcohol (F4H11OH) with DPPC	2013	Journal of Oleo Science, 62 巻 5 号 271-281, doi: 10.5650/jos.62.271.	A two-component Langmuir monolayer consisting of (perfluorobutyl)undecanol (F4H110H) and dipalmitoylphosphatidylcholine (DPPC), a major component of pulmonary surfactants in mammals, has been investigated at the air-water interface. The binary monolayer has been systematically examined from both thermodynamic and morphological perspectives. The excess Gibbs free energy of mixing has been calculated from surface pressure (π)-molecular area (A) isotherms, and the results indicate that the miscibility of the two-component system shows a maximum in thermodynamical stability when the mole fraction (XF4H110H) is 0.3. Results from a two-dimensional phase diagram (π vs. XF4H110H) are consistent with these findings and depict the degree of miscibility resulting from the variation in the transition and collapse pressures relative to the concentration of XF4H110H. The miscibility is also supported by in situ Brewster angle microscopy and fluorescence microscopy, as well as ex situ atomic force microscopy for the system after transfer onto a mica substrate. Aside from temperature, a known driving force for the fluidization of DPPC monolayers is a change in surface composition caused by the addition of additive molecules. In the present study, however, the fluidization is driven by increasing surface pressures even at constant XF4H110H. Such a fluidization is a fascinating property when looked at in context of its potential implications for pulmonary replacement therapy, and hence, this study provides a fundamental insight into designing fluorinated materials for biomedical use.			-	
D221	分析	Hiromichi Nakahara, Chikayo Hirano, Ichiro Fujita, Osamu Shibata	Interfacial Properties in Langmuir Monolayers and LB Films of DPPC with Partially Fluorinated Alcohol (F8H7OH)	2013	Journal of Oleo Science, 62 巻 12 号 1017-1027, doi: 10.5650/jos.62.1017.	Two-component interactions between (perfluorooctyl) heptanol (F8H7OH) and dipalmitoylphosphatidylcholine (DPPC), which is a major component of pulmonary surfactants in mammals, were systematically elucidated using Langmuir monolayers and Langmuir-Blodgett (LB) films of the compounds. The interactions such as the miscibility of the compounds and their phase behavior were examined from thermodynamic and morphological perspectives. The surface pressure (π)-molecular area (A) and surface potential (Δ V)-A isotherms of the binary monolayers containing F8H7OH in different mole fractions (XF8H7OH) were measured simultaneously. The excess Gibbs free energy of mixing of the two components was calculated from the π -A isotherms. The resulting isotherm data were employed to construct a two-dimensional (2D) phase diagram of the system. The phase diagram revealed that the transition pressure as well as the monolayer collapse pressure change with changes in XF8H7OH. These thermodynamic analyses suggested that the miscibility of the two components and the solidification of DPPC monolayers can be induced by the addition of F8H7OH. The phase behavior upon monolayer compression was observed morphologically in situ using Brewster angle microscopy (BAM) and fluorescence microscopy (FM), as well as ex situ using atomic force microscopy (AFM). Interestingly, the AFM-based analysis revealed the formation of monodispersed 2D micelles consisting of F8H7OH at low surface pressures.			-	
D222	分析	間中 淳, 五十嵐 淑郎	感度と簡易化の向上を目指すマイクロプレート濃度計測 法の開発	2013	分析化学, 62 巻 9 号 811-818, doi:10.2116/bunsekikagaku.62.811	著者らは、マイクロプレートを用いる微小体積試料の濃度に関する高性能かつ簡易な判定法を開発してきた.本稿では、はじめに亜硫酸塩/過酸化水素系自己触媒反応を用いる方法、ポルフィリン還元体であるポルフィリノーゲンからポルフィリンへの酸化反応を用いる方法、カチオン型水溶性ポルフィリン(TMPyP)をプレート表面上に固定化したマイクロプレート法、及び高倍率濃縮分離法である均一液液抽出を用いたマイクロプレート上での高感度計測法などに関して述べる。いずれの手法も微少の液滴中の微量物質(金属イオン、抗原物質、内分泌かく乱物質など)の検出が可能であった.また、急激な二色の変色反応を利用したマイクロプレートのウェルの変色数による残留塩素などの目視濃度判定法に関しても述べる.この手法は変色数で濃度を判定するため、明確に濃度の目視分析ができる.			-	

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン 文 ン 文 ク 献 ク 講 ① ラ ②	文
D223	分析	Vo Huu Cong, Yutaka Sakakibara, Masahito Komori, Naoyuki Kishimoto, Tomohide Watanabe, Iori Mishima, Ikko Ihara, Tsuneo Tanaka, Yukihito Yoshida, Hiroaki Ozaki	Recent Developments in Electrochemical Technology for Water and Wastewater Treatments	2016	Journal of Water and Environment Technology, 14 巻 2 号 25-36, doi: 10.2965/jwet.15-029	This paper presents the recent attention in scientific studies and development of electrochemical processes. Electrochemical technology has contributed significantly to the purification of water for better human health and aquatic life forms. In this study, we emphasize the developmental trends of electrochemical technologies, their applications, and recent developments in the context of water and wastewater treatments. Recent studies have made great advances in investigating and optimizing advanced electrochemical oxidation processes in treatment of various organic pollutants, reduction of halogenated contaminants, and disinfection of microorganisms. Besides, electrochemical oxidation processes have been combined with other treatment methods to enable their practical application. Excellent electro-catalytic treatment of contaminant and their by-products was achieved through the application of mixed metal oxides (PbO2, SnO2, Ti/RuO2, etc.), Pt, and boron-doped diamond (BDD) electrodes. Several studies have focused on selective removal of trace pollutants in a complex matrix. These studies have shown the possibility of removing target pollutants with relatively low energy consumption. It can be concluded that enhancement of treatment performance of the present technologies will contribute to a wider application of electrochemical processes in water and wastewater treatment.			-	
D224	分析	高沢 麻里, 鈴木 裕識, 小森 行也, 對馬 育夫, 山下 洋正, 小口 正弘	液体クロマトグラフ-精密質量分析計を用いたPRTR物質 の簡易スクリーニング手法の構築と下水試料への適用	2020	環境科学会誌, 33 巻 5 号 114-125, doi: 10.11353/sesj.33.114	本研究では、精密質量分析技術によるターゲットスクリーニング手法に着目し、その適用先として、物性が多様ながら一斉分析の需要 があるPRTR制度の第一種指定化学物質(PRTR物質)を目的物質群として取り上げた。特に、事業者からの流入実態の把握が重要であ る下水試料を対象に、一斉かつ迅速に有無判定し、効率的な定量値取得が望める簡易スクリーニングプロセスの構築を主目的とした。 まず、迅速な有無判定には、正確かつ豊富で機種依存性および試料依存性の低いデータベース(DB)が不可欠であることから、スク リーニングDB構築における標準品解析手順として、(1)3段階で希釈した標準品を無段階MS/MS法で測定し、(2)濃度に応じてス ベクトル強度が増減しているプロダクトイオン候補を抽出した。(3)抽出されたプロダクトイオン候補と対象物質の元素組成の整合性 を確認し、プロダクトイオンを決定した。以上の3点のプロセスにより、28種のPRTR物質におけるプロダクトイオンおよび保持時間情 報を取得した。次に、DBの拡充を目的に、既存のDBから引用した情報を整理し、PRTR物質を81物質収録したPRTR-DBを構築した。 10か所の下水処理施設から得た流入および処理水をPRTR-DBと突合した結果、スクリーニングにおいて39物質が検出された。不特定 物質が含まれる試料に対し、一次スクリーニングを行うことで、定量が見込める物質の絞り込みが容易となった。その上で、定量を試 みた結果、8物質が定量された。本調査から、各処理施設で検出される物質種、その数および定量値の変動が大きいことが明らかとな り、不特定物質の定量には事前スクリーニングが有効であるとともに、調査数(試料数)の増加による取得データの充実が重要である ことが示唆された。本研究で構築した簡易スクリーニングプロセスは、DBへの登録物質数を増加しつつ、実測を繰り返すことで、さら に頑強なDBの構築が期待でき、また、異なる対象物質群にも応用可能である。			-	
D225	分析	松村 益代(兵庫県 立健康科学研究所 健康科学部), 風見 眞紀子	有機フッ素化合物(PFASs)の直接注入-LC-MS/MSによ る分析法の検討	2022	兵庫県立健康科学研究所研究報告(2434-1908)3-4号 Page15- 20(2022.03)	液体クロマトグラフ-タンデム質量分析計(LC-MS/MS)による水道水中の有機フッ素化合物(PFASs)の直接注入法について検討した。標 準液としてPFASs混合品、内部標準液としてPFASs安定同位体混合品を用いた。直接注入法の対象化合物はスルホン酸類では炭素数4~ 8であるペルフルオロブタンスルホン酸、ペルフルオロヘキサンスルホン酸、ペルフルオロオクタンスルホン酸、カルボン酸類では炭素 数6~10のペルフルオロヘキサン酸、ペルフルオロヘプタン酸、ペルフルオロオクタン酸、ペルフルオロノナン酸およびペルフルオロデ カノン酸とした。5ng/L濃度のPFASsの添加回収試験を水道水で行った結果、真度95~105%、併行精度4.3~8.4%、室内精度4.6~10% とガイドラインの目標を満たす良好な結果が得られた。本分析法は水道水中のPFASsの8化合物について、迅速かつ高精度な分析が可 能な手法であると考えられた。			-	
D226	分析	森脇 洋(信州大学 繊維学部応用生物 科学系), 中野 武	残留性有機汚染物質のキラル分析	2014	ぶんせき(0386-2178)477号 Page475-483(2014.09)	残留性有機汚染物質(POP)の中には光学異性体を有するものがある。光学異性体は、(+)体と(-)体とで酵素や天然にあるキラル分子との相互作用の違いから生物学的な物性が異なることがある。これまで得ることができなかったPOPの環境中における挙動に関する情報がキラル分析により得られるケースがあることが分かった。こうした挙動解析が、POPの汚染対策、違法な発生源の探索につながると思われる。POPのキラル分析を行った研究において報告された知見を総括した。			-	
D227	分析	仲田尚生(星菜科 大学薬品分析化 学教室),中田彩 子,岡田文雄,伊 藤里恵,井之上 浩一,斉藤貢一, 中澤裕之	オンライン固相抽出-高速液体クロマトグラフィー/タン デム質量分析計を用いるヒト血しょう中有機フッ素系化 合物の一斉分析法の開発	2005	分析化学(0525-1931)54巻9号 Page877-884(2005.09), DOI:10.2116/BUNSEKIKAGAKU.54.877	簡便かつ多検体処理能を有する前処理法であるオンライン固相抽出法を採用し,高精度・高選択性な機能を有するHPLC/MS/MSを用い ることにより,迅速かつ高感度・高精度な血漿試料中パーフルオロ化合物(PFCs)の一斉分析法を開発した.カラムスイッチング方式を用 いたオンライン固相抽出法を採用することで,除タンパクした血漿試料中のPFCsを簡便な操作で測定することが可能となった.ヒト血漿 試料中PFCsの分析へ応用し,検出限界は0.08~0.14ng/ml,定量限界は0.50ng/mlとした.内標準物質にパーフルオロヘプタン酸を用いるこ とにより,回収率93.3%以上と良好な回収率を得ることができた.ヒト血漿試料中のPFCsの定量に応用できることが示唆された			-	

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D228	ばく露	Lin, Huiju; Taniyasu, Sachi; Yamazaki, Eriko; Wei, Si; Wang, Xinhong; Gai, Nan; Kim, Jin Hyo; Eun, Heesoo; Lam, Paul K S; Yamashita, Nobuyoshi	Per- and Polyfluoroalkyl Substances in the Air Particles of Asia: Levels, Seasonality, and Size- Dependent Distribution	2020	Environ Sci Technol. 2020 Nov 17;54(22):14182-14191. doi: 10.1021/acs.est.0c03387. Epub 2020 Nov 6.	Information regarding the size-dependent distribution of per- and polyfluoroalkyl substances (PFAS) in atmospheric particulate matter (PM) is very limited. In this study, 248 size-specific PM samples were collected from 9 Asian cities using a portable 4-stage cascade impactor for the analysis of PFAS. Of the 34 investigated PFAS, perfluorooctanoic acid (PFOA) and perfluorooctanesulfonic acid (PFOS) were the major compounds. In particular, the emerging PFAS, hexafluoropropylene oxide dimer acid, was quantified in the PM for the first time, with concentrations ranging from <0.086 to 21.5 pg/m(3). Spatially, PFOA and PFOS were the predominant compounds in China, while precursors, emerging PFAS, and short-chain PFAS dominated in India, Japan, and South Korea, respectively. Seasonal variations of PFAS may be controlled by regional climate, local or seasonal emission sources, and long-range transport of air masses. Size-dependent distribution was investigated, showing that the majority of PFAS predominantly affiliated in fine particles, while PFOS and its alternatives tended to attach on coarser particles. Moreover, PFOS distributed on specific sizes exhibited seasonal and regional dependency, while no such patterns were observed for PFOA. These findings will provide useful information on the geographical and size-dependent distribution of PFAS in the atmospheric PM.		В
D229	ばく露	Muir, Derek; Miaz, Luc T	Spatial and Temporal Trends of Perfluoroalkyl Substances in Global Ocean and Coastal Waters	2021	Environ Sci Technol. 2021 Jul 20;55(14):9527-9537. doi: 10.1021/acs.est.0c08035. Epub 2021 Mar 1.	Per- and polyfluoroalkyl substances (PFAS) have been widely detected in global surface waters since the early 2000s. Here, we have compiled and analyzed the published data for perfluorocarboxylates (PFCAs) and perfluorosulfonates (PFSAs) in surface waters of coastal seas, the Great Lakes, and open oceans to examine temporal and geospatial trends. Mass discharges from major rivers were also estimated. A large number of measurements of individual PFAS have been made in these surface waters (29 500 values), with seven C4-C10 PFSAs and nine C4-C12 PFCAs accounting for 83% of all data. However, most results (85% for PFSAs; 80% for PFCAs) were for the coastal seas of Western Europe, China, Korea, and Japan, while results were limited for coastal North America and lacking for South America and Africa. Highest median concentrations of PFCAs and PFSAs were reported in the Bohai and Yellow Seas region of China as well as in the North and Baltic seas in Europe. Significant declines in median PFSAs and C7-C12 PFCAs were also observed for the period 2012-2018 in these same regions, and for 2004-2017 in the Great Lakes. Mass discharge estimates indicated continued substantial riverine emissions of long chain (C7-C12) PFCAs in the period 2015-2019 for the coastal seas of China and reductions in emissions for Western European rivers compared to earlier time periods.		В
D230	ばく露	Eun, Heesoo; Yamazaki, Eriko; Pan, Yu; Taniyasu, Sachi; Noborio, Kosuke; Yamashita, Nobuyoshi	Evaluating the Distribution of Perfluoroalkyl Substances in Rice Paddy Lysimeter with an Andosol	2022	Int J Environ Res Public Health. 2022 Aug 20;19(16):10379. doi: 10.3390/ijerph191610379.	The properties of potential emerging persistent contaminants, perfluoroalkyl substances (PFAS), in an andosol rice paddy lysimeter were analyzed to determine their mobility and leaching behavior regarding carbon chain length and functional groups. For this purpose, simulated contaminated water (Σ PFAS = 1,185,719 ng/L) was used in the lysimeter. The results showed that PFAS distribution in the paddy soil lysimeter was influenced by the migration of these substances into irrigation water and their adsorption into the soil. PFHxS (C6) and PFOS (C8), which are the main components of the simulated contaminated water, were mostly captured in the soil layers of the low-humic andosol layer (0-35 cm). PFAS distribution may depend on soil properties, such as total carbon (TC) content. Compared with perfluoroalkane sulfonic acids (PFSAs), the distribution of perfluoroalkyl carboxylic acids (PFCAs) in soil showed significant variation. The remaining PFCAs were distributed across all layers of the lysimeter, except for the longer-chain PFCAs. Moreover, the PFSA distribution was directly correlated with the carbon chain number, whereby longer- and shorter-chain PFSAs accumulated in the top and bottom soil layers, respectively. This study provides detailed information on the distribution, leaching, uptake, and accumulation of individual PFAS in andosol paddy fields in Japan.		C
D231	ばく露	Wang, Siquan; Lin, Xiaoping; Li, Qin; Liu, Chang; Li, Yongyu; Wang, Xinhong	Neutral and ionizable per-and polyfluoroalkyl substances in the urban atmosphere: Occurrence, sources and transport	2022	Sci Total Environ. 2022 Jun 1;823:153794. doi: 10.1016/j.scitotenv.2022.153794. Epub 2022 Feb 9.	In the atmosphere, the photodegradation of neutral per-and polyfluoroalkyl substances (n-PFASs) is a source of ionizable PFASs (i-PFASs). However, they are not frequently simultaneously analyzed to study their transport and sources. In this study, n-PFASs and i-PFASs were simultaneously analyzed in the atmosphere of China, Japan and Malaysia to investigate the occurrence, seasonal variations, sources and transport. Results showed that n-PFASs ranged from 4.8 to 1400 pg m(-3), with an average value of 170 pg m(-3), and 8:2 fluorotelomer alcohol (8:2 FTOH) was the most abundant compound. i-PFASs ranged from 3.7 to 330 pg m(-3), with an average value of 49 pg m(-3), and perfluorobutanoic acid (PFBA) had the highest concentration. Generally, airborne PFASs had a decreasing gradient from cities with high population density toward less industrialized sites. i-PFASs exhibited significantly (P < 0.05) seasonal variations, which were higher in the summer. 8:2 FTOH and 10:2 FTOH had significant (P < 0.05) positive correlations with perfluoroctanoic acid and perfluorodecanoic acid, suggesting that they had same sources, such as coemission and photodegradation of FTOHs. Urumqi and Selangor were far away from industry, and high percentages (>95%) but low concentrations of PFBA were found in these cities, indicating the long-range atmospheric transport of PFBA due to its high volatility. The Summer Monsoon may promote the transport of high concentrations of PFAS from coastal cities to inland cities.		с

分野 タイトル 発行年 書誌情報 要旨 (原文) No 著者 (参考) Per- and polyfluoroalkyl substances (PFASs) are a group of persistent contaminants detected waters. Previous studies have performed suspect and non-target screening by high-resolution determine the composition of PFAS contamination and to discover unknown PFASs. Here, w suspect screening against two lists in the NORMAN Suspect List Exchange in firefighting for Yukioka, Satoru drinking water (n = 18) collected in Okinawa, Japan, in April 2019. Samples were analyzed by Tanaka, Shuhei A profile analysis with suspect screening of per- and Water Res. 2020 Oct 1;184:116207. doi: quadrupole time-of-flight (QTOF) MS in electron spray ionization mode. Suspect screening Suzuki, Yuji; ばく露 D232 polyfluoroalkyl substances (PFASs) in firefighting 2020 Echigo, Shinya; 10.1016/j.watres.2020.116207. Epub 2020 Jul 20. their molecular weights, functional groups, and perfluoroalkyl chain lengths. Long-chain per foam impacted waters in Okinawa, Japan their precursors were specifically found around the firefighting training area. Short-chain PF ärrman. Anna Fujii, Shigeo precursors by environmental processes. Perfluoroalkyl sulfonamide precursors were found to sulfonic acids (PFSAs) in the drinking water treatment process. In contrast, biological activa perfluoroalkyl carboxylic acids (PFCAs). The PFAS profile showed that a large number of dif considered Per- and polyfluoroalkyl substances (PFAS) are a broad class of hundreds of fluorinated che Houck, Keith A; concerns due to their widespread presence and persistence in the environment. Several of the Patlewicz, Grace comprehensively studied for experimental toxicity, environmental fate and exposure, and hu Richard, Ann M; chemicals have limited or no data available. To inform methods for prioritizing these data-po Williams, Anton studies, we evaluated 142 PFAS using an in vitro screening platform consisting of two multip I; Shobair, Bioactivity profiling of per- and polyfluoroalkyl encompassing 81 diverse transcription factor activities and tested in concentration-response Toxicology. 2021 Jun 15;457:152789. doi: Mahmoud A D233 ばく霰 substances (PFAS) identifies potential toxicity μ M. Results showed activity for various nuclear receptors, including three known PFAS targ 10.1016/j.tox.2021.152789. Epub 2021 Apr 20. Smeltz, Marci; pathways related to molecular structure alpha and peroxisome proliferator receptors alpha and gamma. We also report activity again Clifton, M Scott key heterodimeric partner of type II, non-steroidal nuclear receptors. Additional activities we Wetmore, receptor, nuclear receptor related-1 protein, and nuclear factor erythroid 2-related factor 2, Barbara: orthogonal assay approaches, we confirmed activity of representative PFAS against several Medvedev, Alex; key PFAS structural features associated with nuclear receptor activity that can inform future Makarov, Sergei prioritizing chemicals for risk assessment and in the design of new structures devoid of biolo Only a few dozens of the several thousand existing per- and polyfluoroalkyl substances (PF. target analysis. This study employed suspect screening to examine patterns of emerging and river water affected by industrial point sources. In total, 86 PFAS were (tentatively) identifie categories. Homologue patterns revealed distinct differences between fluoropolymer produc Joerss, Hanna Beyond the Tip of the Iceberg: Suspect Screening Chinese Xiaoqing River Basin, the C8 homologue was the most prevalent compound of the e Menger, Frank; Reveals Point Source-Specific Patterns of Emerging Environ Sci Technol. 2022 May 3;56(9):5456-5465. doi: perfluoroalkyl carboxylic acids (CI-PFCAs) and perfluoroalkylether carboxylic acids (PFECAs D234 ばく露 2022 Tang, Jianhui; 10.1021/acs.est.1c07987. Epub 2022 Apr 21. and Novel Per- and Polyfluoroalkyl Substances in homologues were dominant in the German Alz River. This indicates that the phaseout of long Ebinghaus, Ralf German and Chinese Rivers their ongoing production in Asian countries also apply to unregulated emerging PFAS classe Ahrens, Lutz differentiate the point sources were the peak area ratio of perfluorobutane sulfonic acid (PF hydro-substituted PFBS (H-PFBS) as well as the occurrence of byproducts of the sulfonated Nafion. The large number of identified unregulated PFAS underlines the importance of a gro whereas the revealed contamination patterns can be used to estimate, prioritize, and minim The occurrence of per- and polyfluoroalkyl substances (PFAS) in water resources is an emer environmental persistence and bioaccumulation in humans. In Western countries, health ad peen released to warn the public of its potential adverse effects. However, awareness regar its infancy as reflected by the minimal safeguards imposed to protect the population from ex Baluyot, Jobriell PFAS contamination in Asia with a focus on freshwater resources to determine whether PFA C; Reyes, Per- and polyfluoroalkyl substances (PFAS) as Environ Res. 2021 Jun;197:111122. doi: 10.1016/j.envres.2021.111122. Epub 2021 Apr 3. globe. Peer reviewed articles which included information on PFAS levels from 2000 to 2020 D235 ばく露 Emmanuel Marc; contaminants of emerging concern in Asia's contamination was detected in surface water relative to ground, tap, and drinking water. PF Velarde, Michael freshwater resources countries in Asia, such as China, Japan, and South Korea, were above the recommended lev PFAS in South and Southeast Asia were just below the recommended level, but the rise of P alongside its remarkable economic and industrial growth, suggests that increased PFAS con Asia may soon follow, as these countries compete with the global economy. Hence, there is mplement measures that will reduce the exposure of their population to PFAS

	備考	出 情 対 報 象 抽	ン 文 煎 ラ	ン 文 ク 献 ② ラ
ed in firefighting foam impacted on mass spectrometry (HRMS) to re performed a profile analysis with am impacted environmental and y liquid chromatography (LC) returned 116 candidate PFASs with fluoroalkyl acids (PFAAs) and some of rAAs were assumed to be formed from o be transformed to perfluoroalkyl ted carbon filtration formed ferent substances needs to be	評価書文 献No.84 と重複		A	
emicals with environmental health hese chemicals have been man epidemiology; however, most oor chemicals for detailed toxicity olexed transactivation assays e format ranging from 137 nM to 300 getsspecifically estrogen receptor st the retinoid X receptor beta, the ere found against the pregnane X a sensor of oxidative stress. Using of these targets. Finally, we identified e predictive models for use in ogical activity.			С	
AS) are monitored using conventional d novel PFAS in German and Chinese d and grouped into 18 structure tition sites of the two countries. In the emerging series of chlorinated d). In contrast, C6 and shorter g-chain compounds in Europe and s. Additional characteristics to BS) versus the emerging compound d tetrafluoroethylene-based polymer uping approach on a regulatory level, ize contributions of specific sources			В	
rging concern because of their visories regarding PFAS exposure have ding PFAS exposure in Asia is still at exposure. Here, we reviewed studies on AS is also a concern in this part of the were compiled. The highest PFAS AS levels in water resources in several el, similar to that in the United States. PFAS in China in the recent decade, itamination in South and Southeast a need for these countries to also			В	

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	 出情 ン文 ン文 対報 ク献 ク献 の
D236	ばく露	津田 泰三, 瀧野 昭彦, 居川 俊弘, 河原 晶, 北川 典 孝, 佐貫 典子, 卯 田 隆	琵琶湖とその周辺河川水質および琵琶湖底質における有 機フッ素化合物	2015	; 環境化学, 25 巻 3 号 139-148, doi: 10.5985/jec.25.139	The sum of 9 PFCs concentrations in water of Lake Biwa was 10.6 \sim 13.5 ng/L and little differences among 4 sites of northern basin of Lake Biwa (12B, 17A, 17B, 17C') in August 2011. The order of average PFCs composition in 7 sites of all over the Lake Biwa was PFOA > PFNA > PFHpA \geq PFHxA > PFOS > PFDA > PFHxS > PFUnDA \geq PFBS, little differences among the sites. The concentration range (average) in water of 12 rivers around Lake Biwa was 0.48 \sim 59.2(26.4) ng/L and large differences among the 12 rivers. The order of average PFCs composition in water of the 12 rivers was PFOA > PFNA > PFOS > PFHpA > PFDA > PFBS > PFHxS > PFUnDA, slightly different from that in Lake Biwa. Seasonal changes of PFCs concentrations and compositions in water of 3 sites of Lake Biwa (6B, 12B, 17B) were little in May, August, November 2012 and February 2013. The sum of 15 PFCs concentration range (average) in sediment of Lake Biwa was ND \sim 4.42 (1.51) ng/g dry wt. in May \sim December 2013. The PFCs concentration was high in clay-like sediment of deep central area of northern basin of Lake Biwa. There were no differences between southern and northern basins of Lake Biwa in the PFCs composition of the water and the order of PFCs composition of the sediment and northern basins of Lake Biwa in the PFCS > PFDA = DFFXA = PFBA = PFNA = PFHA > PFDA > PFOS. However, there were differences for the PFCs composition of the sediment and the order was PFDA > PFPA > PFOS > PFDA > PFOS > PFDA in the southern basin and PFUnDA > PFTrDA > PFDoDA > PFOS in the northern basin. The ratio of short-middle chain carbon (C4 \sim C9) PFCs was high and long chain carbon (C12 \sim C14) PFCs were not detected in the water of Lake Biwa. However, the ratio of middle-long chain carbon (C10 \sim C13) PFCS and PFOS was high and short-middle chain carbon (C4 \sim C7) PFCs were not detected in the sediment of Lake Biwa.		В
D237	ばく露	西野 貴裕, 上野 孝司, 高橋 明宏, 高澤 嘉一, 柴田 康行, 仲摩 翔太, 北野 大	多摩川水系における有機フッ素化合物の汚染実態の変化 とその収支	2013	3 環境化学, 23 巻 4 号 177-186, doi: 10.5985/jec.23.177	13 kind of Perfluorinated compounds (PFCs) in the mainstream of Tamagawa River and its inflows (tributaries, and effluents from Sewage Treatment Plants) were analyzed, and the loads of PFOS, PFOA and other 4 compounds were evaluated. The concentrations of PFOS and PFOA were found to be much lower than those of 2005 since 2009. This result indicates that the Stockholm Convention on Persisitent Organic Pollutants (POPs) and 2010/2015 PFOA Stewardship Program are effective. The cumulative load of PFCs that was accumulated in the inflows sequentially from Nagata Bridge, as the uppermost point in this study, closely resembled the measured load at each sampling point in Tamagawa River. These results indicate that PFCs were scarcely degraded, volatilized, during flow down the river. The ratio of PFCs with longer chain length such as PFUnDA and PFTrDA in sediment samples were much higher than those of water ones.		В
D238	ばく露	三島 聡子, 小澤 憲司, 中山 駿一, 菊池 宏海	相模湾漂着マイクロプラスチックの有機フッ素化合物の 吸着実態と流入河川の影響	2020) 環境化学, 30 巻 66-81, doi: 10.5985/jec.30.66	Microplastics (MP) can cause damage to ocean ecosystem. The environmental problems due to MP contamination is attracting worldwide attention. In this study, the survey was conducted to clarify the origin of MP obtained on various beaches of Sagami Bay from the viewpoint of chemical adsorption. There was no clear difference in the amount of Perfluorinated Compounds (PFCs) adsorbed on various MP materials. PS foam with a large surface area adsorbed more PFCs per unit weight than resin. The amount of PFOS adsorbed on the MP collected on Kugenuma beach downstream Hikiji river, where PFOS concentration in the water sample was relatively high, was higher than that adsorbed on the MP collected from the other two beaches. The total rainfall for one month before sampling in autumn was higher than the annual average, and the amount of PFCs adsorbed on the MP in autumn was lower than that in other seasons. The amount of PFOS adsorbed on the MP was high in the river downstream from the middle of the Hikiji River. Partition coefficient (Kd) of PFOS that obtained from the elution test used the collected MP was higher than the valve by adsorption test for unused MP. Apparent Kd of PFOS by the MP on Kugenuma beach and the river water at Hujimi bridge of Hikiji river was the same order as the valve that obtained from the elution test used the collected MP. It has been clarified that the MP fragments flowed into the Hikiji river were adsorbed with PFOS and flowed down, and they were drifted to the Kugenuma beach.		В
D239	ばく露	田原 るり子, 山口 高志	北海道内の冬季中の有機フッ素化合物の沈着量調査	2014	↓環境化学, 24 巻 1 号 11-17, doi: 10.5985/jec.24.11	A survey of perfluorinated chemicals (PFCs) deposition during winter was performed at rural areas and hinterlands in Hokkaido (9 points). The depositions were calculated from the concentrations of PFCs in snow covers. The PFCs concentrations were 2.3 \sim 12 ng/kg. PFBA was the dominant compound, and PFOA and PFNA were also detected. The deposition amounts and amount rates of PFCs were 0.38 \sim 8.6 μ g/m2 and 5.7 \sim 95 ng/m2/day, respectively. They were high in the area along the Sea of Japan. The concentrations of some of PFCs among detected PFCs were higher than those in the snowfall at metropolitan area. The result shows not only wet deposition but dry deposition and/or chemical reaction of precursors also contributed to the deposition during the winter.		В
D240	ばく露	高木 博夫, 永野 公代, 佐野 友春, 彼谷 邦光	タイ王国湖沼および湾岸における有機フッ素系界面活性 剤の現状	2019	} 環境化学, 19 巻 4 号 479-485, doi: 10.5985/jec.19.479	Perfluorooctanoic acid (PFOA) and Perfluorooctane sulfonate (PFOS) as persistence organic pollutants (POPs) have been detected in environmental waters around the world. However, only few information on PFOA and PFOS in the Thai environment has been obtained. In order to clarify the pollutions of PFOA and PFOS in waters of lakes and seaside areas in Thailand, we analyzed PFOS and PFOA with SPE-LC/MS in water samples in Kasetsert University in Bangkok, Thailand. However, commercial methanol and RO water for LC/MS analysis purchased from chemical companies in Bangkok were contaminated with PFOS and PFOA before use. The contaminants in the solvent and the commercial pure water were removed using a mix-mode anion exchange solid-phase extraction cartridge (OASIS MAX, Waters). PFOS and PFOA were detected from all samples at the ranges between 0.8 and 61.7 ng/L and between 10.0 and 29.0 ng/L, respectively. It should be noted that the molar ratios of PFOS and PFOA in the East-side and the West-side of the Thai Gulf were different. The finding suggests that the pollutants in the both sides might be drained from different sources.		В

分野 発行年 要旨 (原文) 著者 タイトル 書誌情報 No. (参考) A survey of PFOS and PFOA concentrations was performed for surface water in Lake Biwa (around Lake Biwa in May and June 2009. The concentrations were 0.8~5.3 ng/L for PFOS at and ND~10 ng/L for PFOS and ND~32 ng/L for PFOA in the rivers. The loading amounts of 琵琶湖水および琵琶湖周辺河川水におけるPFOSおよび flowing into Lake Biwa were 2~582 mg/day (n=19) and 8~7084 mg/day (n=25), respectively 津田 泰三, 井上 ばく露 PFOAの濃度調査および琵琶湖への河川流入負荷量の推 among the 12 sites except the two sites (8C and 168) for the PFOS and PFOA concentration D241 亜紀子 居川 俊 2010 環境化学, 20 巻 3 号 259-263, doi: 10.5985/iec.20.259 弘,田中 勝美 differences of PFOS and PFOA concentrations among the rivers were probably because of th amounts in the basin areas of the rivers. The concentrations of PFOS in Lake Biwa were low Kasumigaura but the concentrations of PFOA were reverse. On the other hands, The PFOS a around Lake Biwa were relatively low in the recent river survey data in Japan. We measured 13 perfluorinated compounds (PFCs) in the groundwater in Tokyo. PFCs with detected. PFOS and PFOA were detected at high concentrations, despite discharge reductio 西野 貴裕. 加藤 東京都内地下水における有機フッ素化合物の汚染実態と Chromatograms of PFOS showed variations in the peak area ratio between linear-PFOS and D242 ばく露 みか,下間志正, 2015 環境化学, 25 巻 3 号 149-160, doi: 10.5985/jec.25.149 土壌浸透実験における挙動の考察 points. To investigate the cause, leaching experiments were conducted for the 13 PFCs and 北野 大 show that branched-PFOS penetrated the soil faster than linear-PFOS, and shorter chain PF Long chain PFCs with more than 10 carbons were expected to remain in soil. The concentration of perfluorinated compounds (PFCs) contained in waste samples and elu measured respectively using sensitive method. The PFCs contained in the samples were ext 吉田 光方子, 竹峰 were eluted with water. Afterward, the PFCs were separated, concentrated with nitrogen-ga 秀祐,松村千里, 廃棄物試料における有機フッ素化合物(PFCs)の含有及び results were considered focusing on the proportion and the difference in elution ratio of eacl D243 ばく露 中野 武, 高田 光 2011 環境化学, 21 巻 2 号 135-140, doi: 10.5985/jec.21.135 溶出状況 As a result, it was confirmed that the concentration of PFCs contained in the samples can be 康,東海明宏,盛 waste. The differences in the concentrations contained in various kinds of waste samples we 岡通 of industry, and treatment process. The elution ratio for the contained amount was different carbon chain compounds (C5-C8) had high elution rate, while long compounds (C9-C14) we To investigate the behavior of emerging contaminants in drinking water, we measured the co (PFOA), perfluorooctane sulfonate (PFOS) and a number of pharmaceuticals and personal ca water treatment system PFOA concentration ranged from 4 to 225ng/L and 5 to 153ng/L in raw water and final wate purification plant. However the concentrations of PFOA had decreased since September, 200 生活衛生, 54 巻 2 号 128-136, doi: D244 ばく露 林 広宣 水道水の未規制化学物質への取り組みと現状 2010 treatment plant effluents decreased in the same period. It was thought that the consumption 10.11468/seikatsueisei.54.128 upstream area We have also developed an analytical method for 73 PPCPs using LC-MS/MS. The number concentration was more than the quantification limit at the Kunijima purification plant was (iopamidol, iohexol) in finished water. The advanced water treatment system, in particular th remove PPCPs efficiently. n this paper, we focus on perfluorooctane sulfonate (PFOS) and perfluorooctanoate (PFOA) countries (i.e., Japan, Singapore, Thailand, Malaysia, China, Vietnam, Taiwan, Sweden, Turk 田中 周平,藤井 collected in different water environments (e.g., river, lake, wetland, reservoir, wastewater tre 滋穂, LIEN from Nov. 2004 to Dec. 2007. The main conclusions obtained in this study are as follows: 1) Nguyen Pham the surface water of rivers was more than 10.0 ng · I-1 in Osaka. The average concentration 世界10カ国21都市の水環境におけるPFOS・PFOA汚染 Hong, 野添 宗裕, 2008 水環境学会誌, 31 巻 11 号 665-670, doi: 10.2965/jswe.31.665 more than 10.0 ng · I-1 in Bangkok and Taipei. 2) The average concentration of PFOA in the D245 ばく露 KUNACHEVA の現況 1,000 ng · I-1 (median : 48.6 ng · I-1) in Osaka, and it was more than 15 ng · I-1 in Kyoto, She Chinagarn, 木村 The average concentration of PFOA in residential tap water was more than 10 ng · I-1 in Osa 功二, SHIVAKOTI number of cities where the difference between river water and tap water was less than 1.0 n Binaya dissolved PFOS and PFOA was 16 for PFOS and 11 for PFOA, respectively. 4) The dissolved effluent were higher than those in influent of most wastewater treatment plants (16/19 for F 小谷野 道子, 杉田 都市大気中のperfluorooctane sulfanate (PFOS) の測定を行った。東京に隣接する和光市で、ナ 蓄積性・ 和俊, 稲葉 洋平, 日 (夏期)と12月1-27日 (冬期)の毎日捕集した。捕集した試料はメタノールで超音波抽出し、L 2010 大気環境学会誌, 45 巻 6 号 279-282, doi: 10.11298/taiki.45.279 都市大気中ペルフルオロオクタンスルホン酸 (PFOS) 濃 D246 環境中運 山口 一郎, 谷保 PFOSの回収率は90%、繰り返し精度は13% (c.v.)であった。TSP濃度の幾何平均値は7月が48 μ 度の週間変化 佐知,山下 信義, あった。これに対しPFOS濃度の幾何平均値は7月が6.8 pg/m3、12月が3.5 pg/m3と夏期の方が 遠藤 治 度は、平日に対して、土曜と日曜の週末に低い週間変化を示していた。

	備考	出 情 対 報 象 抽	ン 文 ク 献 ① ラ	ン 文 ク 献 ② ラ
14 sites) and 31 rivers (35 sites) nd 8.7~26ng/L for PFOA in Lake Biwa PFOS and PFOA from the rivers y. There were no wide differences s in the Lake Biwa surface water. The ne differences of their loading yer than those in Lake Suwa or Lake and PFOA concentrations in the rivers			В	
nine carbons or fewer were frequently n measures taken since 2010. branched-PFOS with the sampling branched-PFOS isomers. The results FCs faster than longer-chain PFCs.			В	
ted from the waste samples were racted with methanol, while the PFCs s and analyzed by LC/MS/MS. The h PFCs. e measured without pulverizing solid ere found depending on the category based on compounds. The short re low.			С	
oncentration of perfluorooctanoic acid are products (PPCPs) in an advanced r, respectively, at the Kunijima 07, as the volume of sewerage n of PFOA had decreased in the of PPCPs of which the average 80 in raw water, but fell to two ne ozonation process, appears thus to			В	
in water environment of 21 cities in 10 ey and Canada). 1,160 samples were eatment plant, residence, and sea) The average concentration of PFOS in of PFOS in residential tap water was surface water of rivers was more than enzhen, Khon Kaen, and Singapore. aka and Okayama in Japan. 3) The ng · I-1 in the median concentrations of PFOS and PFOA concentrations in PFOS, 38/45 for PFOA).			В	
大気中浮遊粒子 (TSP) を2006年7月3-29 C/MS/MSで分析した。この方法による μg/m3、12月が43 μg/m3とほぼ同等で ³ 冬期よりも高かった。大気中のPFOS濃		1	A	

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No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	出情 備考 象抽	ン 文 ク 献 ① ラ	
D247	ばく露	今井 志保, 川中 洋平, 土屋 悦輝, 尹 順子	東京都内の水道水中の有機フッ素化合物濃度および組成 分布	2012	! 水環境学会誌, 35 巻 3 号 57-64, doi: 10.2965/jswe.35.57	東京都内の水道水について,有機フッ素化合物 (PFCs) である11種のペルフルオロアルキルカルボン酸類および5種のペルフルオロア ルキルスルホン酸類を測定した。40地点のPFCsの総濃度は0.72~95 ng・L-1の範囲で,平均値は19 ng・L-1であった。最多検出地点 では12種のPFCsが検出され,PFCs組成比を用いたクラスター分析の結果,都内の水道水は多摩地域と区部の二種類にほぼ大別でき た。区部の水道水のPFCs組成比および濃度は類似しているのに対して,多摩地域の水道水の組成比および濃度にはばらつきがみられ た。これは区部の水道水が表流水を原水としているのに対して,多摩地域では各浄水所において表流水に地下水を混合して原水として いることによるものと考えられた。諸外国のPFCsの指針値等と測定値を比較した結果,都内の水道水中の個々のPFC濃度は指針値等を 下回った。	1	A	
D248	ばく露	吉澤 正, 栗原 正 憲, 大石 修, 清水 明, 杉山 寛	ー般廃棄物最終処分場の浸出水中の有機フッ素化合物お よびその水処理	2011	.水環境学会誌, 34 巻 7 号 95-101, doi: 10.2965/jswe.34.95	浸出水中の有機フッ素化合物(PFCs)濃度および水処理の実態を把握するために、市町村等が設置した千葉県内の21の一般廃棄物最終処分場の浸出水、それを水処理して排出される放流水および活性炭吸着処理原水の中のPFCsの調査を実施した。浸出水中のPFCs濃度は26.3~2,650 ng・L-1、幾何平均値467 ng・L-1であった。いずれの施設の浸出水でもパーフルオロカルボン酸(PFCAs)濃度とパーフルオロアルキルスルホン酸(PFASs)濃度を比べると、PFCAs濃度が高かった。PFCsは主に活性炭吸着処理により除去されており、定期的に活性炭を交換している施設ではPFOSとPFOAの平均除去率はそれぞれ87.0、77.5%であった。活性炭吸着能力の経時的な低下にともない、炭素鎖の短いPFCAsから除去率が低下していた施設があった。		В	
D249	ばく露	雪岡 聖, 田中 周 平, 鈴木 裕識, Zeng Chenghui, 北尾 亮太, 仲田 雅俊, 藤井 滋穂	化粧品由来のポリフルオロアルキルリン酸エステル類の 下水処理場における挙動および流入負荷量の推定	2018	水環境学会誌, 41 巻 2 号 27-34, doi: 10.2965/jswe.41.27	本研究では1) 化粧品におけるポリフルオロアルキルリン酸エステル類 (PAPs) の存在実態の把握,2) 下水処理場におけるPAPsの挙動の 検討,3) 化粧品由来のPAPsの流入負荷量の推定を目的とした。国内外の化粧品を23製品購入し,2016年8月に5ヶ所の下水処理場を調査 した。化粧品中の∑3 diPAPs (6:2diPAP, 6:2/8:2diPAP, 8:2diPAP) は1,030~58,500,000 ng g-wet-1であった。下水処理場における∑3 diPAPsの濃度は最初沈殿汚泥で479 ng L-1,返送汚泥で269 ng L-1であり,その負荷量は生物反応槽前後で減少する傾向が示された。化 粧品由来の∑3 diPAPsの流入負荷量は67~1,180 mg day-1であり,その流入負荷率は14±2%を占め,化粧品由来のPAPsの負荷割合が明 らかになった。		С	
D250	ばく露	高木 麻衣, 吉永 淳	日本人小児のハウスダストを介した化学物質曝露のリス ク評価	2009) 室内環境, 12 巻 2 号 103-114, doi:10.7879/siej.12.103	小児の化学物質曝露が懸念されている中,主要な化学物質曝露源の一つとしてハウスダストが注目されつつある。本研究では,我が国 において今後さらに詳細な調査が必要と考えられる化学物質のスクリーニングを行う目的で,国内のハウスダスト中化学物質濃度(金 属類,ポリプロモジフェニルエーテル類,多環芳香族炭化水素類(PAHs),フタル酸エステル類,ダイオキシン類,DDT,クロルピリ ホス,パーフルオロオクタンスルホン酸,ビスフェノールA,ノニルフェノール)に関する既往の報告値を主に用いて,小児のハウス ダストを介した化学物質曝露量を推定し,リスク評価を行った。 鉛とフタル酸ジエチルヘキシル(DEHP)の曝露量95%値におけるハザード比(HQ)はそれぞれ,0.2,1.7であり,本研究で許容リス クと設定した0.1を超過した。PAHs,無機と素,ダイオキシン類の曝露量95%値における過剰発がんリスクは,それぞれ3×10-5,1× 10-3,8×10-5となり,許容リスクと設定した10-5を超過した。さらに,これらの化学物質のうち,鉛,DEHP,PAHsは,ハウスダス ト経由の曝露量の全曝露量に対する寄与が大きいと推定された。よって,国内のハウスダストについては,鉛,DEHP,PAHsに関し優 先的に実態調査を進め,ハウスダストを曝露媒体として含めた小児の健康リスク評価をする必要があると考えられる。		В	
D251	ばく露	大野 光明	基地・軍隊をめぐる概念・認識枠組みと軍事化の力学?? 基地問題と環境社会学をつなぐために??	2019	■環境社会学研究, 25 巻 35-50, doi: 10.24779/jpkankyo.25.0_3!	 沖縄では沖縄戦,米軍占領期,そして日本「復帰」後から現在に至るまで,戦時と平時をわかたず,軍隊による事件・事故,人権侵害,環境破壊が生じてきた。沖縄に対する強権的な政治と基地の新設,軍隊の機能の変容が進む現在にあって,環境社会学の知見による現状への介入は喫緊のものとして期待されているのではないだろうか。だが,環境社会学はこれまで軍事基地問題に正面から向き合ってきたとはいえない。そこで本稿では,沖縄の基地・軍隊をめぐる諸問題を事例として,環境社会学が軍事基地問題をとらえるために必要な基本的視座を提示することを試みる。 まず,沖縄の軍事環境問題の歴史をふりかえり,軍事的暴力の特徴が空間的・時間的に広がりをもっていることを確認する。そのうえで,軍事基地をめぐる諸問題をとらえるための概念や認識枠組みを批判的に検討した。すなわち,受益という概念や受苦を強いられる人びとへの受益の還流や配分という枠組み自体が軍事化されていることを考察した。そのうえで,環境社会学が軍事環境問題を対象化するためには,脱軍事化をつくりだしていく批判的な知と枠組みが必要であることを示し,その基本的な視座を整理した。 		С	
D252	ばく露	功刀 正行	 篤志観測船を用いた残留性有機汚染物質による地球規模 海洋汚染観測	2013	日本海水学会誌, 67 巻 1 号 2-11, doi: 10.2116/bunsekikagaku.59.967	No abstract available		D	
D253	ばく露	玉城 全一郎(沖縄 医療生協平和活動 委員会事務局)	【沖縄本土復帰から50年】米軍の有機フッ素化合物によ る環境汚染と健康被害	2022	! 民医連医療(0285-2241)596号 Page20-21(2022.05)	No abstract available		D	
D254	ばく露	小泉 昭夫(京都保 健会社会健康医学 福祉研究所)	【環境問題と民医連】米軍基地および工場周辺の有機 フッ素化合物PFASによる環境汚染の現状と健康影響	2021	民医連医療(0285-2241)588号 Page14-17(2021.09)	No abstract available		D	
D255	ばく露	越後 信哉(京都大 学 大学院工学研 究科都市環境工学 専攻)	【飲料水の安全と安心の確保】変換過程を考慮した水道 ² 水質の安全確保	2021	公衆衛生(0368-5187)85巻2号 Page89-94(2021.02), doi: 10.11477/mf.1401209558	<文献概要>ポイント ◆人為由来の化学物質が水環境中や水処理プロセス中で有害な化学物質に変換されることがある.◆下水処理と 浄水処理など,複数の変換過程の組み合わせについても考慮が必要である.◆おびただしい数の化学物質が対象となるため,実験だけでは なく,反応機構の体系化や計算化学の援用も重要となる.		С	

別添-2 文献データベース文献リスト

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨 (原文)	備考	出情 ン文 ン文 対報 象抽 ① ラ ② ラ
D256	ばく露	設楽 夕莉菜(千葉 市環境保健研究所 環境科学課), 鈴木 瑞穂, 坂元 宏成	千葉市の水域における有機フッ素化合物調査(第11報)	2019	千葉市環境保健研究所年報(1347-5053)26号 Page65- 69(2019.12)	当研究所では2008年度から有機フッ素化合物(PFCs)汚染の実態調査を行っている。本年度(2018年度)の調査では、市内を流れる河川の 実態を広範囲で把握できるよう、主要9河川の14地点を選び、11種のPFCsについて夏季と冬季に調査を行った。結果、9河川すべてで PFCsが検出され、PFCsは河川水とともに海域等へ排出されていることが明らかになった。各地点のPFCs合算値をみると、夏季の最大 値は六方の111.9ng/Lであり、冬季の最大値は六方の92.0ng/Lであった。対象物質ごとにみると、ペルフルオロオクタンスルホン酸は 14地点のうち動物公園が夏季・冬季とも最も高値を示し、ペルフルオロオクタン酸は六方が夏季・冬季とも最も高値を示した。この2 地点についてはPFCs濃度組成比が他の調査地点と異なっていたことから、河川へ排出される何らかの特別な事由が存在するのではない かと考えられた。		В
D257	ばく露	鈴木 瑞穂(千葉市 環境保健研究所 環境科学課), 設楽 夕莉菜, 坂元 宏成	千葉市の水域における有機フッ素化合物調査(第10報)	2018	千葉市環境保健研究所年報(1347-5053)25号 Page48- 50(2018.12)	12種の有機フッ素化合物について、千葉市内の水域5地点で夏季(2017年8月14日)と冬季(2018年3月5日)に実態調査を行った。対象物質 は、Wellington Laboratories社製混合標準溶液PFAC-MXBに含まれるペルフルオロオクタン酸(PFOA)を含むペルフルオロカルボン酸 類13物質、ペルフルオロオクタンスルホン酸(PFOS)を含むペルフルオロアルキルスルホン酸類4物質の計17物質のうち、一定程度感度 が得られた12物質とした。鹿島川では、例年と同様、他の調査地点と比較してすべての物質について低濃度の傾向があり、濃度はおお むね横ばいであった。葭川では動物公園で、例年PFPeAおよびPFHxAが他の調査地点と比較して高濃度の傾向にあるが、今回も夏季調 査でそれぞれ14ng/Lおよび11ng/Lと高い値であった。PFOSおよびPFOAについては、2008年度から継続して調査を行っているが、 PFOSよりもPFOAのほうが高濃度の傾向にあった。		В
D258	ばく露	鈴木 瑞穂(千葉市 環境保健研究所 環境科学課), 設楽 夕莉菜, 坂元 宏 成, 五木田 正, 塚 原 滋	千葉市の水域における有機フッ素化合物調査(第9報)	2017	千葉市環境保健研究所年報(1347-5053)24号 Page53- 56(2017.12)	千葉市の主要河川である鹿島川から下泉、葭川から源町407番地地先(動物公園)と六方、花見川から汐留と八千代芦太の5地点を測定地 点として選択した。ペルフルオロオクタンスルホン酸(PFOS)は平成26年から一部の地点でやや増加傾向が見られ、0.4~27ng/Lであっ た。ペルフルオロオクタン酸(PFOA)は横ばい傾向で3.9~50ng/Lであった。関東地方の河川14ヶ所の幾何平均値と比べて、PFOSに関 しては下泉、動物公園、汐留の3地点で、PFOAに関しては全地点でこの値を超過していた。また、PFOS及びPFOAの合計濃度は8.2~ 53ng/Lで、全ての地点においてEPAの飲料水の健康勧告値70ng/Lを下回っていた。その他の有機フッ素化合物(PFCs)は、動物公園で ペルフルオロヘキサンスルホン酸(PFHxS)及びペルフルオロヘキサン酸(PEHxA)、八千代芦太でPFNAが、それぞれ10ng/L以上の濃度 で検出された。		В
D259	ばく露	高島 輝男(岐阜県 保健環境研究所), 鈴木 崇稔	化学物質の環境濃度に関する研究	2015	岐阜県保健環境研究所報(1340-2676)23号 Page13- 17(2015.11)	No abstract available		D
D260	ばく露	山下 紗矢香(福岡 市保健環境研究所 環境科学課),豊福 星洋,戸渡 寛法, 宇野 映介,松尾 友香	福岡市の公共用水域における水質・底質中有機フッ素化 合物調査	2015	福岡市保健環境研究所報(1343-3512)40号 Page74- 79(2015.10)	平成24年度から平成26年度にかけて福岡市の公共用水域における水質および底質中の有機フッ素化合物調査を行った。その結果、水質 については博多湾よりも河川で高濃度のPFOSおよびPFOAを検出したが、底質においては河川よりも博多湾においてPPOSおよび PFOAを高濃度で検出した。水質においてはPFOSよりもPFOAを高濃度検出したが、底質においてはPFOSをPFOAよりも高濃度検出し たことから、PFOSがより底質に蓄積しやすいと考えられた。また、底質においてはPFOSおよびPFOA濃度とCOD、強熱減量および有 機炭素には正の相関が見られた。(著者抄録)		В
D261	ばく露	望月 映希(富士・ 東部林務環境事務 所), 小林 浩, 薬袋 ゆい	山梨県内の環境水中における有機フッ素化合物の実態調 査	2015	山梨県衛生環境研究所年報(2186-554X)58号 Page32- 37(2015.08)	有機フッ素化合物は安定な物質で、様々な有用な特徴がある為、合成樹脂やその合成補助剤、撥水・撥油剤、泡消火剤等として幅広く 使用されている。しかし、有機フッ素化合物やその分解産物は化学的に安定であるがゆえ、環境中に放出された場合、長期にわたり残 存する。これらの化合物のうちPFOS・PFOAとその類縁物質(以下、PFCsという。)は特に水に溶けやすく、我が国の水環境中でも しばしば検出されているが、本県ではいまだ詳細な調査は行われていない。そこで本調査では、山梨県内の河川を主な対象にPFCsの現 状を把握し、汚染実態を明らかにすることにした。		В
D262	ばく露	原田 浩二(京都大 学 大学院医学研 究科環境衛生学分 野), 小泉 昭夫	子どもを取り巻く環境と健康(第4回) 環境化学物質の曝 露 有機フッ素系化学物質(PFCs)の曝露実態	2015	公衆衛生(0368-5187)79巻6号 Page413-418(2015.06)	新たなPOPsとして2000年以降,急速に汚染物質として認識され,なお現在も汚染実態が未解明な点がある有機フッ素系化学物質について解説する.有機フッ素系化学物質がどのような用途,場所で使用,検出されるのかをこれまでの調査例から知ってもらいたい.特に日本ほか,東アジアでは欧米とは異なる有機フッ素系化学物質が観察されることを紹介する.有機フッ素系化学物質の曝露は主に食品を介していると考えられるが,局所的には,有機フッ素化学物質を使用する事業所の周辺では水や大気を介した曝露が大きくなる点について留意したい.		с
D263	ばく露	金井 祐貴(千葉市 環境保健研究所 下水道営業課),五 木田 正,平山 雄 一,宮本 廣	千葉市の水域におけるPFCs調査(第6報)	2014	千葉市環境保健研究所年報(1347-5053)21号 Page59- 61(2014.12)	千葉市内の主要河川5地点でPFCs(有機フッ素化合物)17物質の調査を行い、以下の結果を得た。1)PFOS、PFOAのほかにPFBA、 PFPeA、PFHxA、PFHpA、PFNA、PFDA、PFUdA、PFBS、PFHxSが検出された。2)5年前から継続的に測定しているPFOSは5地点と も減少傾向にあった。3)5年前から測定しているPFOAは概ね横ばい傾向にあり、PFOSと比べると高濃度であった。4)5地点のうち花見 川の八千代芦太地点では前年度にPFNAが高濃度で検出されたが、今年度は急減し、他地点とほぼ同じ濃度となっていた。5)葭川の動 物公園地点ではPFHxSが前年度に引き続き高濃度で検出された。		В
D264	ばく露	西野 貴裕(東京都 環境科学研究所), 加藤 みか, 上野 孝司, 北野 大	都内水環境中における有機フッ素化合物の動態	2014	東京都環境科学研究所年報(1343-3016)2014巻 Page52- 58(2014.11)	No abstract available		D
D265	ばく露	松山 明(川崎市環 境総合研究所),山 本 美穂,千室 麻 由子,鴨志田均	川崎市内の水環境における有機フッ素化合物の環境実態 調査	2013	川崎市環境総合研究所年報(2188-1774)1号 Page58- 62(2013.12)	川崎市内の水環境における有機フッ素化合物の環境案態調査について報告した。調査対象物質は、過去に使用実態が多く問題視された 炭素数が8個のPFOS及びPFOAに加え、同時分析が可能であったスルホン酸類及びカルボン酸類合計10物質とした。水質では2011年度 及び2012年度共に全地点全物質が検出され、いずれの物質も海域よりも河川のほうが高濃度であった。2012年度の底質の調査では、不 検出(検出下限値未満)の地点及び物質もあった。		В

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No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D266	ばく露	岸 玲子(北海道大 学環境健康科学研 究教育センター)	スタートする「環境省エコチル調査」とその先駆け的研 究モデルとなった「北海道スタディ」について これま での成果と今後の課題	2011	. 北海道の公衆衛生37号 Page37-41(2011.03)	No abstract available		D
D267	ばく露	荒堀 康史(奈良県 保健環境研究セン ター), 浅野 勝佳, 兎本 文昭	奈良県内河川の有機フッ素化合物濃度実態調査(第一報)	2012	奈良県保健環境研究センター年報(1348-3153)46号 Page46- 50(2012.12)	2011年6月~2012年1月に、大和川水系10地点、飛鳥川7地点、紀の川水系5地点、新宮川水系3地点において有機フッ素化合物17種の濃 度調査を行った。結果、大和川水系では全地点でPFOAが検出され、その濃度は7~140ng/Lであった。飛鳥川ではPFOAとPFHxAの濃 度が急激に上昇する地点があり、これは、規制対象となりつつあるPFOAから代替物質であるPFHxAへの切り替えが進んでいることを 示唆すると考えられた。紀の川水系ではPFOAやPFHxAが1~7ng/Lの濃度で検出され、新宮川水系では全く検出されなかった。		В
D268	ばく露	小泉 昭夫(京都大 学 医学研究科環 境衛生学分野),藤 井 由希子,新添 多聞,原田 浩二	日中韓における母乳を用いた残留性有機汚染物質のモニ タリング	2012	日本母乳哺育学会雑誌(1882-4242)5巻2号 Page41- 52(2012.03)	残留性有機汚染物質(Persistent Organic Pollutants;POPs)は環境中のいたるところに遍在し、長期間残留するとともに生物濃縮性を有 する環境汚染物質である。POPs汚染に関して母乳をスクリーニングすることは乳児の現在の曝露状況を把握する上で重要である。 POPsは脂溶性があるため、血液から母乳に受動輸送される。東アジアの各国で母乳にどのようなPOPsが含まれるかは異なる。中国人 の母乳ではDDTやヘキサクロロベンゼン濃度が高いが、日本人ではクロルデン、PCB、ペルフルオロオクタン酸、韓国人ではPBDEsの 濃度が高い。こういった特徴の明らかな違いは3国における過去から現在の化学物質曝露の特徴に関連している。POPs濃度は規制され たものは過去に比べて低下してきており、乳児への影響は考えにくいが、新たに検出される物質もある。従って子どもの健康のために もヒト母乳の継続的なモニタリングが必要である。(著者抄録)		В
D269	ばく露	木村 真也(群馬県 衛生環境研究所), 須藤 和久,下田 美里,後藤 和也, 松本 理沙,小澤 邦壽,松村 千里, 柴田 康行	利根川における有機フッ素化合物の流出状況	2011	群馬県衛生環境研究所年報(1340-265X)43号 Page37- - 39(2011.11)	有機フッ素化合物(PFCs)16物質について、利根川と山岳湖沼(榛名湖、尾瀬沼、赤城小沼)における濃度測定を行った。測定には液体ク ロマトグラフ・タンデム型質量分析計を用い、サロゲート法で定量を行った。その結果、9物質が検出され、このうち第一種特定化学物 質に指定されているペルフルオロオクタンスルホン酸については全国平均と比較してほぼ同レベルであった。利根川における各PFCsの 濃度分布をみると、どのPFCsも下流にいくほど高濃度となっており、検出されたPFCsの種類も上流に比べて多かった。湖沼について は、利根川の上流・中流よりも高濃度であり、これはFPCsが難分解性であることや水の滞留時間が長いことなどが要因と推測された。		В
D270	ばく露	小泉 昭夫(京都大 学大学院医学研 究科環境衛生学分 野)	環境汚染物質のモニタリングと今後の課題 母乳の安 心・安全	2011	日本母乳哺育学会雑誌(1882-4242)5巻Suppl. Page33- · 36(2011.10)	No abstract available		D
D271	ばく露	岸 玲子(北海道大 学 大学院医学研 究科)	環境リスクによる潜在的な健康障害の解明 特に次世代 影響に関する研究	2010)日本医師会雑誌(0021-4493)138巻10別冊 Page56-59(2010.01)	No abstract available		D
D272	ばく露	Harada Kouji H.(京都大学 医学 研究科環境衛生 学), Koizumi Akio	日本における難分解性フッ化物の環境的及び生物学的モ ニタリングとその毒性(Environmental and biological monitoring of persistent fluorinated compounds in Japan and their toxicities)(英語)	2005	Environ Health Prev Med. 2009 Jan;14(1):7-19. doi: 10.1007/s12199-008-0058-5. Epub 2008 Nov 11.	Perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS) comprise a class of per- and poly-fluorinated compounds that have been detected in the environment as well as in humans. The aim of this review is to summarize several monitoring studies in Japan and characterize the toxicokinetics of these compounds. We found that the levels of contamination by these compounds had unique patterns in Japan. The levels of PFOA in serum from inhabitants of the Kansai region were higher than those of other regions. The PFOA levels in air and water samples from the Kansai region were also relatively high. The estimated intakes from these routes partly explain the differences in the serum levels. The toxicokinetics of these compounds have been investigated. Serum samples from male participants had significantly higher geometric means for PFOS and PFOA compared to samples from female participants. This sex-related difference was partly simulated by menstrual blood loss. There are large interspecies differences in the excretion pathways of these compounds. The serum clearances of PFOA via urine were 300-1,000-fold lower in humans than in Wistar rats and Japanese macaques. On the other hand, the biliary excretion of these compounds was comparable in rats and humans, and the long half-lives in humans may be attributable to the low levels of urinary excretion and high biliary reabsorption rates. These findings suggest that qualitative differences in the excretion routes exist between humans and other species. For risk assessment of these compounds, further information regarding sources of exposure and their toxicokinetics is needed.		В
D273	ばく露	原田 浩二(京都大 学 大学院医学研 究科環境衛生学分 野), 小泉 昭夫	環境衛生 難分解性有機フッ素化合物による環境汚染と 健康影響	2008	B 医学のあゆみ(0039-2359)227巻2号 Page149(2008.10)	No abstract available		D
D274	ばく露	齋藤 憲光(岩手県 環境保健研究セン ター), 佐々木 和 明, 八重樫 香	有機フッ素系化合物による環境汚染とその分析法	2005	うぶんせき(0386-2178)366号 Page299-307(2005.06)	No abstract available		D

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No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン 文 ク 献 ① ラ ② ラ
D275	ばく露	斎藤 憲光(岩手県 環境保健研究セン ター),原田 浩二, 井上 佳代子,佐々 木 和之,吉永 侃 夫,小泉 昭夫	日本各地の表層水のPerfluorooctanoate and perfluorooctane sulfonate濃度(Perfluorooctanoate and Perfluorooctane Sulfonate Concentrations in Surface Water in Japan)(英語)	2004	Journal of Occupational Health(1341-9145)46巻1号 Page49- 59(2004.01), doi: 10.1539/joh.46.49	著者らは,日本全国における表層水のPerfluorooctanoate(PFOA)とperfluorooctane sulfonate(PFOS)濃度を固層抽出法を用いてLC/MS - で測定した.その結果,近畿地方のPFOAの幾何平均は他の地方の値に比べて有意に高い値であった(ANOVA p<0.01).淀川と神崎川の系統 的調査により2つの高濃度汚染地が見出された.PFOAについては公的下水処理場であり,PFOSでは空港であった.以上より,大阪地区では 無視できない量のPFOAが環境中に放出されていること,および人々は飲料水を通じて曝露を受けていることが明らかになった			В
D276	ばく露	井之上 浩一(星薬 科大学 薬品分析 化学教室)	21世紀のPCBとは? 有機フッ素系化合物のヒト汚染	2004	ファルマシア(0014-8601)40巻2号 Page162(2004.02), doi: 10.14894/faruawpsj.40.2_162	No abstract available			D
D277	バイオモ ニタリン グ	Thépaut, E; Dirven, H A A M; Haug, L S; Lindeman, B; Poothong, S; Andreassen, M; Hjertholm, H; Husøy, T	Per- and polyfluoroalkyl substances in serum and associations with food consumption and use of personal care products in the Norwegian biomonitoring study from the EU project EuroMix	2021	Environ Res. 2021 Apr;195:110795. doi: 10.1016/j.envres.2021.110795. Epub 2021 Jan 30.	BACKGROUND: Human exposure to chemicals through the oral, dermal, or inhalation routes is significant. To assess this exposure, a human biomonitoring study was conducted in Norway to examine the plausibility of source-to-dose calculations for chemical mixtures. Per- and polyfluoroalkyl substances (PFASs) are man-made compounds used for their surfactant properties, and several are persistent and bioaccumulative. Some PFASs are toxic and are regarded as endocrine disruptors and have been shown to suppress immune function and affect cholesterol homeostasis. Using the participants from the EuroMix BM study, we set out to describe PFAS concentrations and to evaluate associations with diet and use of personal care products (PCPs). METHODS: Participants (44 males and 100 females) kept detailed diaries on their food consumption and their PCP use for two non-consecutive days. All urine (24 h) and blood samples were collected at the end of each study day. Levels of 25 PFASs were analysed in serum from study day 1 using a high throughput online solid phase extraction ultra-high-performance liquid chromatography tandem mass spectrometry method. Multivariable linear regressions were performed between each food and PCP category and each chemical and were sex-stratified when the consumption of food or use of PCPs was significantly different between men and women. RESULTS: Eight PFASs were detected in all analysed samples (PFHxS, PFHpS, PFOS, PFOA, PFNA, PFDA, PFUnDA and PFDoDA), and four PFASs were below the limit of detection (PFOPA, PFDPA, PFDA, PFDA, PFDS and PFTrDA). Sunscreen, mouthwash, and lip gloss/lip balm were found to be positively associated with PFASs (PFOA, PFTrDA, and PFOSA). CONCLUSION: The participants in the EuroMix study were exposed to PFASs through their diet and PCP use. Several foods and PCPs were found to be potential sources of exposure to PFASs.			В
D278	バイオモ ニタリン グ	Dzierlenga, Michael W; Keast, Debra R; Longnecker, Matthew P	The concentration of several perfluoroalkyl acids in serum appears to be reduced by dietary fiber	2021	Environ Int. 2021 Jan;146:106292. doi: 10.1016/j.envint.2020.106292. Epub 2020 Dec 9.	Fiber-rich food intake has been associated with lower serum concentrations of perfluoroalkyl substances (PFAS) in some studies and dietary fiber was related to lower serum PFAS in a recent study. Given the previous epidemiologic data suggesting that fiber might decrease serum PFAS concentrations, we examined the relation of serum PFAS concentrations to intake of dietary fiber in National Health and Nutrition Examination Survey (NHANES) data. We examined the PFAS-fiber association among 6482 adults who participated in the NHANES, 2005-2016. Fiber intake was estimated based on two 24-hour diet recalls. We adjusted the models for determinants of PFAS and potentially confounding factors such as intake of foods reported to increase PFAS exposure. Results were expressed as the percent difference in PFAS concentration per interquartile range (IQR) increase in fiber (and 95 percent confidence interval), and the NHANES sampling parameters were used to make the results generalizable to the U.S. The adjusted percent difference in perfluorooctanoic acid (PFOA) per IQR increase in fiber was -3.64 (-6.15, -1.07); for perfluorooctane sulfonic acid (PFOS) was -6.69 (-9.57, -3.73), and for perfluorononanoic acid (PFNA) was -8.36 (-11.33, -5.29). These results suggest that dietary fiber increases the gastrointestinal excretion of PFOA, PFOS, and PFNA. Because fiber also lowers serum cholesterol, in some studies of the serum cholesterol-PFAS relationship confounding by fiber may be worth evaluating.			В
D279	バイオモ ニタリン グ	Jain, Ram B	Associations between concentrations of selected perfluoroalkyl acids and concentrations of blood cadmium, lead, and total mercury	2021	Environ Sci Pollut Res Int. 2021 Jun;28(21):26537-26544. doi: 10.1007/s11356-021-12493-w. Epub 2021 Jan 23.	Data (N = 2552) from National Health and Nutrition Examination Survey for US adults aged \geq 20 years for 2011-2016 were analyzed to estimate the associations between the concentrations of blood cadmium, lead, and total mercury and the concentrations of seven perfluoroalkyl acids (PFAA), namely, 2-(N-Methyl-perfluorooctane sulfonamido) acetic acid (MPAH), perfluorooctanoic acid (PFOA), perfluorononanoic acid (PFNA), perfluorodecanoic acid (PFDA), perfluoroundecanoic acid (PFUnDA), perfluorohexane sulfonic acid (PFHxS), and perfluorooctane sulfonic acid (PFOS). Concentrations of blood cadmium were negatively associated with the concentrations of PFHxS (β = - 0.05428, p < 0.01) and PFOS (β = - 0.0212, p = 0.02). Concentrations of blood lead were positively associated with the concentrations of MPAH (β = 0.03301, p < 0.01), PFOA (β = 0.04783, p = 0.01), PFNA (β = 0.11761, p < 0.01), PFDA (β = 0.08007, p < 0.01), PFUA (β = 0.11382, p < 0.01), and PFOS (β = 0.04996, p = 0.02). Percent increases in the concentration of blood lead were 0.32%, 0.46%, 1.13%, 0.77%, 1.09%, and 0.48% for 10% increases in the concentrations of MPAH, PFOA, PFNA, PFDA, PFUA, and PFOS, respectively. Concentrations of blood total mercury were positively associated with the concentrations of PFNA (β = 0.37105, p < 0.01), PFDA (β = 0.46875, p < 0.01), PFUA (β = 0.56934, p < 0.01), and PFOS (β = 0.17557, p < 0.01). Percent increases in the concentration of blood total mercury were 3.6%, 4.57%, 5.58%, and 1.69% for 10% increases in the concentrations of PFNA, PFDA, PFDA, PFUA, and PFOS, respectively. Associations between the concentrations of PFAAs with blood total mercury were substantially stronger than the concentrations with blood lead. Higher the carbon chain length for PFAAs, stronger were the associations between PFAAs with lead and mercury.			В

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン文 ン文 ク献 ① ラ ② ラ
D280	バイオモ ニタリン グ	Aker, Amira; Ayotte, Pierre; Caron-Beaudoin, Élyse; De Silva, Amila; Ricard, Sylvie; Lemire, M élanie	Associations between dietary profiles and perfluoroalkyl acids in Inuit youth and adults	2022	Sci Total Environ. 2022 Oct 20;857(Pt 3):159557. doi: 10.1016/j.scitotenv.2022.159557. Online ahead of print.	BACKGROUND: Perfluoroalkyl acids (PFAAs), a subset of perfluoroalkyl substances (PFAS), are synthetic chemicals used in industrial and consumer applications. They are exceptionally stable and highly mobile in the environment, and were detected in high concentrations in Arctic wildlife and Nunavik Inuit. The study's objective was to study the association between dietary profiles in Nunavik and plasma PFAAs concentrations. METHODS: The study used data from the Qanuilirpitaa? 2017 Nunavik Inuit Health Survey (Q2017) (N = 1172) on Inuit adults aged 16-80 years. Nine PFAAs congeners were measured in plasma samples (six were detected). Dietary profiles were identified using latent profile analysis. Two sets of dietary profiles were included; the first included market (store-bought) and country foods (harvested/hunted from the land), and the second included only country foods. Multiple linear regression models regressed log-transformed PFAAs concentrations against the dietary profiles, adjusting for sociodemographic variables. RESULTS: We identified statistically significant 24.54-57.55 % increases in all PFAAs congeners (PFOA, PFNA, PFDA, PFUnDA, PFHxS, and PFOS) in the dietary profile defined by frequent country food consumption compared to the dietary profile defined by frequent market food consumption. Individuals defined by low consumption of foods (related to food insecurity) had higher concentrations of six PFAAs compared to individuals with frequent market food consumption. The associations were stronger with profiles defined by more frequent country food consumption, and particularly those with increased marine mammal consumption. PFDA, PFUnDA, and PFOS were particularly associated with high country food consumption of any country foods. CONCLUSIONS: Increased country food consumption was strongly associated with higher PFAAs concentrations, particularly PFOS, PFDA, and PFUnDA. The results provide further evidence that the quality of country foods is being threatened by PFAAs contamination. Additional nationa			В
D281	バイオモ ニタリン グ	Zhao, Xiang; Lin, Ji-Yan; Dong, Wen-Wei; Tang, Meng-Ling; Yan, Shi-Gui	Per- and polyfluoroalkyl substances exposure and bone mineral density in the U.S. population from NHANES 2005-2014	2022	J Expo Sci Environ Epidemiol. 2022 Jun 24. doi: 10.1038/s41370-022-00452-7. Online ahead of print.	BACKGROUND: Environmental exposures such as perfluoroalkyl substances (PFASs) were considered potential risks for bone mineral density (BMD). OBJECTIVE: To examine the associations between PFASs and BMD among the U.S. METHODS: This study included a total of 6416 participants from the National Health and Nutrition Examination Survey (NHANES 2005-2014). Multiple linear regression models were used to analyze the associations between serum PFASs and BMD and the coefficient β with 95% confidence intervals (95% CI) was calculated as the effect estimate. Covariates such as age, race, BMI, smoking, alcohol intake, milk intake, and physical activity were adjusted in these models. Additionally, gender and menopausal period were considered in further subgroup analyses. RESULTS: Based on the combined data of NHANES 2005-2014, the effects from exposure to PFASs on BMD were found with gender and menopausal status differences. Positive associations were found in PFOA (β = 0.010; 95% CI: 0.003, 0.016), PFHxS (β = 0.007; 95% CI: 0.003, 0.012), and PFNA (β = 0.001; 95% CI: 0.001, 0.017) in total population. Negative associations for PFOA (β = -0.020; 95% CI: -0.029, -0.012), PFOS (β = -0.011; 95% CI: -0.028, -0.011), PFHxS (β = -0.019; 95% CI: -0.025, -0.013), PFDE (β = -0.010; 95% CI: -0.016, -0.005), and PFNA (β = -0.011; 95% CI: -0.021, -0.002) were found in women, while no significant association was found in men. In further subgroup analyses, women in pre-menopause status showed consistent negative associations. SIGNIFICANCE: PFASs exposure may be associated with BMD and gender and menopausal status confound the associations.			В
D282	バイオモ ニタリン グ	Richterová, D; Govarts, E; Fá belová, L; Rausová, K; Rodriguez Martin, L; Gilles, L; Remy, S; Colles, A; Rambaud, L; Riou, M; Gabriel, C; Sarigiannis, D; Pedraza-Diaz, S; Ramos, J J; Kosjek, T; Snoj Tratnik, J; Lignell, S; Gyllenhammar, I; Thomsen, C; Haug, L S; Kolossa-Gehring, M; Vogel, N; Franken, C;	PFAS levels and determinants of variability in exposure in European teenagers - Results from the HBM4EU aligned studies (2014-2021)	2022	Int J Hyg Environ Health. 2022 Oct 31;247:114057. doi: 10.1016/j.ijheh.2022.114057. Online ahead of print.	BACKGROUND: Perfluoroalkyl substances (PFAS) are man-made fluorinated chemicals, widely used in various types of consumer products, resulting in their omnipresence in human populations. The aim of this study was to describe current PFAS levels in European teenagers and to investigate the determinants of serum/plasma concentrations in this specific age group. METHODS: PFAS concentrations were determined in serum or plasma samples from 1957 teenagers (12-18 years) from 9 European countries as part of the HBM4EU aligned studies (2014-2021). Questionnaire data were post-harmonized by each study and quality checked centrally. Only PFAS with an overall quantification frequency of at least 60% (PFOS, PFOA, PFHXS and PFNA) were included in the analyses. Sociodemographic and lifestyle factors were analysed together with food consumption frequencies to identify determinants of PFAS exposure. The variables study, sex and the highest educational level of household were included as fixed factors in the multivariable linear regression models for all PFAS and each dietary variable was added to the fixed model one by one and for each PFAS separately. RESULTS: The European exposure values for PFAS were reported as geometric means with 95% confidence intervals (CI): PFOS [2.13 μ g/L (1.63-2.78)], PFOA ([0.97 μ g/L (0.75-1.26)]), PFNA [0.30 μ g/L (0.19-0.45)] and PFHxS [0.41 μ g/L (0.33-0.52)]. The estimated geometric mean exposure levels were significantly higher in the North and West versus the South and East of Europe. Boys had significantly higher concentrations of the four PFAS compared to girls and significantly higher PFASs concentrations were found in teenagers from households with a higher education level. Consumption of seafood and fish at least 2 times per week was significantly associated with 21% (95% CI: 2-31%) increase in PFOS concentrations and 20% (95% CI: 10-31%) increase in PFNA concentrations as compared to less frequent consumption of seafood and fish. The same trend was observed for PFOA and PFHxS but n			В

別添-2 文献データベース文献リスト

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨 (原文)	備考	出 情 対 報 象 抽	ン 文 ン 文 ク 献 ク 献 ① ラ ② ラ
D283	バイオモ ニタリン グ	Burgess, Jefferey L; Fisher, Julia M; Nematollahi, Amy; Jung, Alesia M; Calkins, Miriam M; Graber, Judith M; Grant, Casey C; Beitel, Shawn C; Littau, Sally R; Gulotta, John J; Wallentine, Darin D; Hughes, R Jeffrey; Popp, Charles; Calafat, Antonia M; Botelho, Julianne C; Coleman, Alissa D; Schaefer-Solle, Natasha; Louzado-	Serum per- and polyfluoroalkyl substance concentrations in four municipal US fire departments	2022	Am J Ind Med. 2022 Jul 21. doi: 10.1002/ajim.23413. Online ahead of print.	BACKGROUND: Firefighters have occupational and environmental exposures to per- and polyfluoroalkyl substances (PFAS). The goal of this study was to compare serum PFAS concentrations across multiple United States fire departments to National Health and Nutrition Examination Survey (NHANES) participants. METHODS: Nine serum PFAS were compared in 290 firefighters from four municipal fire departments (coded A-D) and three NHANES participants matched to each firefighter on sex, ethnicity, age, and PFAS collection year. Only Departments A and C had sufficient women study participants (25 and six, respectively) to compare with NHANES. RESULTS: In male firefighters compared with NHANES, geometric mean perfluorohexane sulfonate (PFHxS) was elevated in Departments A-C, sum of branched perfluoromethylheptane sulfonate isomers (Sm-PFOS) was elevated in all four departments, linear perfluoroctane sulfonate (n-PFOS) was elevated in Departments B and C, linear perfluoroctane (n-PFOA) was elevated in Departments B-D, and perfluorononanoate (PFNA) was elevated in Departments B-D, but lower in A. In male firefighters compared with NHANES, perfluoroundecanoate (PFUnDA) was more frequently detected in Departments B-D. In female firefighters compared with NHANES, perflus and Sm-PFOS concentrations were elevated in Departments A and C. Other PFAS concentrations were elevated and/or reduced in only one department or not significantly different from NHANES in any department. CONCLUSIONS: Serum PFAS, Sm-PFOS, n-PFOA, and PFNA concentrations were increased in at least two of four fire departments in comparison to NHANES.			В
D284	バイオモ ニタリン グ	Jain, Ram B; Ducatman, Alan	Associations of serum perfluoroalkyl substances with concentrations of blood manganese and selenium	2022	Environ Sci Pollut Res Int. 2022 Jul 21. doi: 10.1007/s11356- 022-22089-7. Online ahead of print.	The aim of this study was to estimate the associations of blood manganese and selenium with serum concentrations of selected perfluoroalkyl substances (PFAS). The presence or absence of this association is important because PFAS have documented pro- oxidant properties, whereas manganese and selenium are critical to antioxidant responses. For this purpose, the data from NHANES for US adults aged ≥ 20 years (N = 3982), adolescents aged 12-19 years (N = 1524), and children aged 3-11 years (N = 639) were analyzed. Among adults, concentrations of blood manganese were found to be inversely associated with serum concentrations of perfluorooctanoic acid or PFOA (β = - 0.04204, p < 0.01), perfluorononanoic acid or PFNA (β = - 0.02700, p < 0.01), perfluorohexane sulfonate or PFHxS (β = - 0.04306, p < 0.01), and perfluorooctane sulfonate or PFOS (β = - 0.04494, p < 0.01). Blood concentrations of selenium were found to be positively associated with PFHxS only among adults (β = 0.000678, p = 0.047) and adolescents (β = 0.01377, p = 0.02). The Mn results but not the less consistent Se associations were robust to adjustments for serum albumin. Possible reasons for the inverse association of PFOA, PFHxS, PFNA, and PFOS with Mn among US adults are discussed. The finding raises concerns about manganese's diminished ability to mount antioxidant responses to PFAS exposure.			В
D285	バイオモ ニタリン グ	Han, Feng; Wang, Yuxin; Li, Jingguang; Lyu, Bing; Liu, Jiaying; Zhang, Jian; Zhao, Yunfeng; Wu, Yongning	Occurrences of legacy and emerging per- and polyfluoroalkyl substances in human milk in China: Results of the third National Human Milk Survey (2017-2020)	2023	J Hazard Mater. 2023 Feb 5;443(Pt A):130163. doi: 10.1016/j.jhazmat.2022.130163. Epub 2022 Oct 12.	Per- and polyfluoroalkyl substances (PFAS) are persistent organic pollutants widely contaminated and exposed in humans. China is a major manufacturer and consumer of these chemicals. To characterize the occurrences, geographical variations, temporal trends, and exposure risks of legacy and emerging PFAS in perinatal women and their children in China, 30 PFAS were measured in 100 pooled human milk samples consisting of 3531 individual samples collected from 100 sites in 24 provinces during the 2017-2020 National Human Milk Survey. Linear-perfluorooctanoic acid (L-PFOA, 151 pg/mL) and linear-perfluorooctane sulfonate (L-PFOS, 57.0 pg/mL) were the predominant PFAS in human milk, followed by 6:2 chlorinated polyfluorinated ether sulfonate (6:2 Cl-PFESA, 25.9 pg/mL). The geographic variation trend of PFOA was different from PFOS and Cl-PFESA, and a special geographic trend of perfluoropentanesulfonate (PFPeS) was observed. Comparison of National Human Milk surveys from different periods showed a sharp decrease of PFAS exposure in old industrial areas including Shanghai and Liaoning, but higher PFAS exposure observed in Shandong and Hubei indicated a possible domestic shift of PFAS manufacture to these areas. Worldwide comparison of PFAS in human milk indicated high PFOA exposure in China. Risk assessments for mothers and breastfeeding infants showed that PFAS exposure is of concern in China.			В

No.	分野 (参考)	著者	タイトル

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 村 報 掛	ン 文 ン 文 ク 献 ク 献 ① ラ ② ラ
D286	バイオモ ニタリン グ	Jain, Ram B; Ducatman, Alan	Serum concentrations of selected perfluoroalkyl substances for US females compared to males as they age	2022	Sci Total Environ. 2022 Oct 10;842:156891. doi: 10.1016/j.scitotenv.2022.156891. Epub 2022 Jun 23.	Gender-age specific linear statistical models were fitted to analyze gender-based differences in serum concentrations of PFOA, PFNA, PFHxS, and PFOS for US adults and adolescents (N = 17,932) and children age < 12 years (N = 637) using nationally representative data for US for 2003-2018. Around the age of about 11-12 years for PFOS, PFNA, and PFNA, and around 15 years for PFOA, females begin to have reliably lower serum PFAS than males. This divergence is maximized around the ages of about 35 to 40 years for the alkylate compounds PFOA and PFNA, and from around 24-52 years for the sulfonate compounds PFOS and PFHxS. For example, for PFOS, gender divergence was 1.15 ng/mL at age 15, compared to 5.6 ng/mL at the age of 37 years. Uniquely, PFOS remained lower in females in most years after age 56, a contrast to the convergence in other PFAS studied. For males, increasing patterns were followed by somewhat decreasing patterns of concentration for most PFAS, the reverse was observed for females. The findings have implications for study design. Based on the results provided in detailed tables and figures for this study, we recommend separate analyses of male and female data. In addition, female serum concentration data should be considered for stratified analysis for pre- and post-menopausal time periods. From a mechanistic perspective, the data add support to existing questions about influences on gender differences in serum PFAS that may be attributed to causes other than menstruation, pregnancy, and lactation. These are amenable to further study.			В
D287	バイオモ ニタリン グ	Petriello, Michael C; Mottaleb, M Abdul; Serio, Tara C; Balyan, Bharat; Cave, Matthew C; Pavuk, Marian; Birnbaum, Linda S; Morris, Andrew J	Serum concentrations of legacy and emerging per- and polyfluoroalkyl substances in the Anniston Community Health Surveys (ACHS I and ACHS II)	2022	, Environ Int. 2022 Jan;158:106907. doi: 10.1016/j.envint.2021.106907. Epub 2021 Nov 8.	BACKGROUND: Residents of Anniston Alabama were highly exposed to polychlorinated biphenyls (PCBs) due to longstanding manufacturing in the area. The Anniston Community Health Surveys (ACHS I-2005-2007 and II, 2014) have linked these exposures with a variety of deletereous health outcomes. In addition to PCBs, these individuals were likely simultaneously exposed to other persistent organic pollutants including per and polyfluoroalkyl substances (PFAS), which are an emerging class of ubiquitous industrial chemicals that are measurable in the blood of most individuals and have themselves been linked increased risk of some non communicable diseases. METHODS: To characterize PFAS exposures in ACHS I and ACHS II, we measured eight environmentally significant PFAS in serum by UPLC coupled electrospray ionization tandem mass spectrometry. Perfluoroctane sulfonate (PFOS), Perfluoroctancic acid (PFOA), Perfluorononanoate (PFNA), Perfluorohexane sulfonate (PFHxS), Perfluorobetanoic acid (PFDA), Perfluorononanoate (PFNA), Perfluorohexane sulfonate (PFHxS), Perfluorobetanoic acid (4.2 FTS) were extracted from matched serum samples of individuals who participated in the original ACHS I (2005-2007; n = 297) and the follow up ACHS II (2014; n = 336). Data were collected in negative multiple reaction monitoring (MRM) mode with monitoring of quantitation and qualifier ions for all target PFAS analytes, surrogates and internal standards. VARCLUS procedure was used to create hierarchical clusters between PFAS and other legacy persistent organic pollutants which may share similar exposure routes. RESULTS: Overall, circulating PFAS levels decreased approximately 50% from ACHS I subjects than in conpemporaneous NHANES subjects (2005-2006; ACHS I mean: 71.1 ng/ml; NHANES mean: 20.2 ng/mL), and this relationship persisted in ACHS II subjects (2014; ACHS II mean: 34.7 ng/ml; NHANES mean: 20.2 ng/mL). and this relationship persisted in ACHS II subjects in comparision to NHANES whereas levels of PFOA and PFHx were lower than in NHANES. Fi			В
D288	バイオモ ニタリン グ	Onteeru, Manu; Barnes, Lauren E; O'Connell, Kelli; Bhimani, Jenna; Du, Mengmeng; Romano, Megan E; Kantor, Elizabeth D	Association between fish oil supplements use and serum per- and polyfluoroalkyl substances (PFAS): Results from the National Health and Nutrition Examination Survey	2022	Environ Res. 2022 Dec;215(Pt 1):114205. doi: 10.1016/j.envres.2022.114205. Epub 2022 Aug 30.	BACKGROUND: Per- and polyfluoroalkyl substances (PFAS) are widespread pollutants and classified as potentially carcinogenic to humans. Although consumption of fish, seafood, and their byproducts is a known source of dietary PFAS exposure, little is known about the association between use of fish oil supplements and PFAS. Here, we examine associations between fish oil supplement use and serum PFAS concentrations. METHODS: This analysis includes adults, ages 25 years of age and older, surveyed as part of the National Health and Nutrition Examinations Survey (NHANES). Outcomes include five serum PFAS compounds: perfluorooctane sulfonic acid (PFOS), perfluorooctanoic acid (PFOA), perfluorononanoic acid (PFNA), perfluorohexane sulphonic acid (PFHXS) and perfluorodecanoic acid (PFOA). To determine the association between fish oil use and log-transformed PFAS concentrations, survey-weighted linear regression was used to estimate multivariate-adjusted ratios between fish oil use and PFAS. While results did not vary substantially by age, gender, study cycle, there was some indication of a potential inverse association in subgroups of interest. Specifically, an inverse association was observed between fish oil and PFOS levels in older adults, females, and in early calendar years; an inverse association was also observed between fish oil and PFNA in females and early calendar years. CONCLUSIONS: While fish oil users did not experience increased serum PFAS, there was an unexpected inverse association in subgroups. Further research will be needed to better understand whether this pattern reflects true differences, chance, or bias.			В

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No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	 出情 ン文 ン文 対報 ク献 ク献 ク献 象抽 ① ラ ② ラ
D289	バイオモ ニタリン グ	Wang, Yuxin; Gao, Xueyan; Liu, Jiaying; Lyu, Bing; Li, Jingguang; Zhao, Yunfeng; Wu, Yongning	Exposure to Emerging and Legacy Polyfluoroalkyl Substances in the Sixth Total Diet Study - China, 2016-2019	2022	China CDC Wkly. 2022 Mar 4;4(9):168-171. doi: 10.46234/ccdcw2022.042.	WHAT IS ALREADY KNOWN ABOUT THIS TOPIC? Perfluoroalkyl substances (PFASs) are persistent organic pollutants, which have multi-organ toxicity and potential health risk to humans. WHAT IS ADDED BY THIS REPORT? The most commonly detected PFASs in the Sixth China Total Diet Study (TDS) samples were perfluorooctanesulfonate (PFOS), perfluorooctanoic acid (PFOA), perfluoroundecanoic acid (PFUdA), perfluorodecanoic acid (PFDA), perfluorononanoic acid (PFNA), and 9-chlorohexadecafluoro- 3-oxanonane-1-sulfonate (6:2 CI-PFESA). The mean estimated weekly intakes (EWIs) of PFOA, PFOS, and 6:2 CI-PFESA in the Sixth TDS were 2.17, 2.72, and 2.75 ng/kg body weight per week, respectively. WHAT ARE THE IMPLICATIONS FOR PUBLIC HEALTH PRACTICE? The PFASs levels in some food category and dietary exposure still need to be continuously monitored, especially for 6:2 CI-PFESA.		В
D290	バイオモ ニタリン グ	Nyström, Jennifer; Benskin, Jonathan P; Plassmann, Merle; Sandblom, Oskar; Glynn, Anders; Lampa, Erik; Gyllenhammar, Irina; Lignell, Sanna; Moraeus, Lotta	Healthy eating index and diet diversity score as determinants of serum perfluoroalkyl acid (PFAA) concentrations in a national survey of Swedish adolescents	2022	Environ Res. 2022 Sep;212(Pt A):113170. doi: 10.1016/j.envres.2022.113170. Epub 2022 Mar 24.	Food is an important source of perfluoroalkyl acid (PFAA) exposure for the general adult population, but few data exist for adolescents. Healthy food habits established during adolescence may positively influence health later in life. Associations between serum PFAA concentrations and a healthy eating index (SHEIA15), as well as a diet diversity score (RADDS), were determined in a nationally representative adolescent population from Sweden (Riksmaten Adolescents 2016-2017, RMA). Using consumption data from food registrations and frequency questionnaires, we additionally analyzed associations with commonly consumed food groups. Associations were analyzed by fitting a cumulative probability model using ordinal regression. Among the seven PFAAs detected in ≥70% of the 1098 participants (age 10-21 years), median concentrations ranged from <1 ng/g serum of perfluorononanoic acid (PFNA), perfluorodecanoic acid (PFDA), perflurorundecanoic acid (PFOD), linear (lin-) perfluorohexanesulfonic acid (PFHxS) and branched (br-) perfluorooctanesulfonic acid (PFOS) to 1-2 ng/g serum of lin- perfluoroctanoic acid (PFOA) and lin-PFOS. PFNA, PFDA, PFUnDA and lin-PFOS concentrations were positively associated with both SHEIA15 and RADDS, a finding most likely driven by higher consumption of seafood. PFDA, PFUnDA and lin-PFOS concentrations were positively related to commonly consumed fish/shellfish groups, such as lean marine fish and shellfish. Inverse associations between PFAA concentrations and dairy consumption suggest an underlying factor behind dairy consumption that similarly affects adolescent exposure to the different PFAAs. Isomeric differences in dietary exposure between lin-PFOS and br-PFOS were suggested, as br-PFOS concentrations, in contrast to lin-PFOS, were not associated with SHEIA15, RADDS and consumption of different food groups. We conclude that Swedish adolescents, adhering to a diverse and healthy diet, appears to be more highly exposed to legacy PFAAs than those eating less healthy. Additional research is n		в
D291	バイオモ ニタリン グ	Bil, Wieneke; Zeilmaker, Marco J; Bokkers, Bas G H	Internal Relative Potency Factors for the Risk Assessment of Mixtures of Per- and Polyfluoroalkyl Substances (PFAS) in Human Biomonitoring	2022	Environ Health Perspect. 2022 Jul;130(7):77005. doi: 10.1289/EHP10009. Epub 2022 Jul 26.	substances (PFAS). Because the toxicokinetics of a substance (determining the steady-state blood concentration) may affect the toxic potency, the difference in toxicokinetics among PFAS has to be accounted for when blood concentrations are used in mixture risk assessment. OBJECTIVES: This research focuses on deriving relative potency factors (RPFs) at the blood serum level. These RPFs can be applied to PFAS concentrations in human blood, thereby facilitating mixture risk assessment with primary input from human biomonitoring studies. METHODS: Toxicokinetic models are generated for 10 PFAS to estimate the internal exposure in the male rat at the blood serum level over time. By applying dose-response modeling, these internal exposures are used to derive quantitative internal RPFs based on liver effects. RESULTS: Internal RPFs were successfully obtained for nine PFAS. Perfluorobutanoic acid (PFBA), perfluorohexanoic acid (PFHxA), perfluorononanoic acid (PFNA), perfluorododecanoic acid (PFDoDA), perfluoroctane sulfonic acid (PFOS), and hexafluoropropylene oxide-dimer acid (HFPO-DA, or GenX) were found to be more potent than perfluoroctanoic acid (PFOA) at the blood serum level in terms of relative liver weight increase, whereas perfluorobutane sulfonic acid (PFBS) and perfluorohexane sulfonic acid (PFHxS) were found to be less potent. The practical implementation of these internal RPFs is illustrated using the National Health and Nutrition Examination Survey (NHANES) biomonitoring data of 2017-2018. DISCUSSION: It is recommended to assess the health risk resulting from exposure to PFAS as combined, aggregate exposure to the extent feasible.		В
D292	バイオモ ニタリン グ	Kirk, Andrea B; Plasse, Kelsey Marie; Kirk, Karli C; Martin, Clyde F; Ozsoy, Gamze	Predicting Exposure to Perfluorinated Alkyl Substances (PFAS) among US Infants	2022	Int J Environ Res Public Health. 2022 Jul 9;19(14):8402. doi: 10.3390/ijerph19148402.	PFASs have been detected in nearly every serum sample collected over the last two decades from US adults as part of the National Health and Nutrition Examination Survey (NHANES) and are commonly found in other data sets from around the world. However, less is known about infant PFAS exposures, primarily because the collection of infant serum samples is less common and frequently avoided. Cord blood samples are often preferred for chemical exposure assessments because this is thought to provide a good representation of infant serum concentrations, at least at the time of birth. In this paper, we will provide a statistical and probabilistic analysis of what can be expected for infants living in the US using NHANES from 2007 to 2008, which contains a rare subset of infant data. Regulatory efforts that require estimation of exposures among the very youth can be challenging, both because of a lack of data in general and because variability among this most vulnerable population can be uncertain. We report that US infant exposures are extremely common and that serum concentrations remain fairly constant, despite infant growth rates and relatively high caloric and fluid intake, with the possible exception of PFOS. Infant serum PFOS concentrations between months 1 and 3 are consistently higher than at less than one month, even though healthy infants at 1 and 2 months weigh more than they did at birth. This suggests that the babies are exposed to greater concentrations of PFOS after birth or that excretion kinetics differ for this PFAS.		В

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D293	バイオモ ニタリン グ	Pollock, Tyler; Karthikeyan, Subramanian; Walker, Mike; Werry, Kate; St- Amand, Annie	Trends in environmental chemical concentrations in the Canadian population: Biomonitoring data from the Canadian Health Measures Survey 2007-2017	2021	Environ Int. 2021 Oct;155:106678. doi: 10.1016/j.envint.2021.106678. Epub 2021 Jun 9.	Ten years of nationally representative biomonitoring data collected between 2007 and 2017 are available from the Canadian Health Measures Survey (CHMS). These data establish baseline environmental chemical concentrations in the general population. Here we sought to evaluate temporal trends in environmental chemical exposures in the Canadian population by quantifying changes in biomarker concentrations measured in the first five two-year cycles of the CHMS. We identified 39 chemicals that were measured in blood or urine in at least three cycles and had detection rates over 50% in the Canadian population. We calculated geometric mean concentrations for each cycle using the survey weights provided. We then conducted analyses of variance to test for linear trends over all cycles. We also calculated the percent difference in geometric means between the first and most recent cycle measured. Of the 39 chemicals from diverse chemical groups, including metals and trace elements, phenols and parabens, organophosphate pesticides, per- and polyfluoroalkyl substances, and plasticizers. Significant reductions in chemical concentrations included di-2-ethylhexyl phthalate (DEHP; 75% decrease), perfluorooctane sulfate (PFOS; 61% decrease), perfluorooctanoic acid (PFOA; 58% decrease), dimethylphosphate (DMP; 40% decrease), lead (33% decrease), and bisphenol A (BPA; 32% decrease). Trends were increasing for two pyrethroid pesticide metabolites, including a 110% increase between 2007 and 2017 for 3-phenoxybenzoic acid (3-PBA). No significant trends were observed for the remaining 18 chemicals that included arsenic, mercury, fluoride, acrylamide, volatile organic compounds, and polycyclic aromatic hydrocarbons. National biomonitoring data indicate that concentrations, and therefore exposures, have decreased for many priority chemicals in the Canadian population. Concentrations for other chemical groups have not changed or have increased, although average concentrations remain below thresholds of concern derived from human exposure			В
D294	バイオモ ニタリン グ	Rawn, Dorothea F K; Dufresne, Guy; Clément, Geneviève; Fraser, William D; Arbuckle, Tye E	Perfluorinated alkyl substances in Canadian human milk as part of the Maternal-Infant Research on Environmental Chemicals (MIREC) study	2022	Sci Total Environ. 2022 Jul 20;831:154888. doi: 10.1016/j.scitotenv.2022.154888. Epub 2022 Mar 30.	Perfluorinated alkyl substances (PFAS) were determined in human milk samples (n = 664) from participants in the Maternal- Infant Research on Environmental Chemicals (MIREC) study. Σ PFAS concentrations (sum of seven PFAS) ranged from 3.1 ng L(- 1) to 603 ng L(-1), with a median concentration of 106 ng L(-1) in the Canadian mothers' milk analyzed. These data comprise the first pan-Canadian dataset of PFAS in human milk. Perfluorooctanoic acid (PFOA) and linear perfluorooctanesulfonate (L-PFOS) were the dominant contributors to Σ PFAS in human milk samples. An inverse relationship between Σ PFAS concentrations and age was observed (Spearman correlation - 0.184). Primiparous women had elevated PFAS concentrations in milk relative to women who had children previously (p < 0.001). In contrast, the region of maternal birth did not influence Σ PFAS concentrations (p = 0.156). Although China and Norway have observed consistently detectable levels of perfluoroundecanoic acid (PFUdA) in human milk, PFAS with long carbon chains (n ≥ 11) were not present above method detection limits in Canadian human milk samples analyzed as part of the MIREC study. In conclusion, despite the presence of low levels of environmental contaminants in human milk, Health Canada supports breastfeeding due to the benefits to both infants and mothers.			В
D295	バイオモ ニタリン グ	G. Schoeters, V.J. Verheyen, A. Colles, S. Remy, L. Rodriguez Martin, E. Govarts, V. Nelen, E. Den Hond, A. De Decker, C. Franken, I. Loots, D. Coertjens, B. Morren, M. Bastiaensen, C. Gys, G. Malarvannan, A. Covaci, T. Nawrot, S. De Henauw, M. Bellemans, L. Bruckers	Internal exposure of Flemish teenagers to environmental pollutants: Results of the Flemish Environment and Health Study 2016-2020 (FLEHS IV)	2022	Int J Hyg Environ Health. 2022 May;242:113972. doi: 10.1016/j.ijheh.2022.113972. Epub 2022 Apr 19.	The Flemish Environment and Health Study (FLEHS) collects information on internal exposure to a broad range of environmental chemicals in the general population in Flanders, the Northern region of Belgium. The aim is to establish biomonitoring exposure distributions for the general population in support of public health and environmental policy, environmental risk assessment and risk management decisions. In 2017-2018, urine and blood samples were collected from 428 teenagers by a stratified clustered two stage randomized design. Samples were analyzed for a broad range of biomarkers related to exposure to chlorinated and newer pesticides, brominated and organophosphate flame retardants (BFR/OPFR), polychlorinated biphenyls (PCBs), bisphenols, phthalates and alternative plasticizers, per-and polyfluoroalkyl substances (PFAS), polycyclic aromatic hydrocarbons (PAHs), benzene, metals and trace elements. The geometric mean levels and percentiles of the distribution were estimated for each biomarker, for the whole study population and following stratification for sex, the household educational attainment and the residence area's urbanicity. Geometric means of biomarkers of lead, dichlorodiphenyltrichloroethane (DDT), PCBs, PAHs, regulated phthalates and bisphenol A (BPA) were lower than in the previous FLEHS cycles. Most biomarker levels were below health-based guidance values (HB-GVs). However, HB-GVs of urinary arsenic, blood lead, blood cadmium, sum of serum perfluorooctane sulfonate (PFOS) and perfluoro-1-hexanesulfonate (PFHxS) and the urinary pyrethroid metabolite (3-PBA) were exceeded in respectively 25%, 12%, 39.5%, 10% and 22% of the teenagers. These results suggest that the levels of exposure in the Flemish population to some environmental chemicals might be of concern. At the same time, we noticed that biomarkers for BPA substitutes, metabolites of OPFRs, an expanded list of PFAS, glyphosate and its metabolite could be measured in substantial proportions of participants. Interpretation of these levels in			В

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D296	バイオモ ニタリン グ	Fillol, Clémence; Oleko, Amivi; Saoudi, Abdesattar; Zeghnoun, Abdelkrim; Balicco, Alexis; Gane, Jessica; Rambaud, Loïc; Leblanc, Alain; Gaudreau, Éric; Marchand, Philippe; Le Bizec, Bruno; Bouchart, Valé rie; Le Gléau, Florent; Durand, Gaël; Denys, Sé bastien	Exposure of the French population to bisphenols, phthalates, parabens, glycol ethers, brominated flame retardants, and perfluorinated compounds in 2014- 2016: Results from the Esteban study	2021	Environ Int. 2021 Feb;147:106340. doi: 10.1016/j.envint.2020.106340. Epub 2021 Jan 12.	BACKGROUND: As part of the French Human Biomonitoring (HBM) programme, the Esteban study described, among other things, biomarkers levels of various chemicals in adults (18-74 years old) and children (6-17 years old). This paper describes the design of the study and provides, for the first time, data on the biological exposure of the general French population to a wide range of contaminants posing a threat to human health which are currently found in domestic environments. METHODS: Esteban is a cross-sectional study conducted on a nationwide sample of the French general population. Exposure biomarkers of six families of contaminants deemed detrimental to adults' and children's health were measured in biological samples collected either at participants' homes by a nurse, or brought to a National Health Insurance examination centre. All participants were randomly selected (2503 adults and 1104 children). The geometric mean and percentiles of the distribution of levels were estimated for each biomarker. Most of the descriptive statistical analyses were performed taking into account the sampling design. RESULTS: Results provided a nationwide description of biomarker levels. Bisphenols (A, S and F), and some metabolites of phthalates and perfluorinated compounds (PFCs) (specifically, PFOS and PFOA) were quantified in almost all the biological samples analysed. Higher levels were observed in children (except for PFCs). Levels were coherent with international studies, except for bisphenols S and F, brominated flame retardants (BFRs) and parabens (with higher levels reported in the USA than in France). CONCLUSION AND PERSPECTIVES: This study is the first to provide a representative assessment of biological exposure to domestic contaminants at the French population level. Our results show that the French general population was exposed to a wide variety of pollutants in 2014-2016, and identify the determinants of exposure. These findings will be useful to stakeholders who wish to advocate an overall reduc		В
D297	バイオモ ニタリン グ	Wattigney, Wendy A; Savadatti, Sanghamitra S; Liu, Ming; Pavuk, Marian; Lewis- Michl, Elizabeth; Kannan, Kurunthachalam; Wang, Wei; Spliethoff, Henry; Marquez-Bravo, Lydia; Hwang, Syni-An	Biomonitoring of per- and polyfluoroalkyl substances in minority angler communities in central New York State	2022	Environ Res. 2022 Mar;204(Pt C):112309. doi: 10.1016/j.envres.2021.112309. Epub 2021 Oct 30.	Onondaga Lake in central New York State was listed as a Superfund site in 1994 due to industrial disposal of pollutants. A biomonitoring program was conducted to assess exposure to over 70 legacy contaminants and contaminants of emerging concern in populations disproportionately at risk for exposure residing near Onondaga Lake and to educate these communities on how to reduce exposures. The populations of focus were refugees from Burma and Bhutan and low-income, primarily African American, anglers (urban anglers). These communities consume locally caught fish for economic as well as cultural reasons and therefore may be at higher risk of exposure. This study focuses on assessment of exposure to per- and polyfluoroalkyl substances (PFAS) and associations with local fish consumption. Using respondent driven sampling, 311 refugees and 89 urban anglers were enrolled in the study. Following informed consent, study participants provided blood and urine specimens and completed a questionnaire. Percentiles of locally caught fish meals in the past 12 months by race/ethnicity groups showed that the Burmese participants of Karen ethnicity were the highest consumers, with a median of 135 meals compared to 103 meals for the other Burmese participants, 70 meals for the urban anglers, and 44 meals for the Butanese participants. Compared to the National Health and Nutrition Examination Survey (NHANES) 2015-16 sample of the general U.S. population, the Karen participants had markedly elevated perfluorooctane sulfonic acid (PFOS) and perfluordecancic acid (PFDA) levels with median serum concentrations 9.5 times greater (41.6 ng/mL vs. 4.4 ng/mL) and 26.9 times greater (2.69 ng/mL vs. 0.10 ng/mL), respectively; the other Burmese participants had moderately elevated levels of PFOS and PFDA with median serum concentrations 3.0 times greater (13.3 ng/mL vs. 4.4 ng/mL) and 7.3 greater times greater (0.37 ng/mL vs. 0.10 ng/mL), respectively; and, PFAS levels were not elevated in the Bhutanese or urban angler cohorts. Male gender was c		В
D298	バイオモ ニタリン グ	Obeng-Gyasi, Emmanuel	Factors associated with elevated Per- and Polyfluoroalkyl substances serum levels in older adults	2022	Aging Health Res. 2022 Sep;2(3):100086. doi: 10.1016/j.ahr.2022.100086. Epub 2022 Jun 21.	Per- and Polyfluoroalkyl substances (PFAS) are highly persistent synthetic chemicals that have been produced for more than seven decades. This study examined 6,018 eligible older adults (aged \geq 60 years) using the National Health and Nutrition Examination Survey (NHANES), to assess seven PFAS by sociodemographic and water source data to (a) determine factors most linked with elevated PFAS levels and (b) evaluate the differences by race and ethnicity. The results of this study indicated that among older adults, PFAS levels were more elevated in men than women (p < 0.05), non-Hispanic Blacks than other ethnicities (p < 0.05), among those using well water (p < 0.05), and those with lower education (p < 0.05). Income was not a significant factor among this group. These findings offer insight into the factors associated with elevated PFAS levels in older adults. With this knowledge, it is necessary to target education about PFAS among the most vulnerable.		В

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No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D299	バイオモ ニタリン グ	Graber, Judith M; Black, Taylor M; Shah, Nimit N; Caban-Martinez, Alberto J; Lu, Shou-En; Brancard, Troy; Yu, Chang Ho; Turyk, Mary E; Black, Kathleen; Steinberg, Michael B; Fan, Zhihua; Burgess, Jefferey L	Prevalence and Predictors of Per- and Polyfluoroalkyl Substances (PFAS) Serum Levels among Members of a Suburban US Volunteer Fire Department	2021	Int J Environ Res Public Health. 2021 Apr 2;18(7):3730. doi: 10.3390/ijerph18073730.	BACKGROUND: Per-and polyfluoroalkyl substances (PFAS), are ubiquitous pollutants associated with adverse health outcomes. High PFAS levels have been demonstrated among career firefighters; less is known about PFAS levels among volunteer firefighters who comprise two-thirds of US firefighters. METHODS: Volunteer fire department members completed a survey and provided blood samples. We calculated geometric means and 95% CIs for PFAS reported by the National Health and Nutrition Examination Survey (NHANES). We compared PFAS distribution and levels among non-Hispanic white adult male study participants to those in the 2015-2016 and 2017-2018 NHANES cycles. We assessed associations between PFAS serum levels and years of firefighting controlling demographics and occupation using linear regression. RESULTS: Participant's average age was 46.6 years (sd. 17.1). Perfluorododecanoic acid (PFDA) was detected in almost half study but <3% of NHANES participants; serum levels of PFDOA, perfluorononanoic acid (PFNA), and perfluorodecanoic acid (PFDA) were elevated among participants compared with NHANES. Serum levels of both PFDA and PFDoA were positively associated with years of firefighting. CONCLUSIONS: Volunteer firefighters may have a different serum profile and levels of PFAS than the general population. Future work in this area should include volunteer firefighters from other geographic locations and assess sources of PFAS exposure.		В
D300	バイオモ ニタリン グ	Vorkamp, Katrin; Castaño, Argelia; Antignac, Jean- Philippe; Boada, Luis D; Cequier, Enrique; Covaci, Adrian; Esteban López, Marta; Haug, Line S; Kasper- Sonnenberg, Monika; Koch, Holger M; Pérez Luzardo, Octavio; Osīte, Agnese; Rambaud, Loïc; Pinorini, Maria- Teresa; Sabbioni, Gabriele; Thomsen, Cathrine	Biomarkers, matrices and analytical methods targeting human exposure to chemicals selected for a European human biomonitoring initiative	2021	Environ Int. 2021 Jan;146:106082. doi: 10.1016/j.envint.2020.106082. Epub 2020 Nov 20.	The major purpose of human biomonitoring is the mapping and assessment of human exposure to chemicals. The European initiative HBM4EU has prioritized seven substance groups and two metals relevant for human exposure: Phthalates and substitutes (1,2-cyclohexane dicarboxylic acid diisononyl ester, DINCH), bisphenols, per- and polyfluoroalkyl substances (PFASs), halogenated and organophosphorous flame retardants (HFRs and OPFRs), polycyclic aromatic hydrocarbons (PAHs), arylamines, cadmium and chromium. As a first step towards comparable European-wide data, the most suitable biomarkers, human matrices and analytical methods for each substance group or metal were selected from the scientific literature, based on a set of selection criteria. The biomarkers included parent compounds of PFASs and HFRs in serum, of bisphenols and arylamines in urine, metabolites of phthalates, DINCH, OPFRs and PAHs in urine as well as metals in blood and urine, with a preference to measure Cr in erythrocytes representing Cr (VI) exposure. High performance liquid chromatography-tandem mass spectrometry (LC-MS/MS) was the method of choice for bisphenols, PFASs, the HFR hexabromocyclododecane (HBCDD), phenolic HFRs as well as the metabolites of phthalates, DINCH, OPFRs and PAHs in urine. Gas chromatographic (GC) methods were selected for the remaining compounds, e.g. GC-low resolution MS with electron capture negative ionization (ECNI) for HFRs. Both GC-MS and LC-MS/MS were suitable for arylamines. New developments towards increased applications of GC-MS/MS may offer alternatives to GC-MS or LC-MS/MS approaches, e.g. for bisphenols. The metals were best determined by inductively coupled plasma (ICP)-MS, with the particular challenge of avoiding interferences in the Cd determination in urine. The evaluation process revealed research needs towards higher sensitivity and non-invasive sampling as well as a need for more stringent quality assurance/quality control applications and assessments.		В
D301	バイオモ ニタリン グ	Bashir, Tahir; Asiseh, Fafanyo; Jefferson-Moore, Kenrett; Obeng- Gyasi, Emmanuel	The Association of Per- and Polyfluoroalkyl Substances Serum Levels and Allostatic Load by Country of Birth and the Length of Time in the United States	2022	Int J Environ Res Public Health. 2022 Aug 1;19(15):9438. doi: 10.3390/ijerph19159438.	OBJECTIVES: The aim of this study was to examine the association of per- and polyfluoroalkyl (PFAS) concentrations and allostatic load (AL) by the county of birth and the length of time in the United States of America (U.S.), in a representative sample of U.S. adults. METHODS: Data from the 2007-2014 National Health and Nutrition Examination Survey (NHANES) were used in this cross-sectional study on the U.S. adults aged 20 and older. The analysis was stratified by the length of time in the U.S. and by the county of birth. In all, the sample contained those who were US-born (n = 10,264), Mexico-born (n = 4018), other Spanish speaking country-born (n = 2989), and other not-Hispanic speaking country-born (n = 3911). Poisson models were used to assess the differences in AL and PFAS levels depending on country of birth and length of time in the U.S. RESULTS: Estimates indicated that those born in Other non-Spanish speaking counties had the highest PFAS levels among the country of birth category in the database. Regarding length of time in the U.S., those born in Mexico had low PFAS levels when their length of time in the U.S. was short. The Mexico-born category presented the most at-risk high serum PFAS levels, with AL levels increasing by length of time in the U.S. (p-value < 0.001). CONCLUSION: This study found that PFAS levels among all the categories. In general, AL and PFAS levels are mostly associated with the length of time in the U.S., with foreign-born individuals having increased levels of both the longer they stay.		В

パーフルオロ化合物に係る国際機関等の評価及び科学的知見の情報収集並びに整理 別添-2 文献データベース文献リスト

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨 (原文)	備考	出 情 対 報 象 抽	ン 文 ン 文 ク 献 ク 献 ① ラ ② ラ
D302	バイオモ ニタリン グ	Berg, Vivian; Sandanger, Torkjel Manning; Hanssen, Linda; Rylander, Charlotta; Nøst, Therese Haugdahl	Time trends of perfluoroalkyl substances in blood in 30-year old Norwegian men and women in the period 1986-2007	2021	Environ Sci Pollut Res Int. 2021 Aug;28(32):43897-43907. doi: 10.1007/s11356-021-13809-6. Epub 2021 Apr 11.	Biomonitoring studies are helpful tools and can increase our knowledge on time trends in human blood concentrations of PFASs: how they relate to emission trends and the potential prenatal exposure for future generations. In this study, serum was sampled in cross-sections of men and women who were 30 years old in each of the years 1986, 1994, 2001, and 2007 in Northern Norway and analyzed for 23 PFASs. Differences in serum concentrations across sampling years were investigated graphically and with significance testing and compared with those observed in our previous longitudinal study using repeated individual measurements in older men in the same years. The results demonstrate overall increasing blood burdens of PFASs in men and women in reproductively active ages during 1986-2001 and decreases until 2007. However, longer chained PFASs were still increasing in 2007 indicating divergent time trends between the different PFASs, underlining the importance of continued biomonitoring. Comparisons between 30-year-old men and older men within the same population demonstrated variation in time trends in the exact same years, underlining that biomonitoring studies must regard historic exposures and birth cohort effects.			В
D303	バイオモ ニタリン グ	Buekers, Jurgen; Verheyen, Veerle; Remy, Sylvie; Covaci, Adrian; Colles, Ann; Koppen, Gudrun; Govarts, Eva; Bruckers, Liesbeth; Leermakers, Martine; St- Amand, Annie; Schoeters, Greet	Combined chemical exposure using exposure loads on human biomonitoring data of the 4th Flemish Environment and Health Study (FLEHS-4)	2021	Int J Hyg Environ Health. 2021 Sep;238:113849. doi: 10.1016/j.ijheh.2021.113849. Epub 2021 Sep 20.	To improve our understanding of internal exposure to multiple chemicals, the concept exposure load (EL) was used on human biomonitoring (HBM) data of the 4th FLEHS (Flemish Environment and Health Study; 2016-2020). The investigated chemicals were per- and polyfluoroalkyl substances (PFASs), bisphenols, phthalates and alternative plasticizers, flame retardants, pesticides, toxic metals, organochlorine compounds and polycyclic aromatic hydrocarbons (PAHs). The EL calculates "the number of chemicals to which individuals are internally exposed above a predefined threshold". In this study, the 50th and 90th percentile of each of the 45 chemicals were applied as thresholds for the EL calculations for 387 study participants. Around 20% of the participants were exposed to >27 chemicals above the P50 and to >6 chemicals above the P90 level. This shows that participants can be internally exposed to multiple chemicals in relatively high concentrations. When the chemical composition of the EL was considered, the variability between individuals was driven by some chemicals more than others. The variability of the chemical profiles at high exposure loads (EL-P90) was somewhat dominated by e.g. organochlorine chemicals, PFASs, phthalates, PAHs, organophosphate flame retardants, bisphenols (A & F), pesticides, metals, but to a lesser extent by brominated flame retardants, the organophosphorus flame retardants TCIPP & TBOEP, naphthalene and benzene, bisphenols S, B & Z, the pesticide 2,4-D, the phthalate DEP and alternative plasticizer DINCH. Associations between the EL and exposure determinants suggested determinants formerly associated with fat soluble chemicals, PFASs, bisphenols, and PAHs. This information adds to the knowledge needed to reduce the exposure by policymakers and citizens. However, a more in depth study is necessary to explore in detail the causes for the higher EL in some individuals. Some limitations in the EL concept are that a binary number is used for exposure above or below a threshold, while toxicity an			В
D304	バイオモニタリング	Esteban López, Marta; Göen, Thomas; Mol, Hans; Nübler, Stefanie; Haji- Abbas-Zarrabi, Karin; Koch, Holger M; Kasper- Sonnenberg, Monika; Dvorakova, Darina; Hajslova, Jana; Antignac, Jean-Philippe; Vaccher, Vincent; Elbers, Ingrid; Thomsen, Cathrine; Vorkamp, Katrin; Pedraza-Díaz, Susana;	The European human biomonitoring platform - Design and implementation of a laboratory quality assurance/quality control (QA/QC) programme for selected priority chemicals	2021	Int J Hyg Environ Health. 2021 May;234:113740. doi: 10.1016/j.ijheh.2021.113740. Epub 2021 Mar 26.	A fundamental objective of the human biomonitoring for Europe initiative (HBM4EU) is to progress toward comparable and robust exposure data for a wide variety of prioritized chemicals in human samples. A programme for Quality Assurance/Quality Control (QA/QC) was designed in HBM4EU with the purpose of creating a network of European laboratories providing comparable analytical data of high quality. Two approaches were chosen for two sets of prioritized chemicals with different timelines: (i) Scheme 1, where interested candidate laboratories participated in multiple rounds of proficiency tests (ii) Scheme 2, where selected expert laboratories participated in three rounds of interlaboratory comparison investigations. In both cases, the results were used to identify laboratories capable of generating consistent and comparable results for sample analysis in the frame of HBM4EU. In total, 84 laboratories from 26 countries were invited to participate in Scheme 1 that covered up to 73 biomarkers from Hexamoll* DINCH, phthalates, bisphenols, per- and polyfluoroalkyl substances, halogenated flame retardants (HFRs), organophosporous flame retardants (OPFRs), polycyclic aromatic hydrocarbons (PAH), cadmium, chromium and aromatic amines. 74 of the participants were successful for at least one biomarker in Scheme 1. Scheme 2 involved 22 biomarkers and successful results were obtained by 2 expert laboratories for arsenic, 5 for acrylamide, 4 for mycotoxins, 2 for pesticides and 2 for UV-filters in skin care products. The QA/QC programme allowed the identification of major difficulties and needs in HBM analysis as well of gaining insight in the analytical capacities of European laboratories. Furthermore, it is the first step towards the establishment of a sustainable European network of HBM laboratories.			C
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No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン 文 ン 文 ク 献 ク 献 ① ラ ② ラ
D305	バイオモ ニタリン グ	MacDonald, Amy M; Gabos, Stephan; Braakman, Sandy; Cheperdak, Laurie; Lee, Bonita; Hrudey, Steve E; Le, X Chris; Li, Xing- Fang; Mandal, Rupasri; Martin, Jonathan W; Schopflocher, Don; Lyon, Martha E; Cheung, Po-Yin; Ackah, Fred; Graydon, Jennifer A; Reichert, Megan; Lyon, Andrew W;	Maternal and child biomonitoring strategies and levels of exposure in western Canada during the past seventeen years: The Alberta Biomonitoring Program: 2005-2021	2022	Int J Hyg Environ Health. 2022 Jul;244:113990. doi: 10.1016/j.ijheh.2022.113990. Epub 2022 Jun 14.	The Alberta Biomonitoring Program (ABP) was created in 2005 with the initial goal of establishing baseline levels of exposure to environmental chemicals in specific populations in the province of Alberta, Canada, and was later expanded to include multiple phases. The first two phases focused on evaluating exposure in pregnant women (Phase One, 2005) and children (Phase Two, 2004-2006) by analyzing residual serum specimens. Phase Three (2013-2016) employed active recruitment techniques to evaluate environmental exposures using a revised list of chemicals in paired serum pools from pregnant women and umbilical cord blood. These three phases of the program monitored a total of 226 chemicals in 285 pooled serum samples representing 31,529 individuals. Phase Four (2017-2020) of the ABP has taken a more targeted approach, focusing on the impact of the federal legalization of cannabis on the exposure of pregnant women in Alberta to cannabis, as well as tobacco and alcohol using residual prenatal screening serum specimens. Chemicals monitored in the first three phases include herbicides, neutral pesticides, metals, metalloids, and micronutrients, methylmercury, organochlorine pesticides, organophosphate pesticides, parabens, phthalate metabolites, perfluoroalkyl substances (PFAS), phenols, phytoestrogens, polybrominated compounds, polyclorinated biphenyls (PCBs), dioxins and furans, polycyclic aromatic hydrocarbons (PAHs), and tobacco biomarkers. Phase Four monitored six biomarkers of tobacco, alcohol, and cannabis. All serum samples were pooled. Mean concentrations and 95% confidence intervals (CIs) were calculated for the chemicals detected in ≥25% of the sample pools. cross the first three phases, the data from the ABP has provided baseline exposure levels for the chemicals in pregnant women, children, and newborns across the province. Comparison within and among the phases has highlighted differences in exposure levels with age, geography, seasonality, sample type, and time. The strategies employed throughout the			в
D306	バイオモ ニタリン グ	中田 彩子, 斉藤 貢一, 岩崎 雄介, 伊藤 里恵, 岸 玲 子, 中澤 裕之	乳汁中ペルフルオロ化合物の定量及び母体血からの移行 性	2009	分析化学, 58 巻 8 号 653-659, doi: 10.2116/bunsekikagaku.58.653	本研究では、ペルフルオロ化合物 (PFCs) の子どもへの暴露源として乳汁に着目し、高速液体クロマトグラフィー/タンデム質量分析 法(LC/MS/MS) による高感度分析法を構築した.前処理にはOasis WAXによる固相抽出法を採用した.添加回収試験では、平均回収 率94.3~109.0% (RSD<10.3%) と良好な結果が得られ、本法による定量限界は、ペルフルオロオクタン酸(PFOA) に関しては0.012 ng/mL、ペルフルオロオクタンスルホン酸(PFOS)、ペルフルオロヘキサンスルホン酸(PFHxS) 及びペルフルオロノナン酸 (PFNA) では0.004 ng/mLであった.本法を用いてヒト母乳、育児用粉ミルク及び牛乳の分析を行ったところ、ヒト母乳中から比較 的高濃度のPFCsが検出され、その濃度範囲はPFOSで0.046~0.098 ng/mL、PFOAでは0.016~0.270 ng/mLであった.更に、ヒト母体 血から母乳へのPFCs移行性を調べるために、母乳と同一個人から採取した母体血中のPFCs濃度を測定したところ、母体血と母乳の間 には有意な相関性が示された.		1	A
D307	バイオモ ニタリン グ	中山 祥嗣	世界のHuman Biomonitoringと日本の課題: 実践と政策 応用	2020	学術の動向, 25 巻 11 号 11_80-11_87, doi: 10.5363/tits.25.11_80	Human biomonitoring (HBM) は、国民がどのような化学物質にどれだけ曝露しているかを評価する上で有用なツールである。特に、 国民を代表する値として、体内の化学物質量をモニタリングすることは、行政施策決定のみならず、国民に広く現状を伝え自ら曝露・ 非曝露を選択する機会を与えるためにも重要である。世界では、主要先進国でHBMが実施されており、化学物質のリスク評価・リスク 管理に用いられるとともに、国民の知る権利の一環として情報提供されている。さらに、誰にでも利用できる様式でデータが提供され ているプログラムも存在する。以下に、現在世界において、国民を代表する調査であり、かつ、定常的に行われているHBMプログラム を紹介する。			с
D308	バイオモ ニタリン グ	Yihe Jin, Norimitsu Saito, Kouji H. Harada, Kayoko Inoue, Akio Koizumi	Historical Trends in Human Serum Levels of Perfluorooctanoate and Perfluorooctane Sulfonate in Shenyang, China	2007	The Tohoku Journal of Experimental Medicine, 212 巻 1 号 63-70, doi: 10.1620/tjem.212.63	Perfluorooctane sulfonate (PFOS) and perfluorooctanoate (PFOA) are widespread contaminants in the environment, as well as in wildlife and in humans. The PFOS and PFOA concentrations were determined in historical human serum samples collected in Shenyang, China, in 1987 (n = 15), 1990 (n = 33), 1999 (n = 68) and 2002 (n = 119). The serum donors were students, faculty members and university workers. Since the serum PFOA and PFOS levels did not follow a normal or log-normal distribution, a nonparametric method was applied to analyze the historical trends. For the total male and female subjects, the median level of serum PFOA increased significantly from 0.08 μ g/l in 1987 to 4.3 μ g/l in 2002 (p < 0.05), while the median level of serum PFOS also increased significantly from 0.03 μ g/l in 1987 to 22.4 μ g/l in 2002 (p < 0.05). Both the serum PFOA and PFOS levels continued to increase from 1999 to 2002, with remarkable increases observed in females: 6.3-fold increase for PFOA and 13-fold increase for PFOS. In 2002, serum PFOA and PFOS concentrations of female subjects have increased to 4.9 μ g/l and 22.4 μ g/l in median, respectively, which are comparable to those in U.S.A. and Japan. For male subjects, serum PFOA and PFOS concentrations (1.6 μ g/l and 8.3 μ g/l in median, respectively) are comparable to those in Italy. The data from this study indicate that females are likely to experience higher exposure to these chemicals.			В

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 対報 ク献 象抽 ① ラ	ン 文 ク 献 ② ラ
D309	バイオモ ニタリン グ	Naoya Kishikawa, Naotaka Kuroda	Evaluation of Organic Environmental Pollutants Detected in Human Milk	2009	Journal of Health Science, 55 巻 1 号 1-10, doi: 10.1248/jhs.55.1	Human milk is an important food source for infant because it contains a large number of nutritional substances, growth and immune factors. However, human milk may be contaminated with environmental pollutants when mothers are exposed to these pollutants. In particular, lipophilic organic pollutants are likely to accumulate in milk fat. Therefore, the determination of the organic pollutants levels in human milk is necessary to estimate the health risks of these pollutants to milk-fed infants. For this purpose, a lot of reports for the measurements of environmental pollutants such as polychlorinated organic compounds (PCOCs), polybrominated compounds, perfluorinated compounds (PFCs), polycyclic aromatic hydrocarbons (PAHs) and endocrine disrupting phenols in human milk samples. Also, we described the noteworthy results of several evaluative studies such as time trend and regional difference of pollutant levels.		В	
D310	バイオモ ニタリン グ	吉永 侃夫, 原田 浩二, 井上 佳代 子, 難分解性物質 研究グループ, 小 泉 昭夫	P1073 難分解性化学物質に対する生体試料バンクの有用 性検証と曝露評価	2005	産業衛生学雑誌, 47 巻 Special 号 688, doi: 10.1539/sangyoeisei.KJ00003804320	環境中に放出されて多種多様の化学物質による環境汚染や人体への影響を監視しするために、私達は難分解性化学物質を対象としだ生体試料バングを設立した。今回このバンクの試料を用いて、バンクの有用性の証明と、新規物質の曝露評価を行った。【方法】約30年前から収集された生体試料(血液と陰膳方式の食事)と新規に全国で10箇所で集め出した試料(血液、母乳と購入方式の食事)を基に血液24,500、母乳1,080、食事3,800検体から成るバンクを創設した。これらの試料から1980年代、1995年代を中心とした、同一人物からセットで提供された血液と食事検体を用いて、GCtMS法(有機溶剤抽出法)で#74、#118、#99、#138、#146、#153、#163&164、#156、#170、#180、#182 & 187 のコンジェナーのPCBを、原子吸光法(還元気化法)でメチル水銀を測定して既報のデータと比較てパンクの有用性を検討した。また新規化合物として、PBDEsをG(ンMS法(有機溶剤抽出法)で低一中臭化の、#47、#100、#99、#153のコンジェナーを、PFOS、PFOAを固相抽出してL數MS法で測定してヒトの曝露評価を行った。		1 A	
D311	バイオモ ニタリン グ	Yamaguchi Miwa(Departmen t of Preventive Medicine, Institute of Health Biosciences, the University of Tokushima Graduate School), Arisawa Kokichi, Uemura Hirokazu, Katsuura- Kamano Sakurako, Takami Hidenobu, Sawachika Fusakazu, Nakamoto Mariko, Juta	日本人集団における魚介類摂取量、血清肝酵素、 PFOS、PFOAの血中濃度(Consumption of Seafood, Serum Liver Enzymes, and Blood Levels of PFOS and PFOA in the Japanese Population)(英語)	2013	Journal of Occupational Health(1341-9145)55巻3号 Page184-194(2013.05), doi: 10.1539/joh.12-0264-oa. Epub 2013 Apr 9.	Perfluoroctanesulfonate(PFOS)とperfluorooctanoate(PFOA)の血中濃度と関連する因子について横断的研究により検討した。日本の 15都道府県に居住する男性307例と女性301例(16-76歳)を対象とした。PFOSとPFOAの血中濃度は、液体クロマトグラフィ質量分析で 測定した。肝酵素(γ-GTP、GOT、GPT)とω-3多価不飽和脂肪酸(DHAとEPA)の血清濃度も測定した。PFOSとPFOAの血中濃度と、41 種類の料理、食物、飲料の摂取頻度および肝酵素とω-3多価不飽和脂肪酸の血清濃度との関連性を、順位相関を用いて検討した。素 魚、刺身、近海魚の摂取頻度は、潜在的交絡因子について調整すると、PFOSの血中濃度と有意な正の相関を示した。GOT、GPT、 DHA、EPAの血清濃度は、血中PFOSおよびPFOAと有意な正の相関を示した。PFOSとPFOAの血中濃度には有意な地域差もあり、そ の中央値は東海/比陸/近畿地方で最も高かった。日本人集団では、PFOSの血中濃度が主に魚の摂取量と関連していたことや、PFOSと PFOAの濃度は肝酵素の血清濃度と関連していたことが示唆された。		1 A	
D312	バイオモ ニタリン グ	中田 彩子(星薬科 大学 薬品分析化 学教室), 斉藤 貢 一, 岩崎 雄介, 伊 藤 里恵, 岸 玲子, 中澤 裕之	乳汁中ペルフルオロ化合物の定量及び母体血からの移行 性	2009	分析化学(0525-1931)58巻8号 Page653-659(2009.08), doi: 10.2116/bunsekikagaku.58.653	本研究では、ペルフルオロ化合物(PFCs)の子どもへの暴露源として乳汁に着目し、高速液体クロマトグラフィー/タンデム質量分析法 (LC/MS/MS)による高感度分析法を構築した。前処理にはOasis WAXによる固相抽出法を採用した。添加回収試験では、平均回収率 94.3~109.0%(RSD<10.3%)と良好な結果が得られ、本法による定量限界は、ペルフルオロオクタン酸(PFOA)に関しては0.012ng/mL、 ペルフルオロオクタンスルホン酸(PFOS)、ペルフルオロヘキサンスルホン酸(PFHxS)及びペルフルオロノナン酸(PFNA)では 0.004ng/mLであった。本法を用いてヒト母乳、育児用粉ミルク及び牛乳の分析を行ったところ、ヒト母乳中から比較的高濃度のPFCs が検出され、その濃度範囲はPFOSで0.046~0.098ng/mL、PFOAでは0.016~0.270ng/mLであった。更に、ヒト母体血から母乳への PFCs移行性を調べるために、母乳と同一個人から採取した母体血中のPFCs濃度を測定したところ、母体血と母乳の間には有意な相関 性が示された。(著者抄録)	No.306と 重複	-	

パーフルオロ化合物に係る国際機関等の評価及び科学的知見の情報収集並びに整理

別添-2 文献データベース文献リスト

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン文 ン文 ク献 ① ラ ② ラ
D313	バイオモ ニタリン グ	Kishikawa Naoya(長崎大学 医歯薬学総合研究 科薬学系), Kuroda Naotaka	母乳中に検出される有機環境汚染物質の評価(Evaluation of Organic Environmental Pollutants Detected in Human Milk)(英語)	2005	Journal of Health Science(1344-9702)55巻1号 Page1- 10(2009.02), doi: 10.1248/jhs.55.1	Human milk is an important food source for infant because it contains a large number of nutritional substances, growth and immune factors. However, human milk may be contaminated with environmental pollutants when mothers are exposed to these pollutants. In particular, lipophilic organic pollutants are likely to accumulate in milk fat. Therefore, the determination of the organic pollutants levels in human milk is necessary to estimate the health risks of these pollutants to milk-fed infants. For this purpose, a lot of reports for the measurements of environmental pollutants in milk samples have been published. In this review, we summarized the concentrations of harmful organic environmental pollutants such as polychlorinated organic compounds (PCOCs), polybrominated compounds, perfluorinated compounds (PFCs), polycyclic aromatic hydrocarbons (PAHs) and endocrine disrupting phenols in human milk samples. Also, we described the noteworthy results of several evaluative studies such as time trend and regional difference of pollutant levels.	No.309と 重複		-
D314	バイオモ ニタリン グ	Jin Yihe(中華人民 共和国), Saito Norimitsu, Harada Kouji H., Inoue Kayoko, Koizumi Akio	中国瀋陽におけるペルフルオロオクタン酸およびペルフ ルオロオクタンスルホン酸のヒト血清中濃度の歴史的傾 向(Historical Trends in Human Serum Levels of Perfluorooctanoate and Perfluorooctane Sulfonate in Shenyang, China)(英語)	2007	The Tohoku Journal of Experimental Medicine(0040- 78727)212巻1号 Page63-70(2007.05), doi: 10.1620/tjem.212.63	ペルフルオロオクタンスルホン酸(PFOS)およびペルフルオロオクタン酸(PFOA)は、環境、野生動物、ヒトにおいて広く認められる汚 染物質である。PFOSとPFOAの濃度を中国の瀋陽において1987、1990、1999、2002年に採取した歴史的ヒト血清検体中で測定した。 血清提供者は学生、教職員、大学職員であった。PFOAとPFOSの値は正規分布または対数正規分布に従わなかったため、ノンパラメト リック法を歴史的傾向の解析に使用した。全般的に、PFOA中央値は1987年の0.08 μ g/lから2002年の4.3 μ g/lに有意に上昇し、PFOS中央値も1987年の0.03 μ g/lから2002年の22.4 μ g/lに有意に上昇した。PFOAおよびPFOS値は共に1999年から2002年まで継続して上昇 し、女性ではPFOAが6.3倍、PFOSが13倍という顕著な上昇が認められた。2002年の女性被験者のPFOAおよびPFOS中央値は、それぞ れ4.9 μ g/lおよび22.4 μ g/lに達したが、これは米国および日本の値に匹敵した。男性被験者では、PFOAおよびPFOS濃度(中央値はそれ ぞれ1.6 μ g/lおよび8.3 μ g/l)はイタリアの値に匹敵した。本研究のデータは女性がこれらの化学物質に対して高い曝露を受ける傾向が 高いことを示している。	No.308と 重複		В
D315	バイオモ ニタリン グ	原田浩二(京都大 学医学研究科社 会健康医学系専攻 健康要因学講座環 境衛生学分野),齋藤憲光,井上佳 代子,吉永侃夫, 渡辺孝男,佐々木 司郎,加美山茂 利,小泉昭夫	過去25年間にわたるヒト血清中ペルフルオロオクタンス ルホン酸・ペルフルオロオクタン酸濃度に及ぼす,時間, 性,地理的要因の影響(The Influence of Time, Sex and Geographic Factors on Levels of Perfluorooctane Sulfonate and Perfluorooctanoate in Human Serum over the Last 25 years)(英語)	2004	J Occup Health. 2004 Mar;46(2):141-7. doi: 10.1539/joh.46.141.	ベルフルオロオクタンスルホン酸(PFOS)とベルフルオロオクタン酸(PFOA)の時間,地域,性別の影響を調査するために,著者らが国町(秋田と京都)で集めた過去と現在にわたる血清試料を用いて,血清中PFOSとPFOA濃度をLC/MSにより測定した.その結果,1)2003年においてPFOSは,宮城の3.5(2.9)から京都の28.1(1.5)まで,PFOAについても,宮城の2.8(1.5)から京都の12.4(1.4)までの範囲を示した.女性から集高 められた過去の血清試料により,PFOS・PFOA濃度がこれまでの25年にわたって,それぞれ,3,14倍に増加したことを明示した.また,すべて の地域内で血清中PFOS・PFOA濃度に大きな性差があった.さらに,PFOS・PFOA濃度両方について地域間で顕著な相違があった.京都に おいて,2年以上,近畿地区に居住していた住民のPFOA濃度は,最近その区域に引っ越してきて,半年以上2年未満経過した人々で,両方の性で,有意に高かった.このことは住民の血清中PFOA濃度を高めうるPFOAの汚染源が近畿地区にあることを示唆した	評価書文 献No.104 と重複		A
D316	ADME	Liu, Yingxue; Liu, Kai; Zheng, Ping; Yin, Shanshan; Jin, Hangbiao; Bai, Xiaoxia; Li, Yongqing; Zheng, Jingxian; Dai, Yishuang; Zhao, Meirong; Liu, Weiping	Prenatal exposure and transplacental transfer of perfluoroalkyl substance isomers in participants from the upper and lower reaches of the Yangtze River	2021	Environ Pollut. 2021 Feb 1;270:116202. doi: 10.1016/j.envpol.2020.116202. Epub 2020 Dec 6.	Data on gestational exposure characteristics and transplacental transfer are quite limited for perfluoroalkyl substance (PFAS) isomers, especially those from large-scale comparative studies. To fill this gap, we examined isomers of perfluoroactane sulfonic acid (PFOS), perfluoroactane caid (PFOA), and perfluorohexane sulfonic acid (PFHxS) in matched maternal and cord serum from Mianyang and Hangzhou, which are located in the upper and lower reaches of the Yangtze River, China, respectively. These data were compared with those from our previous study on Wuhan in the middle reach. The average Σ PFAS concentration increased from upstream to downstream (Mianyang (4.44 ng/mL) < Wuhan (9.88 ng/mL) < Hangzhou (19.72 ng/mL)) and may be related to the per capita consumption expenditure of each city. The In-transformed PFAS concentrations showed significant differences between Mianyang and Hangzhou after adjusting confounding factors (p < 0.05). The percentages of linear PFOS and PFOA in maternal and cord serum from these cities all exceeded those in electrochemical fluorination products. The isomer profiles of PFASs in maternal and cord serum might be greatly influenced by local production processes of PFASs and residents' dietary habits. The transplacental transfer efficiencies decreased significantly with increasing concentrations in maternal serum for Σ PFAS, Σ PFOA, Σ PFHxS, n-PFOS, iso-PFOS, 4m-PFOS, 1m-PFOS, n-PFOA, n-PFHxS, and br-PFHxS (Spearman rank correlation coefficients (r) = 0.373-0.687, p < 0.01). These findings support an understanding of the regional characteristics in maternal exposure to PFASs along the Yangtze River, isomeric profiles of PFASs in these regions, and the transplacental transfer processes of PFAS isomers.			ВВ

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D317	ADME	Kang, Habyeong; Kim, Hee-Sun; Yoon, Yeong Sook; Lee, Jeongsun; Kho, Younglim; Lee, Jisun; Chang, Hye Jin; Cho, Yoon Hee; Kim, Young Ah	Placental Transfer and Composition of Perfluoroalkyl Substances (PFASs): A Korean Birth Panel of Parent- Infant Triads	2021	Toxics. 2021 Jul 14;9(7):168. doi: 10.3390/toxics9070168.	Exposure to perfluoroalkyl substances (PFASs) is of public concern due to their persistent exposure and adverse health effects. Placental transfer of PFASs is an important excretion pathway of these chemicals in pregnant women and exposure route in fetuses. We measured PFAS concentrations in maternal, paternal, and umbilical cord serum collected from 62 pregnant Korean women and matched biological fathers of the fetuses. Placental transfer rates (cord to maternal serum ratio) of PFASs were also calculated. Demographics and pregnancy-related factors determining the placental transfer rates were identified using linear regression models. Maternal, paternal, and cord serum showed different PFASs compositions. Among the PFASs, perfluorooctane sulfonate (PFOS) showed the highest concentrations in maternal and paternal serum, while perfluorooctanoic acid (PFOA) showed the highest concentration in cord serum. There was a higher proportion of perfluoroalkyl carboxylic acids (PFCAs) with 9- 12 carbon chains than those with 13-14 carbon chains in maternal and paternal serum, but this proportion was in the opposite direction in cord serum. PFOA and perfluorohexane sulfonate (PFHxS) had higher placental transfer rates (means of 0.32 and 0.36, respectively) than PFOS (mean of 0.12), which is in line with the results of previous studies. Gestational age and birth weight were positively associated with placental transfer rate of PFOA, PFHxS, and PFOS, while pre-pregnant BMI and weight were inversely associated with PFOS. This study showed that placental transfer of PFASs differs by compounds and is associated with pregnancy-related factors. Further studies on novel PFASs are warranted for Korean pregnant women.		ВВ
D318	ADME	Fedorenko, Michael; Alesio, Jessica; Fedorenko, Anatoliy; Slitt, Angela; Bothun, Geoffrey D	Dominant entropic binding of perfluoroalkyl substances (PFASs) to albumin protein revealed by (19)F NMR	2021	Chemosphere. 2021 Jan;263:128083. doi: 10.1016/j.chemosphere.2020.128083. Epub 2020 Sep 2.	Mechanistic insight into protein binding by poly- and perfluoroalkyl substances (PFASs) is critical to understanding how PFASs distribute and accumulate within the body and to developing predictive models within and across classes of PFASs. Fluorine nuclear magnetic resonance spectroscopy ((19)F NMR) has proven to be a powerful, yet underutilized tool to study PFAS binding; chemical shifts of each fluorine group reflect the local environment along the length of the PFAS molecule. Using bovine serum albumin (BSA), we report dissociation constants, K(d), for four common PFASs well below reported critical micelle concentrations (CMCs) - perfluorooctanoic acid (PFOA), perfluoronanoic acid (PFNA), perfluorohexanesulfonic acid (PFHxS), and perfluorooctanesulfonic acid (PFOS) - as a function of temperature in phosphate buffered saline. K(d) values were determined based on the difluoroethyl group adjacent to the anionic headgroups and the terminal trifluoromethyl groups. Our results indicate that the hydrophobic tails exhibit greater binding affinity relative to the headgroup, and that the binding affinities are generally consistent with previous results showing that greater PFAS hydrophobicity leads to greater protein binding. However, the binding mechanism was dominated by entropic hydrophobic interactions attributed to desolvation of the PFAS tails within the hydrophobic cavities of the protein and on the surface of the protein. In addition, PFNA appears to form hemimicelles on the protein surfaces below reported CMC values. This work provides a renewed approach to utilizing (19)F NMR for PFAS-protein binding studies and a new perspective on the role of solvent entropy.		вс
D319	ADME	Lu, Yao; Meng, Lingyi; Ma, Donghui; Cao, Huiming; Liang, Yong; Liu, Hongwei; Wang, Yawei; Jiang, Guibin	The occurrence of PFAS in human placenta and their binding abilities to human serum albumin and organic anion transporter 4	2021	Environ Pollut. 2021 Jan 12;273:116460. doi: 10.1016/j.envpol.2021.116460. Online ahead of print.	Both legacy and emerging per- and polyfluoroalkyl substances (PFAS) have been found to be threats to human health. In particular, fetuses are sensitive to xenobiotics and the placenta functions as a significant barrier for environmental pollutants. The placental transfer of PFAS is closely related to their interactions with proteins. In this study, 54 human placental samples were collected to investigate the occurrence of legacy and emerging PFAS in human placenta, including perfluorinated carboxylates (PFCAs), perfluorinated sulfonates (PFSAs), chlorinated polyfluoroalkyl ether sulfonic acids (CI-PFESAs), and fluorotelomer sulfonates (FTSAs). Among the legacy PFAS, perfluoroctanesulfonate (PFOS), perfluoroctanoic acid (PFOA), and perfluorononanoic acid (PFNA) were detected in all samples, with PFOS and PFOA being the two predominant (mean: 0.457 and 0.242 ng/g wet weight, respectively). Among the emerging PFAS, 6:2 CI-PFESA was detected in all samples with the mean value of 0.104 ng/g wet weight, while the detect frequency (DF) of 8:2 CI-PFESAs was only 24%. The concentration and DF of the four FTSA congeners were low in the placentas. Molecular docking calculation results showed that the binding affinities of PFAS to the human serum albumin (HSA) were increased with chain length in each category except for the PFCAs, of which the perfluoroundecanoic acid (PFUnDA) was the turning point of binding affinity to HSA. For PFSAs, their binding affinities to organic anion transporter 4 (OAT4) were increased with the chain length except for the sodium perfluoro-1-heptanesulfonate (PFHpS) and sodium perfluoro-1-nonanesulfonate (PFNS). The calculation results demonstrated that the placental transfer of PFAS is closely related to chain length. The findings in the study can help better understand the occurrence of the PFAS in the human placenta and the placental transfer mechanisms of PFAS in human beings.		A B

No.	分野 (参考)	著者	タイトル	発行年 書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン文ン ク献ク ① ラ②	文 献 ラ
D320	ADME	Liu, Daxi; Tang, Bo; Nie, Saisai; Zhao, Nan; He, Li; Cui, Jiansheng; Mao, Weili; Jin, Hangbiao	Distribution of per- and poly-fluoroalkyl substances and their precursors in human blood	2023 ^J Hazard Mater. 2023 Jan 5;441:129908. doi: 10.1016/j.jhazmat.2022.129908. Epub 2022 Sep 5.	Many studies have examined per- and poly-fluoroalkyl substances (PFASs) in human blood. However, the distribution of PFASs in human blood remains not well known, especially for perfluorooctane sulfonate (PFOS) precursors. In this study, human blood samples ($n = 162$) were collected from general Chinese population, and then the isomer-specific partitioning of PFASs between human plasma and red blood cells (RBCs) were investigated. Perfluorooctanoate (PFOA) and PFOS were consistently the predominant PFASs in both human plasma and RBCs. In human blood, among C(4)-C(7) perfluoroalkyl carboxylates (PFCAs), the calculated mean mass fraction in plasma ($F(p)$) values increased from 0.76 to 0.82 with the increasing chain length. C(7)-C(13) PFCAs exhibited a trend of gradually decreasing mean $F(p)$ with chain length. Among PFAS precursors, 6:2 fluorotelomer phosphate diester had the highest mean $F(p)$ value (0.87 ± 0.11). Calculated $F(p)$ values of N-methyl perfluorooctanesulfonamide (N-MeFOSA) and N-ethyl perfluorooctanesulfonamide (N-EtFOSA) were 0.66 ± 0.13 and 0.70 ± 0.12 , respectively. Individual branched isomers consistently had greater $F(p)$ values than their corresponding linear isomers for PFOA, PFHxS, and perfluoroctane sulfonamide. To our knowledge, this study first reports the distribution of N-MeFOSA and N-EtFOSA in human blood, contributing to the better understanding of the occurrence and fate of PFASs in humans.			BE	3
D321	ADME	You, Dan; Chang, Xiaochen; Guo, Lijun; Xie, Wei; Huang, Shuping; Li, Xiang; Chai, Hongliang; Wang, Yajun	Per- and polyfluoroalkyl substances (PFASs) in the blood of police and Beagle dogs from Harbin, China: Concentrations and associations with hematological parameters	2022 ^{Chemosphere. 2022 Jul;299:134367. doi: 10.1016/j.chemosphere.2022.134367. Epub 2022 Mar 28.}	Per-and polyfluoroalkyl substances (PFASs) have been omnipresent in the environment and marine organisms. However, little is known about these compounds and their associations with hematological parameters in dogs. In this research, we investigated the concentrations and distributions of PFASs in the blood of dogs and explored the associations between PFASs concentrations in blood and hematological parameters. Perfluorooctanoate (PFOA) was found to be the dominant PFAS in the blood (54.23%), followed by perfluorobutyric acid (PFBA) (16.05%) and perfluorooctanesulfonate (PFOS) (12.05%). On average, PFASs concentration in dogs was 3.553 ng/mL (SD: 2.146). Moreover, age is a key factor influencing the levels of PFBA, PFOA, and PFBS in males, as well as seven PFASs (6:2 CI-PFESA, PFBA, PFOA, PFOS, PFHxS, PFDA, and PFNA) in female dogs' blood. The results revealed that PFHxS in dietary food accounted for most of the total daily PFASs consumption. We also discovered that greater PFASs exposure (including PFOA and PFOS) could significantly increase amylase (AMY) and decrease cholesterol (CHOL) levels. Furthermore, there are linear relationships between PFDA, PFDA, and many biochemical parameters (AMY, CHOL, albumin/globulin (A/G), blood urea nitrogen (BUN), alkaline phosphatase (ALP), creatinine (CREA)). Thus, PFAS accumulation has a certain influence on dogs' health, and we must pay attention to the potential threat posed by these elements to dogs.			вс	0
D322	ADME	Drew, Roger; Hagen, Tarah G; Champness, David; Sellier, Amelie	Half-lives of several polyfluoroalkyl substances (PFAS) in cattle serum and tissues	Food Addit Contam Part A Chem Anal Control Expo Risk 2022 Assess. 2022 Feb;39(2):320-340. doi: 10.1080/19440049.2021.1991004. Epub 2021 Nov 3.	Cattle that were at steady-state serum polyfluoroalkyl substances (PFAS) concentrations due to several years of exposure to water contaminated by residues of Aqueous Film-Forming (AFFF) firefighting foam had perfluorooctane sulphonate (PFOS) isomers, perfluoroheptane sulphonate (PFHpS), perfluorohexane sulphonate (PFHxS), perfluoronanoic acid (PFNA) and perfluorodecanoic acid (PFDA) in serum. Elimination serum half-lives were determined in five heifers from serial blood sampling over 215 days. Eleven additional animals that had blood sampled on day 19 (d19) were euthanised on d63. PFAS half-life estimates from the serial blood sampling and from d19/d63 data were not significantly different. The combined (n = 16) serum half-lives (in days) were: total PFOS (tPFOS, 74.1 \pm 13.4), PFHpS (45.7 \pm 9.4), PFHxS (9.3 \pm 1.3), PFNA (12.3 \pm 3.2) and PFDA (60.4 \pm 10.4). The half-lives of linear PFOS (L-PFOS, 69.4 \pm 11.6) and mono branched PFOS isomers (m-PFOS, 83.6 \pm 19) were not significantly different from tPFOS, but for the di-branched isomers (di-PFOS), the serum half-live was significantly lower (29.9 \pm 5.8). Animal age (1.4-12.3 years old) and serum concentration at the start of depuration did not influence half-lives, and there was no difference between steers and heifers. Consideration of serum and tissue PFAS concentrations at d63 and d215 indicated there was no difference in tPFOS depuration from serum or muscle, but elimination from liver and kidney may be slightly longer. Depuration of PFHpS is essentially the same in serum, kidney and liver, and it is expected depletion from muscle would be comparable. The short half-life of di-PFOS, PFHxS and PFNA did not allow an assessment of clearance from tissues because they were not measurable at d215 but based on the results for PFOS and PFHpS, elimination of PFHxS from tissues is expected to mirror that from serum. Ham health risk assessment implications are discussed.			вс	0

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D323	ADME	Abraham, Klaus; Monien, Bernhard H	Transdermal absorption of (13)C(4)-perfluorooctanoic acid ((13)C(4)-PFOA) from a sunscreen in a male volunteer - What could be the contribution of cosmetics to the internal exposure of perfluoroalkyl substances (PFAS)?	2022	Environ Int. 2022 Nov;169:107549. doi: 10.1016/j.envint.2022.107549. Epub 2022 Sep 26.	Per- and polyfluoroalkyl substances (PFAS) are a complex group of man-made chemicals with high stability and mobility leading to ubiquitous environmental contamination and accumulation especially of some long-chain perfluoroalkyl acids (PFAA) in humans. While dietary intake is the main route of exposure, transdermal uptake from cosmetic products usually is considered negligible. However, PFAS are present in a part of these products, and recent epidemiological studies have provided evidence for relevant uptake via this route. The crucial question is whether PFAA in cosmetic products can cross the human skin barrier. A defined amount (110 µg) of (13)C(4)-perfluorooctanoic acid ((13)C(4)-PFOA) was mixed into a sunscreen (30 g) which was applied on the whole skin of a volunteer. The plasma concentrations of (13)C(4)-PFOA were determined in serial blood samples taken over 115 days using UHPLC-MS/MS and (13)C(2)-PFOA as internal standard. After application, (13)C(4)-PFOA plasma levels increased continuously, reaching levels of 3, 56 and 118 ng/L after 6 h, 3 days and 10 days, respectively. A maximum level of 132 ng/L was measured 22 days after application, representing 9.4 % of the PFOA level resulting from the volunteer's background exposure (1400 ng/L, equivalent to 1.4 ng/mL). In the following weeks, the levels slightly decreased with an estimated half-life of 1.8 years. The best estimate for the fraction absorbed may be 1.6 % of the dose, using a volume of distribution of 0.17 L/kg body weight. For PFOA mixed into a sunscreen, this experimental approach demonstrates a significant uptake of a PFAA via transdermal absorption in humans. In the past, some cosmetic products contained relevant PFAA levels as contaminants/impurities of PFAS added as active ingredients. Depending on these levels and the use (frequency, skin area involved), it is plausible that this route of exposure has contributed to the internal exposure to PFAA, as already suggested by aprincipation.		A B
D324	ADME	Zheng, Ping; Liu, Yingxue; An, Qi; Yang, Xiaomeng; Yin, Shanshan; Ma, Lena Q; Liu, Weiping	Prenatal and postnatal exposure to emerging and legacy per-/polyfluoroalkyl substances: Levels and transfer in maternal serum, cord serum, and breast milk	2022	Sci Total Environ. 2022 Mar 15;812:152446. doi: 10.1016/j.scitotenv.2021.152446. Epub 2021 Dec 21.	Gestation and lactation are critical and vulnerable stages for fetuses and newborns. During these periods, per-/polyfluoroalkyl substances (PFASs) accumulated in mothers can be transferred to newborns through placenta and/or breastfeeding, causing potential health risks. To investigate the pre- and postnatal PFAS exposure of newborns, we analyzed 21 emerging and legacy PFASs in 60 sets of matched maternal serum, cord serum, and breast milk samples. In serum, perfluorooctanoic acid (PFOA), perfluorooctanesulfonic acid (PFOS), and 6:2 chlorinated polyfluorinated ether sulfonates (6:2 CI-PFESA) were the most predominant PFASs, while PFOA, PFOS and 6:2 fluorotelomer phosphate diester (6:2 diPAP) contributed most to breast milk. For most PFASs, the levels followed the order of maternal serum > cord serum > breast milk. The 6:2 CI-PFESA was positively associated with birth weight and ponderal index (p < 0.05). The breastfeeding transfer efficiencies (R(BM), median: 0.02-0.10) of most PFASs were 1-2 orders of magnitude lower than transplacental transfer efficiencies (R(CM), median: 0.40-1.45), except for perfluorobutanesulfonic acid (PFBS) showing high transfer efficiency both through placenta (median at 0.89) and breastfeeding (median at 0.86). The one-month postnatal exposure to PFASs via breastfeeding transfer of PFASs and provides assessments of prenatal and postnatal exposure of newborns bot emerging and legacy PFASs.		A B
D325	ADME	Li, Ying; Andersson, Axel; Xu, Yiyi; Pineda, Daniela; Nilsson, Carina A; Lindh, Christian H; Jakobsson, Kristina; Fletcher, Tony	Determinants of serum half-lives for linear and branched perfluoroalkyl substances after long-term high exposure-A study in Ronneby, Sweden	2022	Environ Int. 2022 May;163:107198. doi: 10.1016/j.envint.2022.107198. Epub 2022 Apr 18.	BACKGROUND: Per- and polyfluoroalkyl substances (PFAS) are persistent substances with surfactant and repellent properties. Municipal drinking water contaminated with PFAS had been distributed for decades to one third of households in Ronneby, Sweden. The source was firefighting foam used in a nearby airfield since the mid-1980s. Clean water was provided from December 16, 2013. AIMS: The purpose was to estimate serum half-lives and their determinants in the study population for different PFAS. METHODS: Up to ten blood samples were collected between 2014 and 2018 from 114 participants (age 4-84 years at entry, 53% female). 19 PFAS were analysed. Linear mixed models were used to estimate the half-lives. RESULTS: Eight PFAS were increased in Ronneby: perfluorooctanoic acid (PFOA), perfluoropentane sulfonate (PFPeS), perfluorohexane sulfonate (PFHxS), perfluoroheptane sulfonate (PFHpS), linear perfluoroctane sulfonate (L-PFOS) and three branched perfluorooctane sulfonates (1 m-PFOS, 3/4/5m-PFOS and 2/6m-PFOS). The mean estimated half-lives (in years) were 0.94 (95 %CI 0.86-1.02) for PFPeS, 2.47 (2.27-2.7) for PFOA, 2.67 (2.51-2.85) for 2/6m-PFOS, 2.73 (2.55-2.92) for L-PFOS, 3.43 (3.19-3.71) for 3/4/5m-PFOS, 4.52 (4.14-4.99) for PFHxS, 4.55 (4.14-5.06) for PFHpS, and 5.01 (4.56-5.55) for 1 m-PFOS. The most important determinants of a shorter half-life were young age, and better kidney function measured by estimated glomerular filtration rate and ratio of paired urine and serum PFAS levels, followed by female sex during their fertile period aged 15-50. Markers of gut inflammation and reduced permeability i.e. zonulin and calprotectin were also possibly associated with shorter half-life. The results also suggested a time-dependent PFAS elimination process, with more rapid elimination in the first year after the end of exposure. CONCLUSION: The half-life estimates are in line with past estimates for some PFAS such as PFOA, and the novel results for different PFOS isomers. These results provide observational support for		A B

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Xia, Xiaowen;

Zheng, Yuxin;

Zhao, Nan;

Huan; Lin,

Yongfeng

ADME

D329

Tang, Xiaowen;

Wang, Bing; Lin,

Nontarget Identification of Novel Per- and

Polyfluoroalkyl Substances in Cord Blood Samples

	(参考)					
326	ADME	Alesio, Jessica L; Slitt, Angela; Bothun, Geoffrey D	Critical new insights into the binding of poly- and perfluoroalkyl substances (PFAS) to albumin protein	2022	Chemosphere. 2022 Jan;287(Pt 1):131979. doi: 10.1016/j.chemosphere.2021.131979. Epub 2021 Aug 21.	With an increasing number of health-related impacts of per- and polyfluoroalkyl substances pressing need to understand PFAS transport within both the human body and the environme transport mechanism for PFAS, understanding PFAS binding to proteins is essential for pred accurate values of protein binding constants are vital. In this work we present a critical analy analyzing PFAS binding to bovine serum albumin (BSA) based on fluorescence quenching: th Stern-Volmer model, and the Hill equation. The PFAS examined include perfluorooctanoic acti (PFNA), perfluorodecanoic acid (PFDA), perfluorobutanesulfonic acid (PFBS), perfluorohexa perfluorooctanesulfonic acid (PFOS), and the replacement compound 2,3,3,3-tetrafluoro-2-(I (HFPO-DA or GenX). While all three models capture the general effects of hydrophobicity and the Hill equation highlighted a unique relationship between binding cooperativity and the nui PFOA exhibiting the greatest binding cooperativity. The significance of steric limitations was obtained by fluorescence quenching, which is an indirect method based on specific binding, dialysis where PFAS binding directly correlated with traditional measures of hydrophobicity. correlated with PFAS physicochemical properties where van der Waals volume best describe fluorescence quenching.
327	ADME	Oh, Jiwon; Bennett, Deborah H; Tancredi, Daniel J; Calafat, Antonia M; Schmidt, Rebecca J; Hertz-Picciotto, Irva; Shin, Hyeong-Moo	Longitudinal Changes in Maternal Serum Concentrations of Per- and Polyfluoroalkyl Substances from Pregnancy to Two Years Postpartum	2022	Environ Sci Technol. 2022 Aug 16;56(16):11449-11459. doi: 10.1021/acs.est.1c07970. Epub 2022 Jul 29.	Exposure to per- and polyfluoroalkyl substances (PFAS) during pregnancy and lactation is of little is known about longitudinal changes in maternal PFAS concentrations from pregnancy is quantified 11 PFAS in 251 serum samples prospectively collected from 42 Northern Californi and third trimesters of pregnancy and at 3, 6, and 24 months after delivery over 2009-2017. V during pregnancy, early postpartum, and late postpartum to estimate percent changes of PFAS detected in more than 99% of samples, linear and branched perfluorooctanesulfonate perfluorooctanoate (n-PFOA), and perfluoronanoate (PFNA) concentrations changed -4% During early postpartum, perfluorohexanesulfonate (PFHxS) and n-PFOA concentrations changed -1% per month, and Sm-PFOS and PFNA concentrations changed -1% per month. During late postpartum, showing negative associations. Our findings might be useful for reco life PFAS exposures for offspring.
328	ADME	Zhang, Wenxiang; Liu, Zheyi; Zhou, Ye; Lai, Can; Sun, Binwen; He, Min; Zhai, Ziyang; Wang, Jian; Wang, Jian; Wang, Qi; Wang, Xian; Wang, Fangjun; Pan, Yuanjiang	Elucidating the molecular mechanisms of perfluorooctanoic acid-serum protein interactions by structural mass spectrometry	2022	Chemosphere. 2022 Mar;291(Pt 2):132945. doi: 10.1016/j.chemosphere.2021.132945. Epub 2021 Nov 16.	Perfluorooctanoic acid (PFOA) is a persistent environmental pollutant and will continually ac inertness and strong interaction with serum proteins, especially serum albumin (SA), inducin However, the molecular mechanisms of dynamic interactions between PFOA with serum pro development of potential therapeutic strategies. Herein, we developed an integrated structur the molecular details of dynamic interactions among PFOA, SA, and β -cyclodextrin (β -CD) (nMS), lysine reactivity profiling (LRP), and molecular docking (MD) simulation. The SA site observed as the primary interaction regions of PFOA. Further, β -CD can disrupt the PFOA c around sites Lys20, Lys280, Lys350, and Lys431-Lys439, with an overall reversing efficiency concentration to PFOA. The interactome of PFOA with complex human serum proteins is glo interaction details, including human serum albumin, apolipoprotein A-I, alpha-2-macroglobul reveal molecular insights into the detail of the interaction between PFOA and serum proteins toxicology.
						Per- and polyfluoroalkyl substances (PFASs) can penetrate the placental barrier and reach e causing adverse birth outcomes. Therefore, novel PFASs identification in cord blood and the are essential to evaluate prenatal exposure risk of PFASs. Herein, 16 legacy and 12 novel PF

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要旨(原文)	備考	出 情 対 報 象 抽	ン 文 ① ラ	ン 文 ⑦ ラ
With an increasing number of health-related impacts of per- and polyfluoroalkyl substances (PFAS) being reported, there is a pressing need to understand PFAS transport within both the human body and the environment. As proteins can serve as a primary transport mechanism for PFAS, understanding PFAS binding to proteins is essential for predictive physiological models where accurate values of protein binding constants are vital. In this work we present a critical analysis of three common models for analyzing PFAS binding to bovine serum albumin (BSA) based on fluorescence quenching: the Stern-Volmer model, the modified Stern-Volmer model, and the Hill equation. The PFAS examined include perfluorooctanoic acid (PFOA), perfluorononanoic acid (PFNA), perfluorodecanoic acid (PFDA), perfluorobutanesulfonic acid (PFBS), perfluorobexanesulfonic acid (PFHxS), perfluorooctanesulfonic acid (PFOS), and the replacement compound 2,3,3,3-tetrafluoro-2-(heptafluoropropoxy)propanoate (HFPO-DA or GenX). While all three models capture the general effects of hydrophobicity and steric limitations to PFAS binding, the Hill equation highlighted a unique relationship between binding cooperativity and the number of fluorinated carbons, with PFOA exhibiting the greatest binding cooperativity. The significance of steric limitations was confirmed by comparing results obtained by fluorescence quenching, which is an indirect method based on specific binding, to those obtained by equilibrium dialysis where PFAS binding directly correlated with traditional measures of hydrophobicity. Finally, the binding constants were correlated with PFAS physicochemical properties where van der Waals volume best described the steric limitations observed by fluorescence quenching.			В	С
Exposure to per- and polyfluoroalkyl substances (PFAS) during pregnancy and lactation is of increasing public health concern, but little is known about longitudinal changes in maternal PFAS concentrations from pregnancy to a few years postpartum. We quantified 11 PFAS in 251 serum samples prospectively collected from 42 Northern California mothers during the first, second, and third trimesters of pregnancy and at 3, 6, and 24 months after delivery over 2009-2017. We fit separate linear mixed models during pregnancy, early postpartum, and late postpartum to estimate percent changes of PFAS for each subperiod. Among five PFAS detected in more than 99% of samples, linear and branched perfluorooctanesulfonate (n- and Sm-PFOS), linear perfluorooctanoate (n-PFOA), and perfluoronanoate (PFNA) concentrations changed -4% to -3% per month during pregnancy. During early postpartum, perfluorohexanesulfonate (PFHxS) and n-PFOA concentrations changed -6% and -5%, respectively, per month, and Sm-PFOS and PFNA concentrations changed -1% per month. During late postpartum, n-PFOS, Sm-PFOS, and PFNA concentrations changed -1% per month. During late postpartum, showing negative associations. Our findings might be useful for reconstructing reliable prenatal or early life PFAS exposures for offspring.			A	В
Perfluorooctanoic acid (PFOA) is a persistent environmental pollutant and will continually accumulate in blood due to its chemical inertness and strong interaction with serum proteins, especially serum albumin (SA), inducing highly adverse health risks. However, the molecular mechanisms of dynamic interactions between PFOA with serum proteins remain unclear, limiting the development of potential therapeutic strategies. Herein, we developed an integrated structural strategy to systematically profile the molecular details of dynamic interactions among PFOA, SA, and β -cyclodextrin (β -CD) by combing native mass spectrometry (nMS), lysine reactivity profiling (LRP), and molecular docking (MD) simulation. The SA site 1, site 2 pockets, and cleft nearby are observed as the primary interaction regions of PFOA. Further, β -CD can disrupt the PFOA combinations with bovine SA regions around sites Lys20, Lys280, Lys350, and Lys431-Lys439, with an overall reversing efficiency of about 26% at an identical concentration to PFOA. The interactome of PFOA with complex human serum proteins is globally profiled with molecular interaction details, including human serum albumin, apolipoprotein A-I, alpha-2-macroglobulin, and complement C3. Our results reveal molecular insights into the detail of the interaction between PFOA and serum proteins, beneficial to understanding PFOA toxicology.			В	С
Per- and polyfluoroalkyl substances (PFASs) can penetrate the placental barrier and reach embryos through cord blood, probably causing adverse birth outcomes. Therefore, novel PFASs identification in cord blood and their relationships with birth outcomes are essential to evaluate prenatal exposure risk of PFASs. Herein, 16 legacy and 12 novel PFASs were identified in 326 cord blood samples collected from pregnant women in Jinan, Shandong, China. The presence of perfluoropolyether carboxylic acids, hydrogen-substituted polyfluoroetherpropane sulfate, and 3:3 chlorinated polyfluoroalkyl ether alcohol in cord blood was reported for the first time. Two extensive OECD (Organization for Economic Co-operation and Development)-defined PFASs named fipronil sulfone and 2-chloro-6-(trifluoromethyl)pyridine-3-ol were also identified. Quantification results showed that the emerging and OECD-defined PFASs separately accounted for 9.4 and 9.7% of the total quantified PFASs, while the legacy PFOA, PFOS, and PFHxS were still the most abundant PFASs with median concentrations of 2.12, 0.58, and 0.37 ng/mL, respectively. Several PFASs (C(9)-C(12) PFCAs, C(6)-C(8) PFSAs, and 6:2 CI-PFESA) showed significantly higher levels for older maternities than younger ones. PFHxS levels were positively associated with birth weight and ponderal index (p < 0.05). The results provide comprehensive information on the presence and exposure risks of several novel PFASs during the early life stage.			A	В

分野 著者 タイトル 発行年 書誌情報 要旨 (原文) No (参考) BACKGROUND: Per- and polyfluoroalkyl substances (PFAS) are associated with negative he life and infancy are of concern. A subgroup of PFAS, linear and branched perfluoroalkane su differences in biochemical reactions, bioaccumulation and potential toxic exposure effects, from mother to baby through placenta or in breastmilk are scarce. OBJECTIVES: The objecti branched and linear PFSA isomers in never-pregnant, pregnant and postpartum women and concentrations of branched and linear, perfluorohexane sulfonate (PFHxS), perfluoroheptan Varsi, Kristin; perfluorooctane sulfonate (PFOS) were measured in never-pregnant women (n = 158), preg Huber, Sandra: Quantitation of linear and branched perfluoroalkane 2022 Environ Int. 2022 Feb;160:107065. doi: and their infants (n = 94) at age six months. RESULTS: There was a linear relation between Averina, Maria; D330 ADME sulfonic acids (PFSAs) in women and infants during pregnancy week 18 and the infant at age six months. The PFSA concentrations in maternal 10.1016/j.envint.2021.107065. Epub 2021 Dec 24 Brox, Jan; Bjø pregnancy and lactation up to 20. The maternal branched/ linear PFHxS ratio increased in the latter part of pregnan rke-Monsen, postpartum, and was substantially lower in the infants. Branched/linear PFHpS ratio increas Anne-Lise in the infants, while the branched/linear PFOS ratio decreased in the mothers and was high inear relations between PFSA concentrations in infants aged six months and mothers in pre pregnancy and lactation are major excretion routes for PFSA, but accumulate in the infant. burden among mothers and infants, as well as the reduced maternal transfer of branched P of branched PFOS isoforms compared to the respective linear isoforms to the infant, might i associated with PFSA exposure, but this should be confirmed in future studies. The extensive use of perfluorooctanoic acid (PFOA), and its substitute hexafluoropropylene resulted in their frequent detection in environmental samples. However, little is known of th the influence of food co-ingestion on absorption. Here, the relative bioavailability (RBA) of P measured using an in vivo mouse model in the presence of food with different nutritional sta n vivo relative bioavailability of perfluorooctanoic acid RBA in soil was variable depending on nutrient co-administration, ranging from 29.8-95.5 % Cui, Xinyi; Gu, (PFOA) and its alternative hexafluoropropylene oxide Environ Int. 2022 Aug 3;168:107450. doi: PFOA and HFPO-TA, a significantly negative correlation was observed between RBA and pr D331 ADME Qian; Juhasz, 2022 trimer acid (HFPO-TA): Influence of food and 10.1016/j.envint.2022.107450. Online ahead of print. while a positive correlation was observed with carbohydrate content (r = 0.51-0.57). Mechan Albert: Chen. Yi food decreased PFOA and HFPO-TA RBA by down-regulating the expression of fatty acid bir mechanisms exploration regulating the expression of multidrug resistance associated protein 4 (Mrp4) in the liver, wh and efflux of PFOA and HFPO-TA. Dietary carbohydrates promoted albumin synthesis and u thereby enhancing absorption and increasing PFOA and HFPO-TA RBA. This study provides strategies for reducing exposure to per- and polyfluoroalkyl substances. Maso, Lorenzo; Trande, Matteo; Liberi, Stefano; Moro, Giulia; Perfluorooctanoic acid (PFOA) is a toxic compound that is absorbed and distributed through Daems, Elise; to serum proteins such as human serum albumin (hSA). Though the interaction between PF Linciano, Sara; assessed using various analytical techniques, a high resolution and detailed analysis of the Sobott, Frank; here the crystal structure of hSA in complex with PFOA and a medium-chain saturated fatty Covaceuszach Protein Sci. 2021 Apr;30(4):830-841. doi: 10.1002/pro.4036. binding sites, four occupied by PFOAs and four by FAs, have been identified. In solution bind Unveiling the binding mode of perfluorooctanoic acid 2021 Epub 2021 Mar 5. ADME D332 Sonia: Cassetta. to human serum albumin hSA stoichiometry and revealed the presence of one high and three low affinity binding sites Alberto; known hSA-binding drugs allowed locating the high affinity binding site in sub-domain IIIA. Fasolato, of the interaction between PFOA and hSA might provide not only a better assessment of the Silvano; Moretto mechanisms of these compounds in vivo but also have implications for the development of Ligia M; De diagnostic and biotechnological applications. Wael, Karolien; Cendron, Laura Angelini, Alessandro

	備考	出 情 対 報 象 抽	ン 文 ク 献 ① ラ	ン ク
ealth effects, and exposure during fetal llfonic acids (PFSA), have significant and data on transfer of PFSA isomers ve was to investigate differences in infants. METHODS: Serum e sulfonate (PFHpS) and nant and postpartum women (n = 114) maternal PFSA concentrations in and infant serum varied with a factor cy (+45%) and remained high sed during pregnancy and was highest in the infants. DISCUSSION: The egnancy week 18 confirm that The observed great variability in PFSA FHxS isoforms and increased transfer mpact adverse health effects			В	В
oxide trimer acid (HFPO-TA) has eir bioavailability via oral ingestion and PFOA and HFPO-TA in soil was atuses ($n = 11$). PFOA and HFPO-TA and 43.9-68.0 %, respectively. For both betein content in food ($r = 0.57-0.72$), nistic studies showed that protein in nding protein 1 (FABP1) and up- nich are responsible for the absorption p-regulated FABP1 expression an insight into potential dietary			В	В
out the body by noncovalent binding OA and hSA has been already binding mode is still lacking. We report acid (FA). A total of eight distinct ding studies confirmed the 4:1 PFOA- s. Competition experiments with The elucidation of the molecular basis e absorption and elimination novel molecular receptors for			A	С

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨 (原文)	備考	出 情 対 報 象 抽	ン 文 ク 献 ① ラ	ンゴ ク 『	文献ラ
D333	ADME	Wei, Xiaojun; Wang, Qian; Liu, Chang	Nanopore sensing of γ -cyclodextrin induced host- guest interaction to reverse the binding of perfluorooctanoic acid to human serum albumin	2022	Proteomics. 2022 Mar;22(5-6):e2100058. doi: 10.1002/pmic.202100058. Epub 2021 Oct 28.	Perfluorooctanoic acid (PFOA) has been one of the most common perfluorochemicals, which are globally pervasive contaminants that are persistent, bioaccumulative, toxic, and have adverse impacts on human health. The highest concentration of PFOA occurs in the blood, where it strongly binds to human serum albumins (HSA). Thus, a method to reverse the HSA-PFOA binding is critical to help facilitate the faster elimination of PFOA from the body to minimize its toxicological effects. Inspired by the remediation effect of cyclodextrin (CD) to PFOA through host-guest interactions, herein, by elucidating inter-molecular interactions using a nanopore sensor, we demonstrated in vitro reversal of the binding of PFOA to HSA using γ -cyclodextrin (γ -CD). The competition behavior for the complexation of PFOA between HSA and γ -CD was discussed in combination with in situ nanopore current recording and nuclear magnetic resonance (NMR) characterization. The present work not only demonstrates the potential therapeutic application of γ -CD for PFOA removal from human blood, but also provides an emerging method for investigating interactions between organic compounds and proteins.			В	с	
D334	ADME	Lupton, Sara J; Hakk, Heldur	Perfluorooctanoic Acid Uptake by Alfalfa (Medicago sativa) and Bioavailability in Sprague-Dawley Rats	2021	J Food Prot. 2021 Apr 1;84(4):688-694. doi: 10.4315/JFP-20- 389.	ABSTRACT: Perfluoroctanoic acid (PFOA) is a perfluorinated alkyl substance used as a surfactant in a wide variety of industrial and consumer products. Over the past decade, concern has increased over the presence of PFOA in biosolids from wastewater treatment plants used as fertilizer on agricultural lands because of the potential for PFOA to enter the food chain. In this study, the uptake of 14C-PFOA from soil by alfalfa and 14C-PFOA bioavailability from consumption of this alfalfa was evaluated in Sprague-Dawley rats. Alfalfa leaves accumulated 14C-PFOA up to 4 to 5 μ g/g of dry leaf, approximately 10 times higher than accumulation in the stem. Alfalfa was ground for feeding to 15 female Sprague-Dawley rats (175 to 200 g). Animals within metabolism cages were fed 10 g of feed (6 g of alfalfa plus 4 g of ground rat chow) twice daily for 14 days (equivalent to 50 μ g of 14C-PFOA per kg per day). At the end of the feeding period, three rats were euthanized for sample collection on each of withdrawal days 0, 3, 7, 11, and 14. During the feeding and withdrawal phases, urine and feces were collected daily. At necropsy, blood, liver, kidney, adipose, muscle, skin, brain, heart, adrenal glands, spleen, lungs, and thymus were removed and assayed for 14C-PFOA by combustion and liquid scintillation counting. Rats had eliminated 72.8% ± 3.4% of the total dose via urine at 14 days, but urinary radioactivity fell below the level of detection by day 3 of the withdrawal period. Fecal elimination was 6.5% ± 1.2% of the dose and fell below the level of detection by day 2 of the withdrawal period. The rapid and high elimination via urine indicates that a majority of the dose was absorbed. The uptake of 14C-PFOA into alfalfa was low from soil with a high organic concentration; however, 14C-PFOA was highly bioavailabile from the alfalfa when used as a feed component for rats. This study provides data for regulators investigating 14C-PFOA bioavailability and disposition in animals or animal products exposed to contaminated fe			В	С	
D335	ADME	Zhou, Yongbing; Qiao, Ying; Zhang, Xuemin; Ma, Xingzhuang; Liu, Hui; Wang, Li	PFOA exposure causes variations of Acot1 among tissues in rats, and Acot1 in serum can be potentially used as a sensitive marker for health monitoring	2022	Toxicol Res (Camb). 2022 Oct 3;11(5):872-880. doi: 10.1093/toxres/tfac065. eCollection 2022 Oct.	Perfluorooctanoic acid (PFOA) is a type of 8-carbon perfluoroalkyl substances (PFASs) widely used in industrial and domestic products, which now is a persistent organic pollutant (POP) found in the environment. Its structure is similar to fatty acids, which enables it to induce the expression of ACOT genes. To investigate the expression levels of Acot1 in various tissues and organs after exposure to PFOA for 28 days in rats, and to compare the variations of Acot1 expression in different tissues, we sectioned samples and incubated with Acot1 antibody. The results show that the transcription and protein expression levels of Acot1 gene were also detected in testis, muscle, and adipose. The results of immunohistochemistry were also verified by western blot detection, and we detected the transcription of Acot1 gene in these tissues and found that they all increased in varying degrees. In this study, the expression of Acot1 protein in rat serum was detected for the first time, and the expression level of Acot1 in rat organism was found to be higher than that in the control group after 4 days of depuration for 7 days of acute PFOA exposure, and Acot1 protein expression also showed an increase with increasing exposure time, indicating that Acot1 can be used as a sensitive biomarker for health monitoring of PFOA occupational workers or exposed persons.			В	В	
D336	ADME	Wen, Yong; Kong, Yi; Peng, Ying; Cui, Xinyi	Uptake, distribution, and depuration of emerging per- and polyfluoroalkyl substances in mice: Role of gut microbiota	2022	Sci Total Environ. 2022 Dec 20;853:158372. doi: 10.1016/j.scitotenv.2022.158372. Epub 2022 Aug 28.	The bioaccumulation and fate in mammals of hexafluoropropylene oxide trimer acid (HFPO-TA) and hexafluoropropylene oxide dimer acid (HFPO-DA), as major alternatives for perfluorooctanoate (PFOA), have rarely been reported. In addition, the role of gut microbiota was greatly understudied. In this study, the uptake, distribution, and depuration of HFPO-TA, HFPO-DA, and PFOA were investigated by exposure to mice for 14 days, followed by a clearance period of 7 days. The patterns of tissue distribution and depuration kinetics of HFPO-TA and PFOA were similar, but different from HFPO-DA. Liver was the main deposition organ for HFPO-TA and PFOA, making contributions of 58.8 % and 59.1 % to the total mass recovered on day 14. Depuration of HFPO-DA was more rapid than HFPO-TA and PFOA. Approximately 95.3 % of HFPO-DA in liver was eliminated on day 21 compared with day 14. While the clearance rates of HPFO-TA and PFOA were only 6.1 % and 13.9 % on day 21. The comparison between normal and pseudo germ-free mice (GM) was also conducted to investigate the effect of gut microbial on in vivo absorption of the three per-and polyfluoroalkyl substances (PFASs). Significantly higher ($p < 0.05$) concentrations of all the three PFASs were observed in most organs and tissues of GM compared with NC group. An analysis of gut microbiota showed that the higher absorption of PFASs in GM group may be attributed to the increase of intestinal permeability (as indicated by the decrease of tight junction protein expression), which were induced by the change of lachnospiraceae abundance. The result highlighted the importance of gut microbiota in absorption and health risk evaluation of emerging PFASs.			В	В	

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨 (原文)	備考	出 村 報 象 抽	ン 文 ク 献 ① ラ ② ラ
D337	ADME	Dourson, Michael; Gadagbui, Bernard	The Dilemma of perfluorooctanoate (PFOA) human half-life	2021	Regul Toxicol Pharmacol. 2021 Nov;126:105025. doi: 10.1016/j.yrtph.2021.105025. Epub 2021 Aug 14.	Disparity in the results from human observational and clinical studies is not uncommon, but risk assessment efforts often judge one set of data more relevant with the loss of valuable information. The assessment for perfluorooctanoate (PFOA) is a good example of this problem. The estimation of its safe dose is disparate among government groups due in part to differences in understanding of its half-life in humans. These differences are due in part to incomplete information on sources of exposure in the human observational half-life studies, which have been routinely acknowledged, but until recently not well understood. Exposure information is thus critical in understanding, and possibly resolving, this disparity in PFOA safe dose, and potentially for disparities with similar chemistries when both human observational and clinical findings are available. We explore several hypotheses to explain this disparity in PFOA half-life from human observational studies in light of findings of a clinical study in humans and relevant exposure information from a recent international meeting of the Society of Toxicology and Environmental Chemistry (SETAC). Based on information from both human observational studies and clinical data, we proposed a range for the half-life for PFOA of 0.5-1.5 years, which would likely raise many existing regulatory safe levels if all other parameters stayed the same.	評価書文 献と重複		A
D338	ADME	Campbell, Jerry; Clewell, Harvey; Cox, Tony; Dourson, Michael; Ethridge, Shannon; Forsberg, Norman; Gadagbui, Bernard; Hamade, Ali; Naidu, Ravi; Pechacek, Nathan; Peixe, Tiago Severo; Prueitt, Robyn; Rachamalla, Mahesh; Rhomberg, Lorenz; Smith,	The Conundrum of the PFOA human half-life, an international collaboration	2022	Regul Toxicol Pharmacol. 2022 Jul;132:105185. doi: 10.1016/j.yrtph.2022.105185. Epub 2022 May 7.	The Steering Committee of the Alliance for Risk Assessment (ARA) opened a call for scientists interested in resolving what appeared to be a conundrum in estimating of the half-life of perfluorooctanoate (PFOA) in humans. An Advisory Committee was formed from nominations received and a subsequent invitation led to the development of three small independent working groups to review appropriate information and attempt a resolution. Initial findings were shared among these groups and a conclusion developed from the ensuing discussions. Many human observational studies have estimated the PFOA half-life. Most of these studies note the likely occurrence of unmonitored PFOA exposures, which could inflate values of the estimated PFOA half-life. Also, few of these studies estimated the half-life of PFOA isomers, the branched chains of which likely have shorter half-lives. This could deflate values of the estimated linear PFOA half-life. Fortunately, several studies informed both of these potential problems. The majority opinion of this international collaboration is that the studies striking the best balance in addressing some of these uncertainties indicate the likely central tendency of the human PFOA half-life is less than 2 years. The single best value appears to be the geometric mean (GM) of 1.3 years (Zhang et al., 2013, Table 3), based on a GM = 1.7 years in young females (n = 20) and GM = 1.2 years in males of all ages and older females (n = 66). However, a combined median value from Zhang et al. (2013) of 1.8 years also adds value to this range of central tendency. While the Collaboration found this study to be the least encumbered with unmonitored PFOA exposures and branched isomers, more studies of similar design would be valuable. Also valuable would be clarification around background exposures in other existing studies in case adjustments to half-life estimates are attempted.	評価書文 献と重複		В
D339	ADME	James; Verma, Kimura, Osamu; Fujii, Yukiko; Haraguchi, Koichi; Kato, Yoshihisa; Ohta, Chiho; Koga, Nobuyuki; Endo, Tetsuya	Effects of perfluoroalkyl carboxylic acids on the uptake of sulfobromophthalein via organic anion transporting polypeptides in human intestinal Caco-2 cells	2020	Biochem Biophys Rep. 2020 Sep 7;24:100807. doi: 10.1016/j.bbrep.2020.100807. eCollection 2020 Dec.	We performed a detailed investigation of the uptake of sulfobromophthalein (BSP) from the apical membrane of Caco-2 cells, which is a substrate for organic anion transporting polypeptides (OATPs), and calculated the kinetic parameters of BSP uptake as follows: $K(m) = 13.9 \pm 1.3 \mu$ M, $V(max) = 1.15 \pm 0.07$ nmol (mg protein)(-1) (5 min)(-1), and k(d) = 38.2 \pm 0.53 \mu L (mg protein)(-1) (5 min)(-1). Coincubation with medium-chain (C7-C11) perfluoroalkyl carboxylic acids (PFCAs), such as perfluoroheptanoic acid (PFHpA, C7), perfluoroctanoic acid (PFOA, C8), perfluorononanoic acid (PFNA, C9), perfluorodecanoic acid (PFDA, C10) and perfluoroundecanoic acid (PFUnDA, C11), significantly decreased BSP uptake by 27-55%, while coincubation with short- (C3-C6) and long-chain (C12-C14) PFCAs decreased the uptake only slightly. Dixon plotting suggested that PFOA, PFNA and PFDA competitively inhibited the BSP uptake with inhibition constant (K(i)) values of 62.2 ± 1.3 μ M, 35.3 \pm 0.1 μ M and 43.2 \pm 0.3 μ M, respectively. PFCAs with medium-chains could be substrates for OATPs, probably OATP2B1, which is the most abundantly expressed OATP isoform in Caco-2 cells.			ВВ
D340	ADME	Ducatman, Alan; Luster, Michael; Fletcher, Tony	Perfluoroalkyl substance excretion: Effects of organic anion-inhibiting and resin-binding drugs in a community setting	2021	Environ Toxicol Pharmacol. 2021 Jul;85:103650. doi: 10.1016/j.etap.2021.103650. Epub 2021 Apr 2.	BACKGROUND: Longer serum half-lives of perfluoroalkyl substances (PFAS) in humans compared to other species has been attributed to differences in the activity of organic anion transporters (OAT). METHODS: Among 56,175 adult participants in the community-based C8 Health Project, 23 subjects were taking the uricosuric OAT-inhibitor probenecid, and 36 subjects were taking the bile acid sequestrant cholestyramine. In regression models of log transformed serum PFAS, medication effects were estimated in terms of mean ratios, adjusting for age, gender, BMI, estimated glomerular filtration rate (eGFR) and water-district of residence. RESULTS: Probenecid was associated with modest, but not statistically significant increases in serum PFAS concentrations. In contrast, cholestyramine significantly lowered serum PFAS concentrations, notably for perfluorooctane sulfonic acid (PFOS). CONCLUSIONS: The effectiveness of cholestyramine in a community setting supports the importance of gastrointestinal physiology for PFAS excretion kinetics, especially for PFOS. We did not find clear evidence that probenecid, an inhibitor of OAT, affects PFAS clearance.			A B

No.	分野 (参考)	分野 著者 タイトル (参考)		発行年	書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン 文 ク 献 ① ラ	ン ク ②	文 献 ラ
D341	ADME	Hong, Aobo; Zhuang, Lili; Cui, Wenxuan; Lu, Qun; Yang, Pan; Su, Shu; Wang, Bin; Zhang, Guohuan; Chen, Da	Per- and polyfluoroalkyl substances (PFAS) exposure in women seeking in vitro fertilization-embryo transfer treatment (IVF-ET) in China: Blood-follicular transfer and associations with IVF-ET outcomes	2022	Sci Total Environ. 2022 Sep 10;838(Pt 3):156323. doi: 10.1016/j.scitotenv.2022.156323. Epub 2022 May 28.	As follicular fluid constitutes a critical microenvironment for the development of oocytes, investigation of environmental contaminants in follicular fluid may facilitate a better understanding of the influence of environmental exposure on reproductive health. In the present study, we aimed to investigate per- and polyfluoroalkyl substances (PFAS) exposure in women receiving in vitro fertilization-embryo transfer (IVF-ET) treatment, determine the blood-follicle transfer efficiencies (BFTE) of PFAS, and explore potential associations between PFAS exposure and selected IVF-ET outcomes. Our results revealed that n-PFOA was the most abundant PFAS in both serum and follicular fluid (FF) (median = 5.85 and 5.56 ng/mL, respectively), followed by n-PFOS (4.95 and 4.28 ng/mL), 6:2 CI-PFESA (2.18 and 2.10 ng/mL), PFNA (1.37 and 1.37 ng/mL), PFUdA (0.33 and 0.97 ng/mL), PFDA (0.37 and 0.66 ng/mL), PFHxS (0.42 and 0.39 ng/mL), and PFHpS (0.11 and 0.10 ng/mL). The median BFTE ranged from 0.65 to 0.92 for individual PFAS, indicating a relatively high tendency of PFAS to cross the blood-follicle barrier (BFB). An inverted V-shaped trend was observed between the median BFTE and the number of fluorinated carbon atoms or the log K(ow) (octanol-water partition coefficient) for individual PFAS, suggesting the influence by physicochemical properties and molecular structures. Although our data did not find any clear pattern in the link between blood or follicular fluid concentrations of PFAS and selected IVF-ET outcomes, our study raises the need for better characterization of exposure to environmental chemicals in follicular fluid to transfer and the properties and molecular fluid to transfer and selected IVF-ET outcomes, our study raises the need for better characterization of exposure to environmental chemicals in follicular fluid teratibar with its patential influence on reproductive health			В	Е	;
D342	ADME	Wang, Jinghua; Pan, Yitao; Wei, Xiaofei; Dai, Jiayin	Temporal Trends in Prenatal Exposure (1998-2018) to Emerging and Legacy Per- and Polyfluoroalkyl Substances (PFASs) in Cord Plasma from the Beijing Cord Blood Bank, China	2020	Environ Sci Technol. 2020 Oct 20;54(20):12850-12859. doi: 10.1021/acs.est.0c01877. Epub 2020 Oct 1.	Due to developmental toxicity, prenatal exposure to per- and polyfluoroalkyl substances (PFASs) in animals may result in adverse effects on the fetus. However, little information is available on PFASs presence in the human cord plasma. Here, we measured the levels of 37 emerging and legacy PFASs in 650 cord plasma samples collected every 5 years spanning 1998 to 2018 by the Beijing Cord Blood Bank and evaluated changes in PFASs concentrations using generalized additive models. We observed an increase in the concentrations of 24 PFASs (Σ (24)PFASs) from 1998 to 2003 followed by a decrease every 5 years from 2003 to 2018. For legacy PFASs, similar trends were observed for PFOS, whereas PFOA levels did not decline until 2013. For emerging chemicals, 6:2 CI-PFESA showed a similar trend as PFOS, and prenatal exposure to 6:2 CI-PFESA could be traced back to 1998, with a median concentration of 0.411 ng/mL in plasma. Our data showed that prenatal exposure to legacy PFASs has gradually decreased in cord plasma from the Beijing Cord Blood Bank in recent years, and the discovery of the presence of emerging chemicals in 1998 suggested that further evaluation is needed to assess possible health risks to pregnant women and fetuses			В	E	;
D343	ADME	Bjorke-Monsen, Anne-Lise; Varsi, Kristin; Averina, Maria; Brox, Jan; Huber, Sandra	Perfluoroalkyl substances (PFASs) and mercury in never-pregnant women of fertile age: association with fish consumption and unfavorable lipid profile	2020	BMJ Nutr Prev Health. 2020 Nov 4;3(2):277-284. doi: 10.1136/bmjnph-2020-000131. eCollection 2020 Dec.	OBJECTIVES: To examine concentrations of perfluoroalkyl substances (PFASs) and lifestyle factors that may contribute to higher levels of pollutants in never-pregnant women of fertile age. DESIGN: Observational cross-sectional study. SETTING: Participants were recruited among employees and students at Haukeland University Hospital and the University of Bergen, Norway. PARTICIPANTS: Healthy, never-pregnant Norwegian women (n=158) of fertile age (18-39 years). OUTCOMES: Concentrations of 20 different PFASs, mercury (Hg), lead, cadmium, total, high-density lipoprotein and low-density lipoprotein (LDL) cholesterol, in addition to self-reported data on dietary intake. RESULTS: Seven PFASs were detected in more than 95% of the women. Women aged 30-39 years had higher concentrations of sum PFAS compared with younger women. Serum PFASs were significantly intercorrelated (rho: 0.34-0.98, p<0.001) and six of them were significantly correlated to whole blood Hg (rho: 0.21-0.74, p<0.01). Fish consumption was the strongest predictor for most serum PFASs and for whole blood Hg. Fish consumption and serum perfluorooctanesulfonic acid (PFOS) concentrations were both positively associated with serum total and LDL cholesterol, established risk factors for cardiovascular disease. CONCLUSIONS: The majority of Norwegian never-pregnant women of fertile age had a mixture of seven different PFASs and Hg detected in their blood. PFAS concentrations were higher in older women and associated with fish intake. As the mean age of women at first birth is increasing, several factors require further consideration including diet, as this may influence the burden of PFAS to the next generation. TRIAL REGISTRATION NUMBER: ClinicalTrials.gov ID: NCT03272022, Unique Protocol ID: 2011/2447, Regional Committee for Medical Research Ethics West (2011/2447), 12 January 2012.			В	Α	٢

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン 文 ク 献 ① ラ	: ン た ク ラ ②	文 献) ラ
D344	ADME	Li, Wenting; Hu, Yuhong; Bischel, Heather N	In-Vitro and In-Silico Assessment of Per- and Polyfluoroalkyl Substances (PFAS) in Aqueous Film- Forming Foam (AFFF) Binding to Human Serum Albumin	2021	Toxics. 2021 Mar 17;9(3):63. doi: 10.3390/toxics9030063.	Drinking water contaminated by fluorosurfactant-based aqueous film-forming foams (AFFF) is a source of human exposure to poly- and perfluoroalkyl substances (PFAS). However, assessment of bioaccumulation potentials of diverse PFAS in commercial products such as AFFF have been insufficient and challenging, especially due to a lack of analytical standards. Here we explore the value of suspect screening, equilibrium dialysis, and molecular-docking simulations to identify potentially bioaccumulative PFAS. We exposed human serum albumin (HSA) protein to dilutions of a legacy AFFF produced by 3M in 1999 using equilibrium dialysis and screened in-vitro protein-binding affinities using high-resolution mass spectrometry (HRMS). Through suspect screening, we identified 32 PFAS and 18 hydrocarbon surfactants in the AFFF that bound to HSA. Quantification of noncovalent association constants for 26 PFAS standards confirmed that many PFAS, including the short-chain perfluoropropane sulfonic acid (log K(a)= 4.1 ± 0.2 M(-1)), exhibit strong binding affinities with HSA. At least five PFAS in AFFF (including three PFAS with less than five perfluorocarbons) remained bound to the precipitated HSA pellet after extensive solvent washing-an indication of high PFAS binding potential. Three PFAS (PFBS, PFOS, and PFOA) were confirmed in the protein pellet with analytical standards and quantified after acid digestion-this sample fraction accounted for 5 to 20% of each compound mass in the sample. We calculated pseudo-bioconcentration factors (BCF(pseudo)) for PFAS that suspect screening flagged as noncovalently bound or potentially covalently bound. Most PFAS exhibiting high BCF(pseudo), especially those with seven perfluorocarbons, contained a carboxylic acid or a sulfonic acid. Finally, we used molecular docking to simulate HSA binding affinities for 62 ligands (26 PFAS targets, 18 PFAS qualified in AFFF, and 18 hydrocarbon surfactants qualified in AFFF). We found that molecular docking can effectively separate HSA-binding and -nonbind			В		В
D345	ADME	Li, Jing; Luo, Kai; Liu, Xiaotu; Tang, Shuqin; Zhang, Jun; Chen, Da	Chemical-specific determinants for pre-conceptional exposure to emerging and legacy per- and polyfluoroalkyl substances	2022	Sci Total Environ. 2022 May 1;819:152501. doi: 10.1016/j.scitotenv.2021.152501. Epub 2021 Dec 27.	The exposure of preconception women to per- and polyfluoroalkyl substances (PFASs) could negatively affect her reproductive health. However, chemical-specific determinants for pre-conceptional exposure to PFASs, particularly the emerging ones, remain poorly understood. In the present study, it was found that the total PFAS concentration ranged from 8.9 to 440.3 ng/mL (median: 49.6 ng/mL) in 1060 preconception women. The PFAS exposure profile was dominated by PFOA (16.8 ng/mL), followed by PFOS (13.3 ng/mL), 6:2 CI-PFESA (8.9 ng/mL), PFDA (2.4 ng/mL), PFNA (2.1 ng/mL), and others. The pre-conceptional exposure to the selected PFASs was significantly associated, in a chemical-specific pattern, with multiple demographic characteristics and the consumption frequency of different types of food. In particular, the exposure to 6:2 CI-PFESA was associated with age, parity, alcohol drinking, educational level, household income, and the consumption frequency of red meat, marine and freshwater fish, shellfish, and shrimp. However, our analysis revealed that the investigated sociodemographic and diet variables only explained a relatively small proportion (1.3%-18.7%) of PFAS concentration variations, raising the need of exploring additional factors critical to pre-conceptional PFAS exposure. Overall, the identification of chemical-specific determinants would greatly facilitate the understanding of the link between pre-conceptional exposure and health outcomes, and the mitigation of human exposure to PFAS, particularly the emerging ones.			В		В
D346	ADME	Ruggiero, Melissa J; Miller, Haley; Idowu, Jessica Y; Zitzow, Jeremiah D; Chang, Shu- Ching; Hagenbuch, Bruno	Perfluoroalkyl Carboxylic Acids Interact with the Human Bile Acid Transporter NTCP	2021	Livers. 2021 Dec;1(4):221-229. doi: 10.3390/livers1040017. Epub 2021 Oct 18.	Na(+)/taurocholate cotransporting polypeptide (NTCP) is important for the enterohepatic circulation of bile acids, which has been suggested to contribute to the long serum elimination half-lives of perfluoroalkyl substances in humans. We demonstrated that some perfluoroalkyl sulfonates are transported by NTCP; however, little was known about carboxylates. The purpose of this study was to determine if perfluoroalkyl carboxylates would interact with NTCP and potentially act as substrates. Sodium-dependent transport of [(3)H]-taurocholate was measured in human embryonic kidney cells (HEK293) stably expressing NTCP in the absence or presence of perfluoroalkyl carboxylates with varying chain lengths. PFCAs with 8 (PFOA), 9 (PFNA), and 10 (PFDA) carbons were the strongest inhibitors. Inhibition kinetics demonstrated competitive inhibition and indicated that PFNA was the strongest inhibitor followed by PFDA and PFOA. All three compounds are transported by NTCP, and kinetics experiments revealed that PFOA had the highest affinity for NTCP with a K(m) value of 1.8 ± 0.4 mM. The K(m) value PFNA was estimated to be 5.3 ± 3.5 mM and the value for PFDA could not be determined due to limited solubility. In conclusion, our results suggest that, in addition to sulfonates, perfluorinated carboxylates are substrates of NTCP and have the potential to interact with NTCP-mediated transport.	『 価書文 代と重複		A		С

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文) 備考	出 情 対 報 象 抽	ン 文 ク 献 ① ラ	ン 文 ク 献 ② ラ
D347	ADME	Chou, Wei-Chun; Lin, Zhoumeng	Development of a Gestational and Lactational Physiologically Based Pharmacokinetic (PBPK) Model for Perfluorooctane Sulfonate (PFOS) in Rats and Humans and Its Implications in the Derivation of Health-Based Toxicity Values	2021	Environ Health Perspect. 2021 Mar;129(3):37004. doi: 10.1289/EHP7671. Epub 2021 Mar 17.	BACKGROUND: There is a great concern on potential adverse effects of exposure to perfluorooctane sulfonate (PFOS) in sensitive subpopulations, such as pregnant women, fetuses, and neonates, due to its reported transplacental and lactational transfer and reproductive and developmental toxicities in animals and humans. OBJECTIVES: This study aimed to develop a gestational and lactational physiologically based pharmacokinetic (PBPK) model in rats and humans for PFOS to aid risk assessment in sensitive human subpopulations. METHODS: Based upon existing PBPK models for PFOS, the present model addressed a data gap of including a physiologically based description of basolateral and apical membrane transporter-mediated renal reabsorption and excretion in kidneys during gestation and lactation. The model was calibrated with published rat toxicokinetic and human biomonitoring data and was independently evaluated with separate data. Monte Carlo simulation was used to address the interindividual variability. RESULTS: Model simulations were generally within 2-fold of observed PFOS concentrations in maternal/fetal/neonatal plasma and liver in rats and humans. Estimated fifth percentile human equivalent doses (HEDs) based on selected critical toxicity studies in rats following U.S. Environmental Protection Agency (EPA) guidelines ranged from 0.08 to 0.91 μ g/kg per day. These values are lower than the HEDs estimated in U.S. EPA guidance (0.51 - 1.6 μ g/kg per day) using an empirical toxicokinetic model in adults. CONCLUSIONS: The results support the importance of renal reabsorption/excretion during pregnancy and lactation in PFOS dosimetry and suggest that the derivation of health-based toxicity values based on developmental toxicity studies should consider gestational/lactational dosimetry estimated from a life stage-appropriate PBPK model. This study provides a quantitative tool to aid risk reevaluation of PFOS, All model codes and detailed tutorials are provided in the Supplemental Materials to allow readers to reprodu			В
D348	ADME	Robuck, Anna R; McCord, James P; Strynar, Mark J; Cantwell, Mark G; Wiley, David N; Lohmann, Rainer	Tissue-specific distribution of legacy and novel per- and polyfluoroalkyl substances in juvenile seabirds	2021	Environ Sci Technol Lett. 2021 Jun 8;8(6):457-462. doi: 10.1021/acs.estlett.1c00222. Epub 2021 May 17.	Of the thousands of per- and polyfluoroalkyl substances (PFAS) in the environment, few have been investigated in detail. In this study, we analyzed 36 legacy and emerging PFAS in multiple seabird tissues collected from individuals from Massachusetts Bay, Narragansett Bay and the Cape Fear River Estuary. PFOS was the dominant compound across multiple tissues, while long-chain perfluorinated carboxylic acids (PFCAs) dominated in brain (mean = 44% of total concentrations). Emerging perfluoroalkyl ether acids (PFEAs)-Nafion byproduct-2 and PFO5DoDA - were detected in greater than 90% of tissues in birds obtained from a nesting region downstream from a major fluorochemical production site. Compound ratios, relative body burden calculations, and electrostatic surface potential calculations were used to describe partitioning behavior of PFEAs in different tissues. Novel PFEAs preferentially partition into blood compared to liver, and were documented in brain for the first time. PFO5DoDA showed a reduced preference for brain compared to PFCAs and Nafion BP2. These results suggest future monitoring efforts and toxicological studies should focus on novel PFAS and long-chain PFCAs in multiple tissues beyond liver and blood, while exploring the unique binding mechanisms driving uptake of multi-ether PFEAs.		В	С
D349	ADME	Moro, Giulia; Liberi, Stefano; Vascon, Filippo; Linciano, Sara; De Felice, Sofia; Fasolato, Silvano; Foresta, Carlo; De Toni, Luca; Di Nisio, Andrea; Cendron, Laura; Angelini, Alessandro	Investigation of the Interaction between Human Serum Albumin and Branched Short-Chain Perfluoroalkyl Compounds	2022	Chem Res Toxicol. 2022 Nov 21;35(11):2049-2058. doi: 10.1021/acs.chemrestox.2c00211. Epub 2022 Sep 23.	The current trend dealing with the production of per- and polyfluoroalkyl substances (PFASs) involves the shifting toward branched short-chain fluorinated compounds known as new-generation PFASs. A key aspect to be clarified, to address the adverse health effects associated with the exposure to PFASs, is their binding mode to human serum albumin (hSA), the most abundant protein in plasma. In this study, we investigated the interaction between hSA and two representative branched short-chain PFASs, namely, HPFO-DA and C6O4. In-solution studies revealed that both compounds bind hSA with affinities and stoichiometries lower than that of the legacy long-chain perfluoroalkyl compound PFOA. Competition experiments using hSA-binding drugs with known site-selectivity revealed that both HPFO-DA and C6O4 bound to pockets located in subdomain IIIA. The crystal structure of hSA in complex with HPFO-DA unveiled the presence of two binding sites. The characterization and direct comparison of hSA interactions with new-generation PFASs may be key elements for the understanding of the toxicological impact of these compounds.		С	С
D350	ADME	Post, Gloria B; Birnbaum, Linda S; DeWitt, Jamie C; Goeden, Helen; Heiger- Bernays, Wendy J; Schlezinger, Jennifer J	Letter to the editors regarding "The conundrum of the PFOA human half-life, an international collaboration"	2022	Regul Toxicol Pharmacol. 2022 Oct;134:105240. doi: 10.1016/j.yrtph.2022.105240. Epub 2022 Aug 13.	No abstract available		С	D

別添-2 文献データベース文献リスト

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨 (原文)	備考	出 対 報 抽	ン文ン ク献ク ① ラ②	文 献 う
D351	ADME	Campbell, Jerry; Clewell, Harvey; Cox, Tony; Dourson, Michael; Ethridge, Shannon; Forsberg, Norman; Gadagbui, Bernard; Hamade, Ali; Naidu, Ravi; Pechacek, Nathan; Peixe, Tiago Severo; Prueitt, Robyn; Rachamalla, Mahesh; Rhomberg, Lorenz; Smith, James; Verma,	Response to letter to editor "letter to the editors regarding "the Conundrum of the PFOA human half- life, an international collaboration."	2022	Regul Toxicol Pharmacol. 2022 Oct;134:105246. doi: 10.1016/j.yrtph.2022.105246. Epub 2022 Aug 12.	No abstract available			СЕ	D
D352	ADME	Zhang, Bo; Wei, Ziyang; Gu, Cheng; Yao, Yiming; Xue, Jingchuan; Zhu, Hongkai; Kannan, Kurunthachalam; Sun, Hongwen; Zhang, Tao	First Evidence of Prenatal Exposure to Emerging Poly- and Perfluoroalkyl Substances Associated with E- Waste Dismantling: Chemical Structure-Based Placental Transfer and Health Risks	2022	Environ Sci Technol. 2022 Nov 18. doi: 10.1021/acs.est.2c05925. Online ahead of print.	Limited information is available about prenatal exposure to per- and polyfluoroalkyl substances (PFAS) in electronic waste (e- waste) recycling sites. In this study, we determined 21 emerging PFAS and 13 legacy PFAS in 94 paired maternal and cord serum samples collected from an e-waste dismantling site in Southern China. We found 6:2 fluorotelomer sulfonate (6:2 FTSA), 6:2 chlorinated polyfluorinated ether sulfonate (6:2 CI-PFESA), and perfluorooctanephosphonate (PFOPA) as the major emerging PFAS, regardless of matrices, at median concentrations of 2.40, 1.78, and 0.69 ng/mL, respectively, in maternal serum samples, and 2.30, 0.73, and 0.72 ng/mL, respectively, in cord serum samples. Our results provide evidence that e-waste dismantling activities contribute to human exposure to 6:2 FTSA, 6:2 CI-PFESA, and PFOPA. The trans-placental transfer efficiencies of emerging PFAS (0.42-0.94) were higher than that of perfluorooctanesulfonic acid (0.37) and were structure-dependent. The substitution of fluorine with chlorine or hydrogen and/or hydrophilic functional groups may alter trans-placental transfer efficiencies. Multiple linear regression analysis indicated significant associations between maternal serum concentrations of emerging PFAS and maternal clinical parameters, especially liver function and erythrocyte-related biomarkers. This study provides new insights into prenatal exposure to multiple PFAS in e-waste dismantling areas and the prevalence of emerging PFAS in people living near the sites.			ВЕ	В
D353	ADME	Xie, Meng-Yi; Lin, Zhi-Ying; Liu, Liang-Ying; Wu, Chen-Chou; Liu, Ya-Wei; Huang, Guang- Long; Zeng, Eddy Y	Use of glioma to assess the distribution patterns of perfluoroalkyl and polyfluoroalkyl substances in human brain	2022	Environ Res. 2022 Mar;204(Pt A):112011. doi: 10.1016/j.envres.2021.112011. Epub 2021 Sep 4.	Human brain has a complex structure and is able to perform powerful functions. Blood-brain barrier blocks the entry of foreign substances and maintains the homeostasis of the brain. However, some exogenous substances are still able to pass through the blood-brain barrier, with distribution patterns yet to be clarified. Perfluoroalkyl and polyfluoroalkyl substances (PFASs), including perfluoroalkyl carboxylic acids (PFCAs), perfluoroalkyl sulfonic acids (PFSAs), a precursor (perfluorooctane sulfonamide that can be degraded to other substances), and emerging PFASs, were analyzed for the first time in living human brain glioma. The target compounds were detected and quantified in 25 out of 26 glioma samples. The concentration range of Σ PFAS was < RL-51 ng g(-1) wet weight (applied to all reported concentrations), with a median of 2.9 ng g(-1). The most abundant compound was PFCAs (40%), followed by PFSAs (28%), emerging PFASs (22%), and perfluorooctane sulfonamide (10%). Abundant alternatives PFASs, including short-chain PFCAs, short-chain PFSAs, and emerging PFASs (52% of Σ PFAS), were found in the glioma samples, supporting the notion that low molecular weight exogenous compounds have high permeability to cross the blood-brain barrier and accumulate in brain tissue. Gender difference was not significant (p > 0.05) in the concentrations of PFASs in the glioma samples. Concentrations of PFASs increased with increasing age, from 0.61 ng g(-1) (0-14 years old) to 1.6 ng g(-1) (>48 years old), with no significant linear correlation with age. The present study suggested that glioma is an effective indicator for monitoring exogenous contaminants in brain tissues.			ВЕ	В

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No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 ク献 ク粛 象抽 ① ラ ②
D354	ADME	Jackson, Thomas W; Scheibly, Chris M; Polera, M E; Belcher, Scott M	Rapid Characterization of Human Serum Albumin Binding for Per- and Polyfluoroalkyl Substances Using Differential Scanning Fluorimetry	2021	Environ Sci Technol. 2021 Sep 21;55(18):12291-12301. doi: 10.1021/acs.est.1c01200. Epub 2021 Sep 8.	Per- and polyfluoroalkyl substances (PFAS) are a diverse class of synthetic chemicals that accumulate in the environment. Many proteins, including the primary human serum transport protein albumin (HSA), bind PFAS. The predictive power of physiologically based pharmacokinetic modeling approaches is currently limited by a lack of experimental data defining albumin-binding properties for most PFAS. A novel thermal denaturation assay was optimized to evaluate changes in the thermal stability of HSA in the presence of increasing concentrations of known ligands and a structurally diverse set of PFAS. Assay performance was initially evaluated for fatty acids and HSA-binding drugs ibuprofen and warfarin. Concentration-response relationships were determined and dissociation constants (K(d)) for each compound were calculated using regression analysis of the dose-dependent changes in HSA melting temperature. Estimated K(d) values for HSA binding of octanoic acid, decanoic acid, hexadecenoic acid, ibuprofen, and warfarin agreed with established values. The binding affinities for 24 PFAS that included perfluoroalkyl carboxylic acids (C4-C12), perfluoroalkyl sulfonic acids (C4-C8), mono- and polyether perfluoroalkyl ether acids, and polyfluoroalkyl fluorotelomer substances were determined. These results demonstrate the utility of this differential scanning fluorimetry assay as a rapid high-throughput approach for determining the relative protein-binding properties and identification of		вс
D355	ADME	Zhu, Yumin; Jia, Yibo; Wang, Xiao; Yi, Shujun; Li, Yuqing; Zhong, Wenjue; Zhu, Lingyan	Mechanisms Underlying the Impacts of Lipids on the Diverse Bioavailability of Per- and Polyfluoroalkyl Substances in Foods	2022	Environ Sci Technol. 2022 Mar 15;56(6):3613-3622. doi: 10.1021/acs.est.1c06461. Epub 2022 Feb 23.	chemical structures involved in binding for large numbers of structurally diverse PFAS. Food is a major source of human exposure to per- and polyfluoroalkyl substances (PFASs), yet little is known about their bioavailability in food matrices. Here, the relative bioavailability (RBA) of PFASs in foods was determined using an in vivo mouse model. Pork, which had the highest lipid content, exhibited the greatest effect on bioavailability by increasing the RBAs of perfluoroalkyl acids (PFAAs) while reducing those of fluorotelomer phosphate diesters (diPAPs). During intestinal digestion of lipids, the bioaccessibility of PFAAs increased due to their greater partition into the stable mixed micelles. However, diPAPs were more likely to partition into the undigested oil phase due to their strong hydrophobicity. Both in vitro incubation and molecular docking results indicated that the PFAAs exhibited stronger binding affinities with mouse blood chylomicrons (CMs) than with diPAPs. Collectively, both lipid digestion in the intestine and the carrier effect of CMs played important roles in modulating the bioavailability of PFASs in food. More attention should be given to further evaluating the health risks of PFASs associated with the intake of high-lipid foods.		BB
D356	ADME	Ragnarsdóttir, Oddný; Abdallah, Mohamed Abou- Elwafa; Harrad, Stuart	Dermal uptake: An important pathway of human exposure to perfluoroalkyl substances?	2022	Environ Pollut. 2022 Aug 15;307:119478. doi: 10.1016/j.envpol.2022.119478. Epub 2022 May 16.	Per- and polyfluoroalkyl substances (PFAS) have been produced and used in a broad range of products since the 1950s. This class, comprising of thousands of chemicals, have been used in many different products ranging from firefighting foam to personal care products and clothes. Even at relatively low levels of exposure, PFAS have been linked to various health effects in humans such as lower birth weight, increased serum cholesterol levels, and reduced antibody response to vaccination. Human biomonitoring data demonstrates ubiquitous exposure to PFAS across all age groups. This has been attributed to PFAS-contaminated water and dietary intake, as well as inadvertent ingestion of indoor dust for adults and toddlers. In utero exposure and breast milk have been indicated as important exposure pathways for foetuses and nursing infants. More recently, PFAS have been identified in a wide range of products, many of which come in contact with skin (e.g., cosmetics and fabrics). Despite this, few studies have evaluated dermal uptake as a possible route for human exposure and little is known about the dermal absorption potential of different PFAS. This article critically investigates the current state-of-knowledge on human exposure to PFAS, highlighting the lack of dermal exposure data. Additionally, the different approaches for dermal uptake assessment studies are discussed and the available literature on human dermal absorption of PFAS is critically reviewed and compared to other halogenated contaminants, e.g., brominated flame retardants and its implications for dermal exposure to PFAS. Finally, the urgent need for dermal permeation and uptake studies for a wide range of PFAS and their precursors is highlighted and recommendations for future research to advance the current understanding of human dermal exposure to PFAS are discussed.		ВВ
D357	ADME	Panagopoulos Abrahamsson, Dimitri; Wang, Aolin; Jiang, Ting; Wang, Miaomiao; Siddharth, Adi; Morello-Frosch, Rachel; Park, June-Soo; Sirota, Marina; Woodruff, Tracey J	A Comprehensive Non-targeted Analysis Study of the Prenatal Exposome	2021	Environ Sci Technol. 2021 Aug 3;55(15):10542-10557. doi: 10.1021/acs.est.1c01010. Epub 2021 Jul 14.	Recent technological advances in mass spectrometry have enabled us to screen biological samples for a very broad spectrum of chemical compounds allowing us to more comprehensively characterize the human exposome in critical periods of development. The goal of this study was three-fold: (1) to analyze 590 matched maternal and cord blood samples (total 295 pairs) using non-targeted analysis (NTA); (2) to examine the differences in chemical abundance between maternal and cord blood samples; and (3) to examine the associations between exogenous chemicals and endogenous metabolites. We analyzed all samples with high-resolution mass spectrometry using liquid chromatography-quadrupole time-of-flight mass spectrometry (LC-QTOF/MS) in both positive and negative electrospray ionization modes (ESI+ and ESI-) and in soft ionization (MS) and fragmentation (MS/MS) modes for prioritized features. We confirmed 19 unique compounds with analytical standards, we tentatively identified 73 compounds with MS/MS spectra matching, and we annotated 98 compounds using an annotation algorithm. We observed 103 significant associations in maternal and 128 in cord samples between compounds annotated as endogenous and compounds annotated as exogenous. An example of these relationships was an association between three poly and perfluoroalkyl substances (PFASs) and endogenous fatty acids in both the maternal and cord samples indicating potential interactions between PFASs and fatty acid regulating proteins.		вА

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 対報 象抽 ① ラ	ン 文 ク 献 ② ラ
D358	ADME	Li, Jiaoyang; Wang, Lei; Zhang, Xin; Liu, Peng; Deji, Zhuoma; Xing, Yudong; Zhou, Yan; Lin, Xia; Huang, Zhenzhen	Per- and polyfluoroalkyl substances exposure and its influence on the intestinal barrier: An overview on the advances	2022	Sci Total Environ. 2022 Dec 15;852:158362. doi: 10.1016/j.scitotenv.2022.158362. Epub 2022 Aug 30.	Per- and polyfluoroalkyl substances (PFAS) are a class of artificially synthetic organic compounds that are hardly degraded in the natural environment. PFAS have been widely used for many decades, and the persistence and potential toxicity of PFAS are an emerging concern in the world. PFAS exposed via diet can be readily absorbed by the intestine and enter the circulatory system or accumulate directly at intestinal sites, which could interact with the intestine and cause the destruction of intestinal barrier. This review summarizes current relationships between PFAS exposure and intestinal barrier damage with a focus on more recent toxicological studies. Exposure to PFAS could cause inflammation in the gut, destruction of the gut epithelium and tight junction structure, reduction of the mucus layer, and induction of the toxicity of immune cells. PFAS accumulation could also induce microbial disorders and metabolic products changes. In addition, there are limited studies currently, and most available studies converge on the health risk of PFAS exposure for human intestinal disease. Therefore, more efforts are deserved to further understand potential associations between PFAS exposure and intestinal dysfunction and enable better assessment of exposomic toxicology and health risks for humans in the future.			С
D359	ADME	Bell, Kiersten S; O'Shaughnessy, Katherine L	The development and function of the brain barriers - an overlooked consideration for chemical toxicity	2022	Front Toxicol. 2022 Oct 18;4:1000212. doi: 10.3389/ftox.2022.1000212. eCollection 2022.	It is well known that the adult brain is protected from some infections and toxic molecules by the blood-brain and the blood- cerebrospinal fluid barriers. Contrary to the immense data collected in other fields, it is deeply entrenched in environmental toxicology that xenobiotics easily permeate the developing brain because these barriers are either absent or non-functional in the fetus and newborn. Here we review the cellular and physiological makeup of the brain barrier systems in multiple species, and discuss decades of experiments that show they possess functionality during embryogenesis. We next present case studies of two chemical classes, perfluoroalkyl substances (PFAS) and bisphenols, and discuss their potential to bypass the brain barriers. While there is evidence to suggest these pollutants may enter the developing and/or adult brain parenchyma, many studies suffer from confounding technical variables which complicates data interpretation. In the future, a more formal consideration of brain barrier biology could not only improve understanding of chemical toxicokinetics but could assist in prioritizing environmental xenobiotics for their neurotoxicity risk.		A	В
D360	ADME	Zhang, Wenping; Pang, Shimei; Lin, Ziqiu; Mishra, Sandhya; Bhatt, Pankaj; Chen, Shaohua	Biotransformation of perfluoroalkyl acid precursors from various environmental systems: advances and perspectives	2021	Environ Pollut. 2021 Mar 1;272:115908. doi: 10.1016/j.envpol.2020.115908. Epub 2020 Nov 6.	Perfluoroalkyl acids (PFAAs) are widely used in industrial production and daily life because of their unique physicochemical properties, such as their hydrophobicity, oleophobicity, surface activity, and thermal stability. Perfluorosulfonic acids (PFSAs) and perfluorocarboxylic acids (PFCAs) are the most studied PFAAs due to their global occurrence. PFAAs are environmentally persistent, toxic, and the long-chain homologs are also bioaccumulative. Exposure to PFAAs may arise directly from emission or indirectly via the environmental release and degradation of PFAA precursors. Precursors themselves or their conversion intermediates can present deleterious effects, including hepatotoxicity, reproductive toxicity, developmental toxicity, and genetic toxicity. Therefore, exposure to PFAA precursors constitutes a potential hazard for environmental contamination. In order to comprehensively evaluate the environmental fate and effects of PFAA precursors and their connection with PFSAs and PFCAs, we review environmental biodegradability studies carried out with microbial strains, activated sludge, plants, and earthworms over the past decade. In particular, we review perfluorooctyl-sulfonamide-based precursors, including perflurooctane sulfonamide (FOSA) and its N-ethyl derivative (EtFOSA), N-ethyl perfluoroctane sulfonamido ethanol (EtFOSE), and EtFOSE-based phosphate diester (DiSAmPAP). Fluorotelomerization-based precursors are also reviewed, including fluorotelomer alcohols (FTOH), fluorotelomer sulfonates (FTSA), and a suite of their transformation products. Though limited information is currently available on zwitterionic PFAS precursors, a preliminary review of data available for 6:2 fluorotelomer sulfonamide betaine (FTAB) was also conducted. Furthermore, we update and refine the recent knowledge on biotransformation strategies with a focus on metabolic pathways and mechanisms involved in the biotransformation of PFAA precursors. The biotransformation of PFAA precursors mainly involves the cleavage of carbon-fluor		В	С
D361	ADME	Jia, Yibo; Zhu, Yumin; Xu, Dashan; Feng, Xuemin; Yu, Xiaoyong; Shan, Guoqiang; Zhu, Lingyan	Insights into the Competitive Mechanisms of Per- and Polyfluoroalkyl Substances Partition in Liver and Blood	2022	Environ Sci Technol. 2022 May 17;56(10):6192-6200. doi: 10.1021/acs.est.1c08493. Epub 2022 Apr 18.	Some per- and polyfluoroalkyl substances (PFASs) tend to be accumulated in liver and cause hepatotoxicity. However, the difficulty to directly measure liver concentrations of PFASs in humans hampers our understanding of their hepatotoxicity and mechanisms of action. We investigated the partitioning of 11 PFASs between liver and blood in male CD-1 mice. Although accumulation of the perfluoroalkanesulfonic acids (PFSAs) in mice serum was higher than their carboxylic acids (PFCAs) counterparts as expected, the liver-blood partition coefficients (R(L/S)) of PFSAs were lower than the PFCAs R(L/S), implying a competition between liver and blood. The in vitro experiments further indicated that the partitioning was dominantly determined by their competitive binding between human liver fatty acid binding protein (hL-FABP) and serum albumin (HSA). The binding affinities (K(d)) of PFASs to both proteins were measured. The correlations between the R(L/S) and log K(d (hL-FABP))/log K(d (HSA)) were stronger than those with log K(d (hL-FABP)) alone, magnifying that the partitioning was dominantly controlled by competitive binding between hL-FABP and HSA. Therefore, the liver concentrations of the selected PFASs in humans could be predicted from the available serum concentrations, which is important for assessing their hepatotoxicity.		A	В

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン 文 ク 献 ① ラ	ン 文 ク 献 ② ラ
D362	ADME	Cao, Yuexin; Ng, Carla	Absorption, distribution, and toxicity of per- and polyfluoroalkyl substances (PFAS) in the brain: a review	2021	Environ Sci Process Impacts. 2021 Nov 17;23(11):1623-1640 doi: 10.1039/d1em00228g.	Per- and polyfluoroalkyl substances (PFAS) are a class of synthetic chemicals colloquially known as "forever chemicals" because of their high persistence. PFAS have been detected in the blood, liver, kidney, heart, muscle and brain of various species. Although brain is not a dominant tissue for PFAS accumulation compared to blood and liver, adverse effects of PFAS on brain functions have been identified. Here, we review studies related to the absorption, accumulation, distribution and toxicity of PFAS in the brain. We summarize evidence on two potential mechanisms of PFAS entering the brain: initiating blood-brain barrier (BBB) disassembly through disrupting tight junctions and relying on transporters located at the BBB. PFAS with diverse structures and properties enter and accumulate in the brain with varying efficiencies. Compared to long-chain PFAS, short-chain PFAS may not cross cerebral barriers effectively. According to biomonitoring studies and PFAS exposure experiments, PFAS can accumulate in the brain of humans and wildlife species. With respect to the distribution of PFAS in specific brain regions, the brain stem, hippocampus, hypothalamus, pons/medulla and thalamus are dominant for PFAS accumulation. The accumulation and distribution of PFAS in the brain may lead to toxic effects in the central nervous system (CNS), including PFAS-induced behavioral and cognitive disorders. The specific mechanisms underlying such PFAS effects on calcium homeostasis and neurotransmitter alterations in neurons. Based on the information available about PFAS uptake, accumulation, distribution and impacts on the brain, PFAS have the potential to enter and accumulate in the brain at varying levels. The balance of existing studies shows there is some indication of risk in animals, while the human evidence is mixed and warrants further scrutiny.			В	в
D363	ADME	Jouanneau, William; Léandri- Breton, Don- Jean; Corbeau, Alexandre; Herzke, Dorte; Moe, Børge; Nikiforov, Vladimir A; Gabrielsen, Geir W; Chastel, Olivier	A Bad Start in Life? Maternal Transfer of Legacy and Emerging Poly- and Perfluoroalkyl Substances to Eggs in an Arctic Seabird	2022	Environ Sci Technol. 2022 May 17;56(10):6091-6102. doi: 10.1021/acs.est.1c03773. Epub 2021 Dec 7.	In birds, maternal transfer is a major exposure route for several contaminants, including poly- and perfluoroalkyl substances (PFAS). Little is known, however, about the extent of the transfer of the different PFAS compounds to the eggs, especially for alternative fluorinated compounds. In the present study, we measured legacy and emerging PFAS, including Gen-X, ADONA, and F-53B, in the plasma of prelaying black-legged kittiwake females breeding in Svalbard and the yolk of their eggs. We aimed to (1) describe the contaminant levels and patterns in both females and eggs, and (2) investigate the maternal transfer, that is, biological variables and the relationship between the females and their eggs for each compound. Contamination of both females and eggs were dominated by linPFOS then PFUnA or PFTriA. We notably found 7:3 fluorotelomer carboxylic acid—a precursor of long-chain carboxylates—in 84% of the egg yolks, and provide the first documented finding of ADONA in wildlife. Emerging compounds were all below the detection limit in female plasma. There was a linear association between females and eggs for most of the PFAS. Analyses of maternal transfer ratios in females and eggs suggest that the transfer is increasing with PFAS carbon chain length, therefore the longest chain perfluoroalkyl carboxylic acids (PFCAs) were preferentially transferred to the eggs. The mean Σ (PFAS) in the second-laid eggs was 73% of that in the first-laid eggs. Additional effort on assessing the outcome of maternal transfers on avian development physiology is essential, especially for PFCAs and emerging fluorinated compounds which are under-represented in experimental studies.			В	С
D364	ADME	Khazaee, Manoochehr; Christie, Emerson; Cheng, Weixiao; Michalsen, Mandy; Field, Jennifer; Ng, Carla	Perfluoroalkyl Acid Binding with Peroxisome Proliferator-Activated Receptors α , γ , and δ , and Fatty Acid Binding Proteins by Equilibrium Dialysis with a Comparison of Methods	2021	Toxics. 2021 Feb 26;9(3):45. doi: 10.3390/toxics9030045.	The biological impacts of per- and polyfluorinated alkyl substances (PFAS) are linked to their protein interactions. Existing research has largely focused on serum albumin and liver fatty acid binding protein, and binding affinities determined with a variety of methods show high variability. Moreover, few data exist for short-chain PFAS, though their prevalence in the environment is increasing. We used molecular dynamics (MD) to screen PFAS binding to liver and intestinal fatty acid binding proteins (L- and I-FABPs) and peroxisome proliferator activated nuclear receptors (PPAR- α , - δ and - γ) with six perfluoroalkyl carboxylates (PFCAs) and three perfluoroalkyl sulfonates (PFSAs). Equilibrium dissociation constants, K(D)s, were experimentally determined via equilibrium dialysis (EqD) with liquid chromatography tandem mass spectrometry for protein-PFAS pairs. A comparison was made between K(D)s derived from EqD, both here and in literature, and other in vitro approaches (e.g., fluorescence) from literature. EqD indicated strong binding between PPAR- δ and perfluorobutanoate (0.097 ± 0.070 μ M). Unlike binding affinities for L-FABP, which increase with chain length, K(D)s for PPARs showed little chain length dependence by either MD simulation or EqD. Compared with other in vitro approaches, EqD-based K(D)s consistently indicated higher affinity across different proteins. This is the first study to report PPARs binding with short-chain PFAS with K(D)s in the sub-micromolar range.			A	С

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン 文 ン 文 ク 献 ク 献 ① ラ ② ラ
D365	ADME	Cao, Huiming; Zhou, Zhen; Hu, Zhe; Wei, Cuiyun; Li, Jie; Wang, Ling; Liu, Guangliang; Zhang, Jie; Wang, Yawei; Wang, Thanh; Liang, Yong	Effect of Enterohepatic Circulation on the Accumulation of Per- and Polyfluoroalkyl Substances: Evidence from Experimental and Computational Studies	2022	Environ Sci Technol. 2022 Mar 1;56(5):3214-3224. doi: 10.1021/acs.est.1c07176. Epub 2022 Feb 9.	The pharmacokinetic characteristics of per- and polyfluoroalkyl substances (PFAS) affect their distribution and bioaccumulation in biological systems. The enterohepatic circulation leads to reabsorption of certain chemicals from bile back into blood and the liver and thus influences their elimination, yet its influence on PFAS bioaccumulation remains unclear. We explored the role of enterohepatic circulation in PFAS bioaccumulation by examining tissue distribution of various PFAS in wild fish and a rat model. Computational models were used to determine the reabsorbed fractions of PFAS by calculating binding affinities of PFAS for key transporter proteins of enterohepatic circulation. The results indicated that higher concentrations were observed in blood, the liver, and bile compared to other tissues for some PFAS in fish. Furthermore, exposure to a PFAS mixture on the rat model showed that the reabsorption phenomenon appeared during 8-12 h for most long-chain PFAS. Molecular docking calculations suggest that PFAS can bind to key transporter proteins via electrostatic and hydrophobic interactions. Further regression analysis adds support to the hypothesis that binding affinity of the apical sodium-dependent bile acid transporter is the most important variable to predict the human half-lives of PFAS. This study demonstrated the critical role of enterohepatic circulation in reabsorption, distribution, and accumulation of PFAS.			ВВ
D366	ADME	Allendorf, Flora; Goss, Kai-Uwe; Ulrich, Nadin	Estimating the Equilibrium Distribution of Perfluoroalkyl Acids and 4 of Their Alternatives in Mammals	202:	Environ Toxicol Chem. 2021 Mar;40(3):910-920. doi: 10.1002/etc.4954. Epub 2021 Feb 9.	Perfluoroalkyl acids (PFAAs) mostly exist as ionic compounds that are of major concern because of their accumulative behavior. The discussion about their risk is ongoing considering the increasing production of structurally similar alternatives. We conducted model calculations based on equilibrium distribution coefficients that allow studying the distribution of PFAAs and their alternatives in various mammalian organs through comparison to empirical measurements in humans and rats. The calculations rely on experimentally determined distribution coefficients of a series of PFAAs and 4 of their alternatives to physiological matrices such as structural proteins, storage lipids, membrane lipids, albumin, and fatty acid binding protein (FABP). The relative sorption capacities in each organ were calculated from the combination of distribution coefficients and physiological data. The calculated distribution of PFAAs and alternatives within the organs showed that albumin and membrane lipids and, to a lesser extent, structural proteins have the highest relative sorption capacities for the compounds. Sorption to FABP is only relevant in the distribution of short-chain PFAAs. Storage lipids play a minor role in the distribution of all studied compounds. Our calculated distribution of PFAAs was evaluated by comparison to reported PFAA concentrations in various organs. Environ Toxicol Chem 2021;40:910-920. © 2020 The Authors. Environmental Toxicology and Chemistry published by Wiley Periodicals LLC on behalf of SETAC.			ВВ
D367	ADME	Björvang, Richelle D; Vinnars, Marie- Therese; Papadogiannakis , Nikos; Gidlöf, Sebastian; Mamsen, Linn Salto; Mucs, Daniel; Kiviranta, Hannu; Rantakokko, Panu; Ruokojä rvi, Päivi; Lindh, Christian H; Andersen, Claus Yding; Damdimopoulou, Pauliina	Mixtures of persistent organic pollutants are found in vital organs of late gestation human fetuses	202	Chemosphere. 2021 Nov;283:131125. doi: 10.1016/j.chemosphere.2021.131125. Epub 2021 Jun 8.	Persistent organic pollutants (POPs) are industrial chemicals with long half-lives. Early life exposure to POPs has been associated with adverse effects. Fetal exposure is typically estimated based on concentrations in maternal serum or placenta and little is known on the actual fetal exposure. We measured the concentrations of nine organochlorine pesticides (OCPs), ten polychlorinated biphenyl (PCB) congeners, and polybrominated diphenyl ether (PBDE) congeners by gas chromatography - tandem mass spectrometry in maternal serum, placenta, and fetal tissues (adipose tissue, liver, heart, lung and brain) in 20 pregnancies that ended in stillbirth (gestational weeks 36-41). The data were combined with our earlier data on perfluoroalkyl substances (PFASs) in the same cohort (Mamsen et al. 2019). HCB, p,p'-DDE, PCB 138 and PCB 153 were quantified in all samples of maternal serum, placenta and fetal tissues. All 22 POPs were detected in all fetal adipose tissue samples, even in cases where they could not be detected in maternal serum or placental function. OCPs showed the highest tissue:serum ratios and PFAS the lowest. The highest chemical burden was found in adipose tissue and lowest in the brain. Overall, all studied human fetuses were intrinsically exposed to mixtures of POPs. Tissue:serum ratios were significantly modified by gestational age, fetal sex and placental function. Importantly, more chemicals were detected in fetal tissues compared to maternal serum and placenta, implying that these proxy samples may provide a misleading picture of actual fetal exposures.			вВ

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 対報 象抽 ① ラ	ン 文 ク 献 ② ラ
D368	ADME	Bernstein, Amanda S; Kapraun, Dustin F; Schlosser, Paul M	A Model Template Approach for Rapid Evaluation and Application of Physiologically Based Pharmacokinetic Models for Use in Human Health Risk Assessments: A Case Study on Per- and Polyfluoroalkyl Substances	2021	Toxicol Sci. 2021 Aug 3;182(2):215-228. doi: 10.1093/toxsci/kfab063.	Physiologically based pharmacokinetic (PBPK) models are commonly used in risk assessments to perform inter- and intraspecies extrapolations as well as to extrapolate between different dosing scenarios; however, they must first undergo quality assurance review, which can be a time-consuming process, especially when model code is not readily available. We developed and implemented (using R and MCSim) a PBPK model template capable of replicating published model results for several chemical-specific PBPK models. This model template allows for faster quality assurance review because the general model equations only need to be reviewed once, and application to a specific chemical then only requires reviewing input parameters. The model template can implement PBPK models with oral and intravenous exposure routes, varying numbers of tissue compartments, renal reabsorption, and multiple elimination pathways, including fecal, urinary, and biliary. Using the model template, we reproduced published model simulation results for perfluorohexanesulfonic acid, perfluoronanoic acid, perfluorodecanoic acid, perfluorooctanoate, and perflouorooctane sulfonate. We also show that the template can be a useful tool for identifying potential model errors. Thus, the model template allows for faster evaluation and review of published PBPK models and provides a proof of concept for using this approach with broader classes of chemical-specific PBPK models.	評価書文 献と重複		A
D369	ADME	Andersen, Melvin E; Mallick, Pankajini; Clewell, Harvey J 3rd; Yoon, Miyoung; Olsen, Geary W; Longnecker, Matthew P	Using quantitative modeling tools to assess pharmacokinetic bias in epidemiological studies showing associations between biomarkers and health outcomes at low exposures	2021	Environ Res. 2021 Jun;197:111183. doi: 10.1016/j.envres.2021.111183. Epub 2021 Apr 20.	Biomarkers of exposure can be measured at lower and lower levels due to advances in analytical chemistry. Using these sensitive methods, some epidemiology studies report associations between biomarkers and health outcomes at biomarker levels much below those associated with effects in animal studies. While some of these low exposure associations may arise from increased sensitivity of humans compared with animals or from species-specific responses, toxicology studies with drugs, commodity chemicals and consumer products have not generally indicated significantly greater sensitivity of humans compared with test animals for most health outcomes. In some cases, these associations may be indicative of pharmacokinetic (PK) bias, i.e., a situation where a confounding factor or the health outcome itself alters pharmacokinetic processes affecting biomarker levels. Quantitative assessment of PK bias combines PK modeling and statistical methods describing outcomes across large numbers of individuals in simulated populations. Here, we first provide background on the types of PK models that can be used for assessing biomarker levels in human population and then outline a process for considering PK bias in studies intended to assess associations between biomarkers and health outcomes at low levels of exposure. After providing this background, we work through published examples where these PK methods have been applied with several chemicals/chemical classes - polychlorinated biphenyls (PCBs), perfluoroalkyl substances (PFAS), polybrominated biphenyl ethers (PBDE) and phthalates - to assess the possibility of PK bias. Studies of the health effects of low levels of exposure will be improved by developing some confidence that PK bias did not play significant roles in the observed associations.		В	с
D370	ADME	Appel, Mareike; Forsthuber, Martin; Ramos, Romualdo; Widhalm, Raimund; Granitzer, Sebastian; Uhl, Maria; Hengstschläger, Markus; Stamm, Tanja; Gundacker, Claudia	The transplacental transfer efficiency of per- and polyfluoroalkyl substances (PFAS): a first meta- analysis	2022	J Toxicol Environ Health B Crit Rev. 2022 Jan 2;25(1):23-42. doi: 10.1080/10937404.2021.2009946. Epub 2021 Dec 20.	Per- and polyfluorinated substances (PFAS), ubiquitously present in the environment and biota, are transferred to the fetus via the placenta. PFAS can be distinguished, among other things, by their different carbon chain lengths and functional groups. The aim of this study was to provide comprehensive evidence on PFAS transfer rates across the human placental barrier by means of a meta-analysis based upon a systematic review. The available literature up to April 2021 was reviewed and transplacental transfer efficiencies (TTEs) of PFAS assessed. A total of 39 studies reporting data on 20 PFAS were included in the systematic review. Of these, 20 studies with data on 19 compounds were included in the meta-analysis. Comprehensive Meta-Analysis (CMA v3.0) was used for quantitative, statistical analyses with random effects models. A curvilinear relationship was found with short and long chains of perfluorocarboxylic acids (PFCAs) exhibiting higher TTE than compounds with intermediate chain length. Among the less well studied PFAS, perfluorohexanoic acid (PFHAX), 6:2 fluorotelomersulfonic acid (6:2 FTS) and perfluorobutanoic acid (PFBA) stood out the most with a high TEEs. The dependence of TTEs on chain length and functional group is clearly shown in this first meta-analysis on PFAS transfer across the human placenta. More data on effects of less well studied PFAS in pregnant women and neonates are needed to assess the potential risk for fetal exposure.		1 A	A

分野 タイトル 発行年 No 著者 書誌情報 要旨(原文) (参考) Per- and polyfluoroalkyl substances (PFAS) accumulation and elimination in both wildlife an PFAS interactions with proteins, including but not limited to organic anion transporters (OA (FABPs), and serum proteins such as albumin. In wildlife, changes in the biotic and abiotic e Bangma. reproductive stage, and health status) often lead to dynamic and responsive physiological ch Jacqueline; location of many proteins, including PFAS-related proteins. Therefore, we hypothesize that i Guillette, T C; impacted as a result of environmentally induced as well as biologically programmed physiologically programmed physiological states and the physiological states are states as the physiological states are states as the physiological states are states and states are states Bommarito. then PFAS that associate with those proteins will also be impacted. Changes in tissue distri 2022 Environ Int. 2022 Jan 15;159:107037. doi: 10.1016/j.envint.2021.107037. Epub 2021 Dec 9. Understanding the dynamics of physiological changes Paige A; Ng, D371 ADME these dynamics may have implications for wildlife studies where these chemicals are measu Carla: Reiner. protein expression, and PFAS in wildlife feathers, eggs). For example, failure to account for factors contributing to PFAS variability in Jessica L; misclassification as measured concentrations may not reflect average exposure levels. The Lindstrom, information with the PFAS research community on what biotic and abiotic changes might be Andrew B; and interpreting a biomonitoring or an ecotoxicity based wildlife study. This review will also Strynar, Mark J epidemiological discipline to improve study design in wildlife research. Overall, understandin and abiotic environments, dynamic protein levels, PFAS levels measured in wildlife, and epidesign and study interpretation and thus strengthen conclusions derived from wildlife studie BACKGROUND: Exposure to environmental chemicals during pregnancy adversely affects m identifying socio-demographic differences in exposures can inform contributions to health ir demographically diverse pregnant participants in San Francisco from the Mission Bay/Moffi Goin, Dana E; serve a primarily higher income population, and Zuckerberg San Francisco General Hospital Abrahamsson ncome population. We collected maternal and cord sera, which we screened for 2420 uniqu Dimitri; Wang, nigh-resolution mass spectrometry using LC-QTOF/MS. We assessed differences in chemic. and demographic groups using linear regression adjusting for false discovery rate. RESULTS Miaomiao; Jiang Ting; Park, June diverse (31% Latinx, 16% Asian/Pacific Islander, 5% Black, 5% other or multi-race, and 43% Disparities in chemical exposures among pregnant 2022 Environ Res. 2022 Dec;215(Pt 1):114158. doi: 10.1016/j.envres.2022.114158. Epub 2022 Aug 29. Soo; Sirota, experienced financial strain (28%) and food insecurity (20%) during pregnancy. We observed ADME D372 omen and neonates by socioeconomic and Marina; Morello maternal (9 chemicals) and cord sera (39 chemicals) between participants who delivered at lemographic characteristics: A nontargeted approach Frosch, Rachel; Of the 39 chemical features differentially detected in cord blood, 18 were present in pesticid DeMicco, Erin; substance (PFAS), 21 in plasticizers, 24 in cosmetics, and 17 in pharmaceuticals; 4 chemica Zlatnik. Marva G: chemical feature annotated as 2.4-dichlorophenol had higher abundances among Latinx con Woodruff, Tracey delivering at ZSFGH compared to MB/ML, those with food insecurity, and those with financ ndicated the chemical feature was either 2,4-dichlorophenol or 2,5-dichlorophenol, both of disrupting effects. CONCLUSIONS: Chemical exposures differed between delivery hospitals conditions faced by populations served. Differential exposures to 2,4-dichlorophenol or 2,5disparities in adverse outcomes. Persistent halogenated organic pollutants (HOPs) are a class of toxic chemicals, which may transplacental transfer from their mothers. Here, we review reported internal exposure levels pesticides, polychlorinated biphenyls, polybrominated diphenyl ethers, short- and medium-c and poly-fluoroalkyl substances) in placenta, and both maternal and umbilical cord sera. We transplacental transfer and placental distribution characteristics of each class of compounds factors on the transfer and accumulation efficiencies of HOPs, as well as the main mechanis Zhang, Xiaolan placental barrier. Reported compound-specific transplacental transfer efficiencies and distr Cheng, umbilical cord:maternal serum and placental:maternal serum concentration ratios (R(CM) ar Xiaomeng; Lei, A review of the transplacental transfer of persistent Environ Int. 2021 Jan;146:106224. doi: summarized. Average published R(CM) values of the HOPs range from 0.24 to 3.08 (lipid-adj 2021 10.1016/j.envint.2020.106224. Epub 2020 Nov 1. D373 ADME Bingli; Zhang halogenated organic pollutants: Transfer wet weights), and are highest for perfluoroalkylcarboxylates (PFCAs) and tetrabromobisphe Guoxia; Bi, characteristics, influential factors, and mechanisms range from 0.14 to 1.02 (lipid-adjusted) and from 0.30 to 1.4 (based on wet weights). The br Yuhao; Yu, reflect effects of various factors, inter alia physicochemical properties of HOPs, metabolic c Yingxin placental maturity, and differential expression of influx/efflux transporters in the placenta. linearly with molecular size, and are curvilinearly related to solubility. Plasma protein binding maternal and fetal metabolic capacities may also affect some HOPs' transfer efficiencies. H Transplacental transport of HOPs likely occurs mostly through passive diffusion, although in maternal and/or fetal sides of the placenta may also facilitate or hinder their transport. Ove our understanding of mechanisms involved in HOPs' transplacental transport.

	備考	出 対 象 抽	ン 文 ① ラ	ン 文 ク 献 ② ラ
ad humans is largely attributed to Ts), fatty acid binding proteins environment (e.g. salinity, temperature, nanges that alter the prevalence and f key PFAS-related proteins are ogical changes (e.g. reproduction), bution across tissues of PFAS due to ured in biological matrices (e.g., serum, a tissue may result in exposure goal of this review is to share general e important to consider when designing draw on parallels from the ng these connections between biotic demiology serves to strengthen study es for years to come.			В	С
aternal and infant health, and hequities. METHODS: We recruited 294 t Long (MB/ML) hospitals, which (ZSFGH), which serves a lower e formulas and their isomers using al abundances across socioeconomic S: Our participants were racially white). A substantial portion d significant abundance differences in the MB/ML hospitals versus ZSFGH. les, one per- or poly-fluoroalkyl l features had unknown sources. A npared to white participants, those ial strain. Post-hoc QTOF analyses which have potential endocrine- likely due to underlying social dichlorophenol may contribute to			С	В
have adverse effects on fetuses via s of various HOPs (organochlorinated hain chlorinated paraffins, and per- e also present analyses of the s, and discuss effects of several sms of HOPs' transfer across the bution efficiencies, expressed as nd R(PM), respectively), are justed) and from 0.04 to 3.1 (based on nol A. Average published R(PM) values oad R(CM) and R(PM) ranges may apacities of mothers and fetuses, Generally, HOPs' R(CM) values decline g affinity and the difference between OPs' molecular size may be influential. flux/efflux transporters expressed on rall, the review highlights clear gaps in			В	В

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D374	ADME	Abrahamsson, Dimitri; Siddharth, Adi; Robinson, Joshua F; Soshilov, Anatoly; Elmore, Sarah; Cogliano, Vincent; Ng, Carla; Khan, Elaine; Ashton, Randolph; Chiu, Weihsueh A; Fung, Jennifer; Zeise, Lauren; Woodruff, Tracey J	Modeling the transplacental transfer of small molecules using machine learning: a case study on per- and polyfluorinated substances (PFAS)		J Expo Sci Environ Epidemiol. 2022 Oct 7. doi: 10.1038/s41370-022-00481-2. Online ahead of print.	BACKGROUND: Despite their large numbers and widespread use, very little is known about the extent to which per- and polyfluoroalkyl substances (PFAS) can cross the placenta and expose the developing fetus. OBJECTIVE: The aim of our study is to develop a computational approach that can be used to evaluate the of extend to which small molecules, and in particular PFAS, can cross to cross the placenta and partition to cord blood. METHODS: We collected experimental values of the concentration ratio between cord and maternal blood (RCM)) for 260 chemical compounds and calculated their physicochemical descriptors using the cheminformatics package Mordred. We used the compiled database to, train and test an artificial neural network (ANN). And then applied the best performing model to predict R(CM) for a large dataset of PFAS chemicals (n = 7982). We, finally, examined the calculated physicochemical descriptors of the chemicals to identify which properties correlated significantly with R(CM). RESULTS: We determined that 7855 compounds were within the applicability domain and 127 compounds are outside the applicability domain of our model. Our predictions of R(CM) for PFAS suggested that 3623 compounds had a log R(CM) > 0 indicating preferable partitioning to cord blood. Some examples of these compounds were bisphenol AF, 2,2-bis(4-aminophenyl)hexafluoropropane, and nonafluoro-tert-butyl 3-methylbutyrate. SIGNIFICANCE: These observations have important public health implications as many PFAS have been shown to interfere with fetal development. In addition, as these compounds are highly persistent and many of them can readily cross the placenta, they are expected to remain in the population for a long time as they are being passed from parent to offspring. IMPACT: Understanding the behavior of chemicals can cross the placenta and expose the fetus, however, the mechanism by which this transport occurs is not well understood. In our study, we developed a machine learning model that describes the transplacental transfer of		СС
D375	ADME	Yadav, Ajay; Verhaegen, Steven; Hadera, Mussie Ghezu; Berntsen, Hanne Friis; Berg, Vidar; Lyche, Jan Ludvig; Sabaredzovic, Azemira; Haug, Line Småstuen; Myhre, Oddvar; Zimmer, Karin Elisabeth; Paulsen, Ragnhild Elisabeth; Ropstad, Erik; Boix, Fernando	Peripherally administered persistent organic pollutants distribute to the brain of developing chicken embryo in concentrations relevant for human exposure	2022	Neurotoxicology. 2022 Jan;88:79-87. doi: 10.1016/j.neuro.2021.10.013. Epub 2021 Oct 29.	Persistent organic pollutants (POPs) can reach the fetal brain and contribute to developmental neurotoxicity. To explore the distribution of POPs to the fetal brain, we exposed chicken embryos to a POP mixture, containing 29 different compounds with concentrations based on blood levels measured in the Scandinavian human population. The mixture was injected into the allantois at embryonic day 13 (E13), aiming at a theoretical concentration of 10 times human blood levels. POPs concentrations in the brain were measured at 0.5, 1, 2, 4, 6, 24, 48, and 72 h after administration. Twenty-seven of the individual compounds were detected during at least one of the time-points analyzed. Generally, the concentrations of most of the measured compounds were within the order of magnitude of those reported in human brain samples. Differences in the speed of distribution to the brain were observed between the per- and polyfluoroalkyl substances (PFASs), which have protein binding potential, and the lipophilic polychlorinated biphenyls (PCBs), organochlorine pesticides (OCPs) and brominated flame retardants (BFRs). Based on pharmacokinetic modeling, PFASs were best described by a one compartment model. PFASs displayed relatively slow elimination (KeI) and persisted at high levels in the brain. Lipophilic OCPs and PCBs could be fitted to a 2-compartment model. These showed high levels in the brain relative to the dose administrated as calculated by area under the curve (AUC)/Dose. Altogether, our study showed that chicken is a suitable model to explore the distribution of POPs into the developing brain at concentrations which are relevant for humans.		вс
D376	ADME	島崎 晃成, 本田 匡人, 赤坂 泰輝, 牟田 朱美, 鵜木 (加藤) 陽子, 沖 野 望, 島崎 洋平, 大嶋 雄治	ラット血漿におけるペルフルオロオクタンスルホン酸 結 合タンパク質の探索	2014	環境毒性学会誌, 17 巻 1 号 11-17, doi: 10.11403/jset.17.11	Perfluorooctane sulfonate (PFOS) is the environmentally persistent compound distributed all over the world. Earlier studies suggested that PFOS is accumulated and give the adverse effects for the organism. Particularly, some studies suggested that PFOS binds to the blood plasma protein. Most of studies performed in vitro exposure experiment not in vivo condition. This study, we conducted in vivo experiments to identify PFOS binding protein in the plasma of rat. PFOS was administered intraperitoneally to Sprague Dawley rat at dose of 1 mg/kg b.w. The plasma obtained was separated by ammonium sulfate precipitation. The highest concentrations of PFOS (1507 ng/mL) and protein (20.7 mg/mL) were found in the 50-55% saturated ammonium sulfate fraction. SDS-PAGE and N-terminal amino acid sequence analysis in the 50-55% saturated ammonium sulfate fraction showed that the rat serum albumin (RSA) was identified as PFOS-binding protein. This is the first report to demonstrate that PFOS is bound to RSA under in vivo condition.		ВВ

パーフルオロ化合物に係る国際機関等の評価及び科学的知見の情報収集並びに整理 別添-2 文献データベース文献リスト

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン 文 ク 献 ① ラ	ン 文 ク 献 ② ラ
D377	ADME	Masanori Katakura, Naomi Kudo, Tadashi Tsuda, Yasuhide Hibino, Atsushi Mitsumoto, Yoichi Kawashima	Rat Organic Anion Transporter 3 and Organic Anion Transporting Polypeptide 1 Mediate Perfluorooctanoic Acid Transport	2007	Journal of Health Science, 53 巻 1 号 77-83, doi: 10.1248/jhs.53.77	The mechanism by which perfluorooctanoic acid (PFOA) is transported in the kidney was studied in rats. We hypothesized that some transporters that are expressed in the basolateral and/or brush border membrane of proximal tubular cells mediate the transport of PFOA. Mannitol infusion, which caused an increase in the urine flow rate, significantly increased the renal clearance (CLR) of PFOA in both male and female rats. Feeding a low-phosphate diet that causes an increase in the expression of rat type II sodium-dependent phosphate transporter (Npt2) reduced the CLR in both male and female rats. These suggest that PFOA is reabsorbed in the proximal tubules, and that a phosphate transporter may be responsible for the renal transport of PFOA. The CLR of PFOA in Eisai hyperbilirubinemic rats that lack multidrug resistance-associated protein 2 (MRP2) was not different from that of the wild type, suggesting that MRP2 is not responsible for the renal transport of PFOA. Three candidate transporters, organic anion-transporting polypeptide 1 (oatp1), Npt2, and organic anion transporter 3 (OAT3) were studied to clarify whether these transporters facilitate [14C]PFOA transport in functional studies in Xenopus laevis oocytes. Both oatp1 and OAT3 facilitated [14C]PFOA transport while Npt2 did not. These results suggest that both oatp1 and OAT3 mediate, at least in part, the transport of PFOA in the proximal tubules of rat kidney.	評価書文 献と重複			В
D378	ADME	Masanori Katakura, Naomi Kudo, Mari Okazaki, Yasuhide Hibino, Yoichi Kawashima	Sex Hormone Regulation of Rat Organic Anion Transporter 3 (rOAT3) Expression in Rat Kidney	2003	Journal of Health Science, 49 巻 3 号 233-238, DOI:10.1248/JHS.49.233	The effects of sex hormones on the level of rat organic anion transporter 3 (rOAT3) protein and its localization were studied in rat kidney. Western blot analysis detected both minor 100-kDa and major 69-kDa proteins in the crude plasma membrane fraction of the kidney. The sum of the levels of both proteins in male rats was not different from that in castrated rats, testosterone-treated rats that had been castrated or female rats. In ovariectomized female rats, the level of these proteins was 3-4 times higher than that in other groups. Treatment of ovariectomized female rats with estradiol reduced rOAT3 to a normal level. Immunohistochemical analysis indicated that rOAT3 was expressed in the renal cortex and outer medulla, where this protein localized in the basolateral membrane of tubules. The immunological localization of rOAT3 was similar in the 6 experimental groups. These results suggest that the cellular level of rOAT3 protein is regulated, at least in part, by estradiol in rat kidney.			С	D
D379	ADME	Kudo Naomi(城西 大学 薬学部), Sakai Ayako, Mitsumoto Atsushi, Hibino Yasuhide, Tsuda Tadashi, Kawashima Yoichi	ラットにおけるペルフルオロオクタン酸の組織分布と肝 細胞内分布は低用量と高用量で異なる(Tissue Distribution and Hepatic Subcellular Distribution of Perfluorooctanoic Acid at Low Dose Are Different from Those at High Dose in Rats)(英語)	2007	Biological & Pharmaceutical Bulletin(0918-6158)30巻8号 Page1535-1540(2007.08), doi: 10.1248/bpb.30.1535	ペルフルオロオクタン酸(PFOA)0.041mg/kg体重を雄ラットに静脈注射後、その分布を16.56mg/kg体重注射の場合と比較した。静注2 時間後、肝臓では低用量と高用量でそれぞれ52%と27%分布した。一方、低用量に比べて高用量では、投与量の大部分が血清、他組 織、胴体に分布していた。肝臓におけるPFOAの細胞内分布を測定した。低用量では8000gペレット、18000gペレット、105000gペレッ ト、105000g上清画分中にそれぞれ45%、34%、18%、3%が分布し、高用量ではそれぞれ28%、17%、13%、43%が分布していた。肝臓 内PFOA濃度が高くなるにつれ、105000g上清画分中により多く分布した。PFOA濃度に従って増加した胆道排出指数は肝臓で上昇し た。これらの結果は、PFOAが非常に低用量で曝露された場合、選択的に肝臓で取り込まれ、膜画分、特に18000gペレットに分布し、 胆汁中に殆ど排出されないことを示唆している。	評価書文 献と重複			В
D380	ADME	白石 剛(滋賀医科 大学 歯口腔外科)	パーフルオロオクタン酸およびフロモキセフナトリウム の血液中における分配平衡のフッ素分析法による研究	1995	滋賀医科大学雑誌(0912-3016)10巻 Page87-97(1995.07)	フッ素元素を指標とした定量分析法(LOPA-GC法)により,生体成分中における含フッ素化合物の動態を観察することができることを示した.PFOA及びFMOXの全血液系及びアルブミン-赤血球混合系中における結合分配の経時変化をこの方法によって追跡した結果,これらの化合物の血液中における動態にはアルブミンのみならず赤血球も強く関与することが示唆された			В	В
D381	ТК	Huang, M C; Dzierlenga, A L; Robinson, V G; Waidyanatha, S; DeVito, M J; Eifrid, M A; Granville, C A; Gibbs, S T; Blystone, C R	Corrigendum to "Toxicokinetics of perfluorobutane sulfonate (PFBS), perfluorohexane-1-sulphonic acid (PFHxS), and perfluorooctane sulfonic acid (PFOS) in male and female Hsd:Sprague Dawley SD rats after intravenous and gavage administration" [Toxicol. Rep. 6 (2019) 645-655]	2021	Toxicol Rep. 2021 Feb 18;8:365. doi: 10.1016/j.toxrep.2021.02.001. eCollection 2021.	[This corrects the article DOI: 10.1016/j.toxrep.2019.06.016.]. Huang, M C Huang MC	評価書文 献と重複		С	D

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)
D382	TK	Gayrard, Vé ronique; Moreau, Jessika; Picard- Hagen, Nicole; Helies, Virginie; Marchand, Philippe; Antignac, Jean- Philippe; Toutain, Pierre- Louis; Leandri, Roger	Use of Mixture Dosing and Nonlinear Mixed Effect Modeling of Eight Environmental Contaminants in Rabbits to Improve Extrapolation Value of Toxicokinetic Data	2021	Environ Health Perspect. 2021 Nov;129(11):117006. doi: 10.1289/EHP8957. Epub 2021 Nov 17.	BACKGROUND: Although in vivo studies of internal exposure to hazardous substances have there is room for progress to improve their informative value while adhering to the four R's: rr and responsibility rule. OBJECTIVES: The objective of the study was to illustrate how toxicok analysis can be implemented under the 4R rule to plan a chronic dosage regimen for investig relationships. METHODS: The intravenous (IV) and oral serum concentrations of eight hazard including 1,1-Dichloro-2,2-bis(p-chlorophenyl)ethylene (pp'DDE), ß-Hexachlorocyclohexane 2,2'4,4'-tetrabromodiphenyl ether (BDE-47), perfluorooctane sulfonate (PFOS), perfluorooctad di(2ethylhexyl)phthalate (DEHP), and bisphenol S (BPS) were obtained after mixture dosing design. Data were comprehensively analyzed using nonlinear mixed effect (NLME) modeling. BPS and of the DEHP metabolite (mono-2-ethylhexyl phthalate), reflected by their mean resi was due to their efficient clearance (CL, 3.2 and 0.47 L/kg/h). The longer MRT of the other of from their extremely low clearance (lower than 0.01 L/kg/h for PFOA and PFOS) or from their (VSS) ranging from 33 to 45 L/kg. Estimates of CL, VSS, and bioavailability were used to con maintenance doses required to attain a nominal steady-state serum concentration of 1 ng/r were applied to predict the serum concentration profile and to contrast the differential rates peripheral compartments. CONCLUSION: NLME modeling of the IV and oral TK of hazardous rabbits while fulfilling the 4R rule, was able to provide the physiological basis for interspecies TK/TD approach to risk assessment.
D383	ТК	Gustafsson, Åsa; Wang, Bei; Gerde, Per; Bergman, Åke; Yeung, Leo W Y	Bioavailability of inhaled or ingested PFOA adsorbed to house dust	2022	Environ Sci Pollut Res Int. 2022 Nov;29(52):78698-78710. doi: 10.1007/s11356-022-20829-3. Epub 2022 Jun 14.	Indoor environments may impact human health due to chemical pollutants in the indoor air a comparing the bioavailability and distribution of PFOA following both an inhalation and an or dust in rats. In addition, extractable organofluorine (EOF) was measured in different tissue s influence of other organofluorine compounds in the experimental house dust. Blood samples points after exposure and at the time of termination; the lungs, liver, and kidney were collect EOF. The concentration of PFOA in plasma increased rapidly in both exposure groups attaini C(max) following inhalation was four times higher compared to oral exposures. At 48 h post of plasma, liver, and kidney were twice as high from inhalation exposures. This shows that PFO rapid systemic distribution following an inhalation or oral exposure to house dust coated with EOF corresponded to 65-71% and 74-87% in plasma and tissues, respectively. The mass bala indicates that there might be other unknown PFAS precursor and/or fluorinated compounds sample that can have accumulated in rats.
D384	ТК	Narizzano, Allison M; Bohannon, Meredith E; East, Andrew G; McDonough, Carrie; Choyke, Sarah; Higgins, Christopher P; Quinn, Michael J Jr	Patterns in Serum Toxicokinetics in Peromyscus Exposed to Per- and Polyfluoroalkyl Substances	2021	Environ Toxicol Chem. 2021 Oct;40(10):2886-2898. doi: 10.1002/etc.5151. Epub 2021 Aug 8.	Per- and polyfluoroalkyl substances (PFAS) are compounds manufactured for use in paints, nonstick cookware, food containers, and water-resistant products. Concerns about PFAS stee the environment, persistence, and variable/uncertain bioaccumulation and toxicity. In the pre- one polyfluoroalkyl substance were administered to white-footed mice (Peromyscus leucopu chemical over 28 d of exposure. Perfluorooctanoate, perfluorohexane sulfonate (PFHxS), and administered to male and female mice via drinking water. Perfluorooctane sulfonate, perfluor sulfonate, and PFHxS were administered to male and female mice via oral gavage. Blood sam of exposure were analyzed for individual PFAS concentrations via liquid chromatography-tan plateau in serum concentration in this toxicity test-relevant timeline depended on interaction perfluoroalkyl sulfonic acids [PFSAs] vs perfluoroalkyl carboxylic acids [PFCAs] vs polyfluori dosing, and 3) to a lesser extent, sex. Specifically, PFCAs were detected at higher concentration PFSAs were generally detected at similar levels across sex. An exception occurred when PFF males than females through bolus, but not continuous, dosing. Type of PFAS had the largest whereas sex had the lowest. As such, future work on the toxicokinetics of PFAS in common et to further explore these patterns. Environ Toxicol Chem 2021;40:2886-2898. © 2021 SETAC. US Government employees and their work is in the public domain in the USA.

	備考	出 情 対 報 象 抽	ン 文 ク 献 ① ラ	ン 文 ク 献 ② ラ
tances have been carried out for many years, he four R's: replacement, reduction, refinement, how toxicokinetic (TK) study design and data in for investigating TK/toxicodynamic (TD) Feight hazardous environmental contaminants cyclohexane (β -HCH), hexachlorobenzene (HCB), berfluorooctanoic acid (PFOA), kture dosing in rabbits using a sparse sampling E) modeling. RESULTS: The short persistence of eir mean residence times (MRT) of a few hours, of the other compounds (1-48 d) resulted either for from their very large volume of distribution used to compute the oral loading and daily on of 1 ng/mL. Simulations with the NLME model rential rates of accumulation in the central vs. of hazardous environmental contaminants, in for interspecies extrapolation of exposure rates in a			В	В
e indoor air and house dust. This study aimed at on and an oral exposure to PFOA coated house rent tissue samples to assess any potential ood samples were collected at sequential time were collected for quantification of PFOA and roups attaining a C(max) at 3 h post exposure. The At 48 h post exposure, the levels of PFOA in the ws that PFOA is readily bioavailable and has a t coated with PFOA. The proportion of PFOA to he mass balance between EOF and target PFOA compounds that co-existed in the house dust			A	В
se in paints, cleaning agents, fire suppressants, put PFAS stem from their ubiquitous presence in ity. In the present study, 5 perfluoroalkyl acids and scus leucopus) to elucidate the kinetics of each (PFHxS), and perfluorobutane sulfonate were nate, perfluorononanoate, 6:2 fluorotelomer ge. Blood samples collected after 14 or 21 and 28 d tography-tandem mass spectrometry. In general, a n interactions between 1) the type of PFAS (i.e., vs polyfluorinated), 2) continuous versus bolus er concentration in females than males, whereas ed when PFHxS yielded higher serum levels in d the largest impact on serum concentrations, in common ecological receptors would be valuable 021 SETAC. This article has been contributed to by			В	В

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D385	ADME	Nilsson, Sandra; Thompson, Jack; Mueller, Jochen F; Bräunig, Jennifer	Apparent Half-Lives of Chlorinated-Perfluorooctane Sulfonate and Perfluorooctane Sulfonate Isomers in Aviation Firefighters	2022	Environ Sci Technol. 2022 Nov 11. doi: 10.1021/acs.est.2c04637. Online ahead of print.	Elevated levels of perfluorooctane sulfonate (PFOS) and elevated detection frequency of chloro-substituted PFOS have been reported in Australian firefighters with historical exposure to aqueous-film forming foam (AFFF). The aim of this study is to estimate the apparent half-lives of CI-PFOS and PFOS isomers in firefighters following the end of exposure to 3M-AFFF. Paired serum samples from 120 firefighters, collected approximately five years apart, were analyzed for 8-CI-PFOS (8-chloroperfluoro-1-octanesulfonic acid) and PFOS isomers via targeted LC-MS/MS. Apparent half-life was estimated by assuming a first order-elimination model. CI-PFOS was detected in 93% of all initial serum samples (<loq-1.09 "1m-pfos".="" "total="" (11.5="" (65%).="" (sum="" 4.0="" 5.0="" 55%="" 7.5="" all="" among="" and="" apparent="" at="" average="" between="" branched="" ci-pfos="" concentration="" concentrations="" differences="" elimination="" estimated="" firefighters="" first="" five="" for="" from="" greater="" had="" half-life="" half-lives="" humans.<="" in="" initial="" is="" isomer="" isomers="" isomers)="" later,="" longest="" made="" marked="" ml).="" ng="" non-linear.="" of="" other="" pfos="" pfos"="" proportion="" ranging="" rate="" report="" sampling="" serum="" study="" suggest="" td="" that="" the="" this="" timepoint.="" to="" total="" up="" was="" years="" years)="" years.=""><td></td><td>1 A A</td></loq-1.09>		1 A A
D386	тк	Warner, Ross M; Sweeney, Lisa M; Hayhurst, Brett A; Mayo, Michael L	Toxicokinetic Modeling of Per- and Polyfluoroalkyl Substance Concentrations within Developing Zebrafish (Danio rerio) Populations	2022	Environ Sci Technol. 2022 Sep 20;56(18):13189-13199. doi: 10.1021/acs.est.2c02942. Epub 2022 Sep 2.	Per- and polyfluoroalkyl substances (PFAS) are pervasive environmental contaminants, and their relative stability and high bioaccumulation potential create a challenging risk assessment problem. Zebrafish (Danio rerio) data, in principle, can be synthesized within a quantitative adverse outcome pathway (qAOP) framework to link molecular activity with individual or population level hazards. However, even as qAOP models are still in their infancy, there is a need to link internal dose and toxicity endpoints in a more rigorous way to further not only qAOP models but adverse outcome pathway frameworks in general. We address this problem by suggesting refinements to the current state of toxicokinetic modeling for the early development zebrafish exposed to PFAS up to 120 h post-fertilization. Our approach describes two key physiological transformation phenomena of the developing zebrafish: dynamic volume of an individual and dynamic hatching of a population. We then explore two different modeling strategies to describe the mass transfer, with one strategy relying on classical kinetic rates and the other incorporating mechanisms of membrane transport and adsorption/binding potential. Moving forward, we discuss the challenges of extending this model in both timeframe and chemical class, in conjunction with providing a conceptual framework for its integration with ongoing qAOP modeling efforts.		вс
D387	ТК	Kudo Naomi(城西 大学 薬 衛生化 学), Kawashima Yoichi	ヒト及び動物におけるペルフルオロオクタン酸の毒性及 びトキシコキネティクス(TOXICITY AND TOXICOKINETICS OF PERFLUOROOCTANOIC ACID IN HUMANS AND ANIMAL S)(英語)	2003	The Journal of Toxicological Sciences(0388-1350)28巻2号 Page49-57(2003.05), doi: 10.2131/jts.28.49	Perfluorooctanoic acid (PFOA) is an octanoic acid derivative to which all aliphatic hydrocarbons are substituted by fluorine. PFOA and its salts are commercially used in various industrial processes. The chemical is persistent in the environment and does not undergo biotransformation. It was reported that PFOA is found not only in the serum of occupationally exposed workers but also general populations. Recent studies have suggested that the biological half-life of PFOA in humans is 4.37 years based on study of occupationally exposed workers. It is increasingly suspect that PFOA accumulates and affects human health, although the toxicokinetics of PFOA in humans remain unclear. In experimental animals, PFOA seems low in toxicity. PFOA is well-absorbed following oral and inhalation exposure, and to a lesser extent following dermal exposure. Once absorbed in the body, it distributes predominantly to the liver and plasma, and to a lesser extent the kidney and lungs. PFOA is excreted in both urine and feces. Biological half-life of PFOA is quite different between species and sexes and the difference is due mainly to the difference in renal clearance. In rats, renal clearance of PFOA is regulated by sex hormones, especially testosterone. PFOA is excreted into urine by active tubular secretion, and certain organic anion transporters are though to be responsible for the secretion. Fecal excretion is also important in the elimination of PFOA. There is evidence that PFOA undergoes enterohepatic circulation resulting in reduced amounts of fecal excretion. Elucidation of the mechanisms of transport in biological systems leads to elimination and detoxification of this chemical in the human body.		ВВ
D388	ADME	Sweeney, Lisa M	Physiologically based pharmacokinetic (PBPK) modeling of perfluorohexane sulfonate (PFHxS) in humans	2022	Regul Toxicol Pharmacol. 2022 Mar;129:105099. doi: 10.1016/j.yrtph.2021.105099. Epub 2021 Dec 18.	Per- and polyfluoroalkyl substances (PFAS) are persistent, man-made compounds prevalent in the environment and consistently identified in human biomonitoring samples. In particular, perfluorooctane sulfonic acid (PFOS), perfluorooctanoic acid (PFOA), and perfluorohexane sulfonic acid (PFHxS) have been identified at U.S. Air Force installations. The study of human toxicokinetics and physiologically based pharmacokinetic (PBPK) modeling of PFHxS has been less robust and has been limited in scope and application as compared to PFOS and PFOA. The primary goal of the current effort was to develop a PBPK model describing PFHxS disposition in humans that can be applied to retrospective, current, and future human health risk assessment of PFHxS. An existing model developed for PFOS and PFOA was modified and key parameter values for exposure and toxicokinetics were calibrated for PFHxS prediction based on human biomonitoring data, particularly general population serum levels from the U.S. Centers for Disease Prevention and Control (CDC) National Health and Nutrition Examination Survey (NHANES). Agreement between the model and the calibration and evaluation data was excellent and recapitulated observed trends across sex, age, and calendar years. Confidence in the model is greatest for application to adults in the 2000-2018 time frame and for shorter-term future projections.		1 A A

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D389	РВРК	Cheng, Weixiao; Ng, Carla A	Bayesian Refinement of the Permeability-Limited Physiologically Based Pharmacokinetic Model for Perfluorooctanoic Acid in Male Rats	2021	Chem Res Toxicol. 2021 Nov 15;34(11):2298-2308. doi: 10.1021/acs.chemrestox.1c00193. Epub 2021 Oct 27.	Physiologically based pharmacokinetic (PBPK) modeling is a powerful technique to inform risk assessment of xenobiotic substances such as perfluorooctanoic acid (PFOA). In our previous study, a permeability-limited PBPK model was developed to simulate the toxicokinetics and tissue distribution of PFOA in male rats. However, due to limited information on some key model parameters (e.g., protein binding and active transport rates), the uncertainty of the permeability-limited PBPK model was quite high. To address this issue, a hierarchical Bayesian analysis with Markov chain Monte Carlo (MCMC) was applied to reduce the uncertainty of parameters and improve the performance of the PBPK model. With the optimized posterior parameters, the PBPK model was evaluated by comparing its prediction with experimental data from three different studies. The results show that the uncertainties of the posterior parameters, most of the predicted plasma toxicokinetics (e.g., half-life) and tissue distribution fell well within a factor of 2.0 of the experimental data. Finally, the Bayesian framework could provide insights into the molecular mechanisms driving PFOA toxicokinetics: PFOA-protein binding, membrane permeability, and active transport.		ВВ
D390	ADME	Deepika, Deepika; Sharma, Raju Prasad; Schuhmacher, Marta; Kumar, Vikas	Risk Assessment of Perfluorooctane Sulfonate (PFOS) using Dynamic Age Dependent Physiologically based Pharmacokinetic Model (PBPK) across Human Lifetime	2021	Environ Res. 2021 Aug;199:111287. doi: 10.1016/j.envres.2021.111287. Epub 2021 May 14.	The widespread use of Perfluorooctane sulfonate (PFOS) in everyday life, its long half-life, and the lipophilicity that makes it easily accumulate in the body, raises the question of its safe exposure among different population groups. There are currently enough epidemiological studies showing evidence of PFOS exposure and its associated adverse effects on humans. Moreover, it is already known that physiological changes along with age e.g. organ volume, renal blood flow, cardiac output and albumin concentrations affect chemicals body burden. Human biomonitoring cohort studies have reported PFOS concentrations in blood and autopsy tissue data with PFOS present in sensitive organs across all human lifespan. However, to interpret such biomonitoring data in the context of chemical risk assessment, it is necessary to have a mechanistic framework that explains show the physiological changes across age affects the concentration of chemical inside different tissues of the human body. PBPK model is widely and successfully used in the field of risk assessment. The objective of this manuscript is to develop a dynamic age-dependent PBPK model as an extension of the previously published adult PFOS model and utilize this model to predict and compare the PFOS tissue distribution and plasma concentration across different age groups. Different cohort study data were used for exposure dose reconstruction and evaluation of time-dependent concentration in sensitive organs. Predicted plasma concentration followed trends observed in biomonitoring data and model predictions showed the increased disposition of PFOS in the geriatric population. PFOS model is sensitive to parameters governing renal resorption and elimination across all ages, which is related to PFOS half-life in humans. This model provides an effective framework for improving the quantitative risk assessment of PFOS throughout the human lifetime, particularly in susceptible age groups. The dynamic age-dependent PBPK model provides a step forward for developing such kind		1 A A
D391	РВРК	Chen, Qiran; Chou, Wei-Chun; Lin, Zhoumeng	Integration of Toxicogenomics and Physiologically Based Pharmacokinetic Modeling in Human Health Risk Assessment of Perfluorooctane Sulfonate	2022	Environ Sci Technol. 2022 Mar 15;56(6):3623-3633. doi: 10.1021/acs.est.1c06479. Epub 2022 Feb 23.	Toxicogenomics and physiologically based pharmacokinetic (PBPK) models are useful approaches in chemical risk assessment, but the methodology to incorporate toxicogenomic data into a PBPK model to inform risk assessment remains to be developed. This study aimed to develop a probabilistic human health risk assessment approach by integrating toxicogenomic dose-response data and PBPK modeling using perfluorooctane sulfonate (PFOS) as a case study. Based on the available human in vitro and mouse in vivo toxicogenomic data, we identified the differentially expressed genes (DEGs) at each exposure paradigm/duration. Kyoto Encyclopedia of Genes and Genomes and disease ontology enrichment analyses were conducted on the DEGs to identify significantly enriched pathways and diseases. The dose-response data of DEGs were analyzed using the Bayesian benchmark dose (BMD) method. Using a previously published PBPK model, the gene BMDs were converted to human equivalent doses (HEDs), which were summarized to pathway and disease HEDs and then extrapolated to reference doses (RfDs) by considering an uncertainty factor of 30 for mouse in vivo data and 10 for human in vitro data. The results suggested that the median RfDs at different exposure paradigms were similar to the 2016 U.S. Environmental Protection Agency's recommended RfD, while the RfDs for the most sensitive pathways and diseases were closer to the recent European Food Safety Authority's guidance values. In conclusion, genomic dose-response data and PBPK modeling can be integrated to become a useful alternative approach in risk assessment of environmental chemicals. This approach considers multiple endpoints, provides toxicity mechanistic insights, and does not rely on apical toxicity endpoints.		ВА

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No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D392	РВРК	Yusuke Kamiya, Mayu Yanagi, Shiori Hina, Kazuki Shigeta, Tomonori Miura, Hiroshi Yamazaki	Plasma, liver, and kidney exposures in rats after oral doses of industrial chemicals predicted using physiologically based pharmacokinetic models: A case study of per?uorooctane sulfonic acid	2020) J Toxicol Sci. 2020;45(12):763-767. doi: 10.2131/jts.45.763.	A simplified physiologically based pharmacokinetic (PBPK) model consisting of chemical receptor, metabolizing and/or excreting, and central compartments was recently proposed. In the current study, this type of PBPK model was set up for per fluorooctane sulfonate, an environmental toxicant with liver effects, as a model compound; the model was then used to estimate tissue concentrations. The pharmacokinetic parameter input values for the model were calculated to give the best fit to reported/measured blood substrate concentrations in rats. The maximum concentrations and areas under the concentration versus time curves in plasma, liver, and kidney extrapolated using PBPK models for per fluorobutane sulfonic acid, perfl uorobexane sulfonic acid, and perfluorooctane sulfonic acid were consistent with the reported mean values in rats. Using the rat models and scaled-up human PBPK models, some accumulation of per fluorooctane sulfonic acid in plasma and liver was seen after repeated doses. The reported 50th and 95th percentile concentrations of per fluorooctane sulfonic acid in human blood (0.0048 and 0.0183 ng/mL, respectively) in the general population underwent reverse dosimetry analysis using our PBPK models. These human blood concentrations potentially imply exposures of 0.041 and 0.16 μ g/kg/day, respectively, for 90 days, values that are roughly similar to the reference dose (0.02 μ g/kg/day) with an uncertainty factor of 30. These results indicate the relatively good estimates for tissue and blood exposures of chemical substrates after oral doses generated using the latest PBPK models.		ВА
D393	РВРК	Kamiya Yusuke(Laborato ry of Drug Metabolism and Pharmacokinetic s, Showa Pharmaceutical University), Yanagi Mayu, Hina Shiori, Shigeta Kazuki, Miura Tomonori, Yamazaki Hiroshi	生理学的薬物動態モデルを用いて予測した工業化学物質 を経口投与したラットにおける血漿、肝臓および腎臓へ の曝露 ペルフルオロオクタンスルホン酸の事例研究 (Plasma, liver, and kidney exposures in rats after oral doses of industrial chemicals predicted using physiologically based pharmacokinetic models: A case study of perfluorooctane sulfonic acid)(英語)	2020) J Toxicol Sci. 2020;45(12):763-767. doi: 10.2131/jts.45.763.	簡易的生理学的薬物動態(PBPK)モデルを、肝毒性がある環境毒物、ペルフルオロオクタンスルホン酸(PFOS)とその2種類のペルフルオ ロアルキルスルホン酸に適用し、それらの組織中濃度を推定した。PFOSをラットに経口投与後の血漿、肝臓、腎臓におけるPFOSの最 大濃度とAUCの測定値は、PBPKモデルを用いて算出した推定値と良く一致した。このラットモデルとヒトPBPKモデルを用いると、 PFOS反復投与後の血漿と肝臓には幾分かのPFOSの蓄積が認められた。PBPKを用いた逆ドシメトリー解析で算出したPFOSの90日反 復投与後の50および95パーセンタイルのヒト血中濃度は0.0048および0.0183ng/mLと報告された。この血中濃度は90日間の0.041およ び0.16µg/kg/day曝露を意味し、規制当局が推奨する参照量0.02µg/kg/day、不確実性因子30にほぼ類似していた。以上より、この PBPKモデルによる経口投与後の化学物質の組織/血中濃度の推定は良好であると考えられた。	JST-46と 重複	
D394	環境中運命	Gassmann, Matthias; Weidemann, Eva; Stahl, Thorsten	Combined leaching and plant uptake simulations of PFOA and PFOS under field conditions	2021	Environ Sci Pollut Res Int. 2021 Jan;28(2):2097-2107. doi: 10.1007/s11356-020-10594-6. Epub 2020 Aug 31.	Per- and polyfluoroalkyl substances (PFASs) are used in industrial production and manufacturing but were repeatedly detected in agricultural soils and therefore in cash crops in recent years. Dissipation of perfluoroalkyl acids (PFAAs), a sub-group of PFASs, in the environment was rather attributed to the formation of non-extractable residues (NER) than to degradation or transformation. Currently, there are no models describing the fate of PFAAs in the soil-plant continuum under field conditions, which hampers an assessment of potential groundwater and food contamination. Therefore, we tested the ability of the pesticide-leaching model MACRO to simulate the leaching and plant uptake of perfluoroactancic acid (PFOA) and perfluoroactane sulfonate (PFOS) in a field lysimeter using two concepts of adsorption: a kinetic two-side sorption concept usually applied for pesticide leaching (scenario I) and the formation of NER (scenario II). The breakthrough of substances could be simulated adequately in scenario II only. Scenario I, however, was not able to reproduce sampled leaching concentrations. Plant uptake was simulated well in the first year after contamination but lacked adequacy in the following years. The model results suggest that more than 90% of PFOA and PFOS are in the pool of NER after 8 years, which is more compared with other studies. However, since NER formation was hypothesized to be a kinetic process and our study used a PFASs leaching time series over a period of 8 years, the results are reasonable. Further research is required on the formation of NER and the uptake of PFASs leaching time series over a period of 8 years, the results are		В
D395	環境中運命	Li, Yulong; He, Liuyang; Lv, Lixin; Xue, Jianming; Wu, Li; Zhang, Zulin; Yang, Lie	Review on plant uptake of PFOS and PFOA for environmental cleanup: potential and implications	2021	Environ Sci Pollut Res Int. 2021 Jun;28(24):30459-30470. doi: 10.1007/s11356-021-14069-0. Epub 2021 Apr 24.	model performance and extend the simulation approach to other PFAAs.Perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS) have gained increasing concern due to their persistent characteristics, wide distribution, biotoxicity, and bioaccumulative properties. The current remediation technologies for PFOA and PFOS are primarily focused on physical and chemical techniques. Phytoremediation has provided promising alternatives to traditional cleanup technologies due to their low operational costs, low maintenance requirements, end-use value, and aesthetic nature. In this review, uptake, translocation, and toxic effects of PFOS and PFOA are summarized and discussed. Several potential hyperaccumulators of PFOS and PFOA are provided according to the existing data. Biomass, chlorophyll, soluble protein, enzyme activities, oxidative stress, and other variables are assessed for potential indicator of PFOS/PFOA biotoxicity. The various studies on multiple scales are compared for identifying the threshold values. Several important implications and recommendations for future research are proposed at the end. This review provides an overview of current studies on plant uptake of PFOS and PFOA from the perspective of phytoremediation.		C

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン文ン文 ク献 ク献 ① ラ ② ラ
D396	環境中運命	Wang, Wenfeng; Rhodes, Geoff; Ge, Jing; Yu, Xiangyang; Li, Hui	Uptake and accumulation of per- and polyfluoroalkyl substances in plants	2020	Chemosphere. 2020 Dec;261:127584. doi: 10.1016/j.chemosphere.2020.127584. Epub 2020 Jul 19.	Per- and polyfluoroalkyl substances (PFASs) are a class of persistent organic contaminants that are ubiquitous in the environment and have been found to be accumulated in agricultural products. Consumption of PFAS-contaminated agricultural products represents a feasible pathway for the trophic transfer of these toxic chemicals along food chains/webs, leading to risks associated with human and animal health. Recently, studies on plant uptake and accumulation of PFASs have rapidly increased; consequently, a review to summarize the current knowledge and highlight future research is needed. Analysis of the publications indicates that a large variety of plant species can take up PFASs from the environment. Vegetables and grains are the most commonly investigated crops, with perfluorooctanoic acid (PFOA) and perfluorooctanesulfonic acid (PFOS) as the most studied PFASs. The potential sources of PFASs for plant uptake include industrial emissions, irrigation with contaminated water, land application of biosolids, leachates from landfill sites, and pesticide application. Root uptake is the predominant pathway for the accumulation of PFASs in agricultural crops, and uptake by plant aboveground portions from the ambient atmosphere could play a minor role in the overall PFAS accumulation. PFAS uptake by plants is influenced by physicochemical properties of compounds (e.g., perfluorocarbon chain length, head group functionality, water solubility, and volatility), plant physiology (e.g., transpiration rate, lipid and protein content), and abiotic factors (e.g., soil organic matters, pH, salinity, and temperature). Based on literature analysis, the current knowledge gaps are identified, and future research prospects are suggested.			В
D397	環境中運命	Li, Fei; Yang, Ning; Yang, Zhimin; Cao, Wei; Zhou, Zhenming; Liao, Xiaobin; Sun, Wenjie; Yuan, Baoling	Biomimetic degradability of linear perfluorooctanesulfonate (L-PFOS): Degradation products and pathways	2020	Chemosphere. 2020 Nov;259:127502. doi: 10.1016/j.chemosphere.2020.127502. Epub 2020 Jul 2.	The reductive degradability and decomposition pathways of linear perfluorooctanesulfonate (L-PFOS) were investigated in a biomimetic system consisting of Ti(III)-citrate and Vitamin B(12). Biomimetic degradation of L-PFOS could well be described by a first-order exponential decay model. Accompanied by the release of fluoride ion, technical PFOS could not only be transformed to perfluorocarboxylates (PFCAs) and perfluoroalkylsulfonates (PFSAs) with perfluoroalkyl carbon chain length < C8 (thereafter referred as carbon-chain-shortened degradation products), but also be transformed to PFCAs with perfluoroalkyl carbon chain length \geq C8 (thereafter referred as carbon-chain-lengthened degradation products). Perfluorohexanesulfonate and perfluorotetradecanoate were the most abundant carbon-chain-shortened and -lengthened degradation products of technical PFOS, respectively. Based on the various degradation products detected during biomimetic reduction of linear [1,2,3,4-(13)C(4)]-PFOS, the degradation pathways of L-PFOS were proposed as follows: L-PFOS was first reduced to C(8)F(17)• radical by cleavage of C-S bond, and then transformed to PFOA through hydrolysis. However, the carbon-chain-shortened products were not generated through the sequential chain-shortening via C(8)F(17)• radicals and/or L-PFOS, while the carbon-chain-lengthened products were not formed via C(8)F(17)• radicals by stepwise addition of CF(2) moiety. In fact, C(8)F(17)• radical and/or L-PFOS were further reduced to form C(n)F(2n+1)• (n = 1, 2, 3, 4) radicals, and these radicals were chain-lengthened by stepwise addition of C(4)F(8) moiety and eventually transformed to various degradation products via hydrolysis (PFCAs) or combination reaction with sulfonyl hydroxide (PFSAs). All carbon-chain-shortened compounds were first identified as the biomimetic reduction products of L-PFOS.			С
D398	環境中運命	Hu, Hongmei; Zhang, Yingying; Zhao, Nan; Xie, Jiahui; Zhou, Yanqiu; Zhao, Meirong; Jin, Hangbiao	Legacy and emerging poly- and perfluorochemicals in seawater and sediment from East China Sea	2021	Sci Total Environ. 2021 Nov 25;797:149052. doi: 10.1016/j.scitotenv.2021.149052. Epub 2021 Jul 19.	Following the global phase out of perfluorooctane sulfate (PFOS), chlorinated polyfluoroalkyl ether sulfonates (CI-PFAESs) and p- perfluorous nonenoxybenzenesulfonate (PFNOBS) have emerged as novel PFOS substitutes. However, until now, limited data is available on their occurrence and environmental behaviors in the marine environment. Here, seawater and sediment samples were collected from East China Sea and analyzed for CI-PFAESs, PFNOBS, and perfluoroalkyl acids (PFAAs; including their branched isomers) to investigate their concentrations, potential sources, and sediment-seawater partitioning behaviors. Perfluorooctanoate (PFOA) and PFOS were consistently the predominant PFAAs in seawaters and sediments. Branched PFOA and PFOS isomers were consistently much less frequently detected in sediments than that in seawaters. Linear PFOA contributed 92-95% of total PFOA in seawaters, suggesting the great contribution of telomerization PFOA. 6:2 CI-PFAES was detected in all seawaters (concentration, 0.58-47 pg/L) and in the majority of sediments (<lod-28 46%="" g).="" in="" observed="" of="" pfnobs="" pg="" seawater<br="" was="">samples (concentration, <lod-5.2 (<lod-1.7="" 66%="" and="" distribution="" g).="" l)="" of="" pg="" samples="" sediment="" spatial="" suggested="" the<br="" trend="">riverine input as an important source of PFAAs and 6:2 CI-PFAES in this sampling area. 6:2 CI-PFAES (log K(oc), 2.6 \pm 0.36) and PFNOBS (2.7 \pm 0.33) had comparable mean log-transformed sediment-seawater partitioning coefficients (log K(oc)) to PFOA (2.5 \pm 0.32) or PFOS (2.8 \pm 0.49), indicating their long-range transport potential in global oceans with ocean currents. Overall, this study provides the first data on occurrence and partitioning behaviors of 6:2 CI-PFAES and PFNOBS in the marine environment.</lod-5.2></lod-28>			С

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 対報 ク献 象抽 ① ラ	ン 文 ク 献 ② ラ
D399	環境中運命	Xing, Yingna; Li, Qi; Chen, Xin; Fu, Xiaowen; Ji, Lei; Wang, Jianing; Li, Tianyuan; Zhang, Qiang	Different transport behaviors and mechanisms of perfluorooctanoate (PFOA) and perfluorooctane sulfonate (PFOS) in saturated porous media	2021	J Hazard Mater. 2021 Jan 15;402:123435. doi: 10.1016/j.jhazmat.2020.123435. Epub 2020 Jul 8.	Perfluorooctanoate (PFOA) and perfluorooctane sulfonate (PFOS) in soil aroused increasing concern, however there is little information about their transport in porous media, which is urgently needed to better control their environmental risks. In this study, saturated sand columns (considering the coupled effect of solution cation type and pH) and a two-site nonequilibrium transport model (TSM) were used to investigate the transport behaviors and mechanisms of PFOA and PFOS. Breakthrough data and the TSM parameters showed PFOA had higher mobility than PFOS, and divalent cation could inhibit their transport by increasing the nonequilibrium interactions between them and the sand. pH had little influence on PFOA migration when there was only monovalent cation in the solution since PFOA had limited affinity with the sand, however, polyvalent cation could provide additional adsorption sites for it through cation bridging and enhance the effect of pH. Differently, decreasing pH inhibited the transport of PFOS more significantly, and the effect was stronger than that of changing cation type. That proved mechanisms like hydrogen-bonding which were sensitive to solution pH played an important role in PFOS migration. These results provide important scientific basis to the remediation strategy and the migration prediction model development of PFOA and PFOS.		С	
D400	環境中運命	Yu, Peng-Fei; Li, Yan-Wen; Zou, Long-Jun; Liu, Bai-Lin; Xiang, Lei; Zhao, Hai- Ming; Li, Hui; Cai, Quan-Ying; Hou, Xue-Wen; Mo, Ce-Hui; Wong, Ming Hung; Li, Qing X	Variety-Selective Rhizospheric Activation, Uptake, and Subcellular Distribution of Perfluorooctanesulfonate (PFOS) in Lettuce (Lactuca sativa L.)	2021	Environ Sci Technol. 2021 Jul 6;55(13):8730-8741. doi: 10.1021/acs.est.1c01175. Epub 2021 Jun 25.	Perfluorooctanesulfonate (PFOS) as an accumulative emerging persistent organic pollutant in crops poses severe threats to human health. Lettuce varieties that accumulate a lower amount of PFOS (low-accumulating crop variety, LACV) have been identified, but the regarding mechanisms remain unsolved. Here, rhizospheric activation, uptake, translocation, and compartmentalization of PFOS in LACV were investigated in comparison with those of high-accumulating crop variety (HACV) in terms of rhizospheric forms, transporters, and subcellular distributions of PFOS. The enhanced PFOS desorption from the rhizosphere soils by dissolved organic matter from root exudates was observed with weaker effect in LACV than in HACV. PFOS root uptake was controlled by a transporter-mediated passive process in which low activities of aquaporins and rapid-type anion channels were corrected with low expression levels of PIPs (PIP1-1 and PIP2-2) and ALMTs (ALMT10 and ALMT13) genes in LACV roots. Higher PFOS proportions in root cell walls and trophoplasts caused lower root-to-shoot transport in LACV. The ability to cope with PFOS toxicity to shoot cells was poorer in LACV relative to HACV since PFOS proportions were higher in chloroplasts but lower in vacuoles. Our findings provide novel insights into PFOS accumulation in lettuce and further understanding of multiprocess mechanisms of LACV.		В	
D401	環境中運命	Schaefer, Charles E; Drennan, Dina; Nickerson, Anastasia; Maizel, Andrew; Higgins, Christopher P	Diffusion of perfluoroalkyl acids through clay-rich soil	2021	J Contam Hydrol. 2021 Aug;241:103814. doi: 10.1016/j.jconhyd.2021.103814. Epub 2021 Apr 17.	Diffusion through a water saturated silty clay soil column was measured for six perfluoroalkyl acids (PFAAs), including perfluorooctanoic acid (PFOA) and perfluorooctane sulfonic acid (PFOS). An aqueous pore diffusion model, which incorporated linear adsorption parameters measured independently in batch tests and a tortuosity factor determined independently using a bromide tracer test, was used to describe the experimental diffusion data. The diffusion model substantially underpredicted PFAA diffusion through the soil column for the more strongly sorbing PFAAs (most notably PFOS). Instead, application of a diffusion model that included a surface diffusion-like process provided substantially improved prediction of PFAA diffusion through the soil. The ratio of the observed pore diffusion coefficient to the observed surface diffusion serves a potentially important role for strongly sorbing PFAAs in clay-rich soils, and highlights the need for additional studies into the coupled adsorption and diffusion of PFAAs in low permeability media.		В	
D402	環境中運命	C	Research progress on the pollution, adsorption, and transport of perfluorooctanoic acid (PFOA) at the sediment-water interface	2021	Ying Yong Sheng Tai Xue Bao. 2021 Nov 15;32(11):4147- 4155. doi:10.13287/j.1001-9332.202111.034.	Perfluorooctanoic acid (PFOA) is an important perfluorinated surfactant, which has received great attention as an emerging pollutant, due to its persistence, high toxicity, and bioaccumulation. Sediment is an important environmental reservoir for PFOA, while polluted sediment can serve as a long-term contamination source causing pollution to overlying surface water and surrounding groundwater. Here, the source, pollution level, adsorption and transport of PFOA at the sediment-water interface were systematically reviewed. Industrial discharge was the major release for PFOA entering surface water and sediment. PFOA was generally at ng·L(-1) and ng·g(-1) levels in global surface water and sediment. More serious pollution was found in some parts of China. Sediment composition, hadrochemical condition, natural organic matter, and surfactants could strongly affect PFOA adsorption in sediment, though the controlling mechanisms were controversial. Research on PFOA transport in sediment had just been started with limited progress. There is a great gap in understanding the mechanisms underlying PFOA transport in sediment, which should be strengthened in the future.		В	
D403	環境中運命	Lupton, Sara J; Casey, Francis; Smith, David J; Hakk, Heldur	Perfluorooctanoic Acid Transport in Soil and Absorption and Distribution in Alfalfa (Medicago sativa)	2022	J Food Prot. 2022 Jan 1;85(1):164-172. doi: 10.4315/JFP-21- 276.	ABSTRACT: Perfluorooctanoic acid (PFOA) is used as a surfactant in consumer and industrial products and is frequently found in biosolids from wastewater treatment plants. When present in biosolids applied to croplands, PFOA can contaminate feed and fodder used by livestock, but the extent of PFOA transfer from soil to plants is not well characterized. A single dose of radiocarbon (14C)-tagged PFOA was applied to unplanted soil or soil containing growing alfalfa. PFOA transport through unplanted soil and uptake by alfalfa was monitored over a 10-week study period. Radiocarbon was initially measured in roots, stems, and leaves 7 days after [14C]-PFOA application to soil. PFOA accumulation was greatest in leaves during the 10-week sampling. By week 10, PFOA migration through unplanted soil had reached a depth of 22.8 ± 2.5 cm. In contrast, PFOA migrated to 7.5 ± 2.5 cm in soil containing alfalfa plants. The greatest predictor of PFOA concentration in alfalfa leaves was PFOA concentration in the top 5 cm of soil; PFOA concentrations at lower depths were not correlated with alfalfa PFOA concentrations. PFOA transport through soil may be slowed by the presence of forage; however, PFOA accumulation in edible portions of forage plants may increase food animal exposure to PFOA residues.		с	

分野 タイトル 発行年 書誌情報 要旨 (原文) No 著者 (参考) Diffusion of perfluorooctanoate (PFOA) and perfluorooctane sulfonate (PFOS) through 0.1 n and 0.75 mm LLDPE coextruded with ethyl vinyl alcohol (denoted as CoEx) at room tempera examined. These tests had negligible source depletion throughout the monitoring period, inc partitioning and diffusion through the LLDPE. At 483 days, 23 ° C receptor PFOA and PFOS $(c(r)/c(o) < 3.2 \times 10(-4))$ for all tests, and at 399 days elevated temperature receptor conce $< 1.6 \times 10(-5)$) at 35 $^{\circ}$ C and $< 0.5 \mu$ g/L (c(r)/c(o) $< 2.0 \times 10(-5)$) at 50 $^{\circ}$ C for both PFOA Di Battista, V; coefficient, S(gf) was 0.9-1.4 (PFOA) and 2.8-5.3 (PFOS) based on sorption tests at 23 °C. PFOA and PFOS diffusion through LLDPE and LLDPE 環境中運 Rowe, R Kerry; Waste Manag. 2020 Nov;117:93-103. doi: D404 2020 permeation coefficient, P(g)(CoEx), for CoEx was consistently lower than P(g)(LLDPE). For Patch, D; Weber, coextruded with EVOH at 22 °C, 35 °C, and 50 °C 10.1016/j.wasman.2020.07.036. Epub 2020 Aug 17. 10(-16) m(2)/s at 23 ° C, $<11 \times 10(-16) \text{ m}(2)/\text{s}$ (35 ° C), and $<10 \times 10(-16) \text{ m}(2)/\text{s}$ (50 ° $3.1 \times 10(-16) \text{ m}(2)/\text{s} (23^{\circ} \text{ C}), <13 \times 10(-16) \text{ m}(2)/\text{s} (35^{\circ} \text{ C}), \text{ and } <19 \times 10(-16) \text{ m}(2)/\text{s}$ had $P(g)(CoEx) < 0.55 \times 10(-16) m(2)/s$ and $P(g)(LLDPE) < 3.2 \times 10(-16) m(2)/s$ (23 ° C). and P(g)(LLDPE) < 40 \times 10(-16) m(2)/s (35 ° C), and P(g)(CoEx) < 8.2 \times 10(-16) m(2)/s at 20 \times 10(-16) m(2)/s at 20 m(2)/s (50 ° C). These values are preliminary and may change (e.g., decrease) as more data values deduced for PFOA and PFOS are remarkably lower than those reported for other cont which exhibits similar behaviour Perfluorooctanoic acid (PFOA) and perfluorooctane sulfonic acid (PFOS) are the most repres that accumulate in the food chain and are harmful to the environment. The uptake, transloc PFOA and PFOS in plants have been reported in recent years; however, the regulatory mech Zhang, Ping; mediated plant growth and development remain largely unclear. Here, using Arabidopsis tha Sun, Liangliang; Perfluorooctanoic acid and perfluorooctane sulfonic showed that both PFOA and PFOS inhibited plant growth; PFOS showed a stronger inhibitor Sci Total Environ. 2022 Dec 10;851(Pt 2):158287. doi: 環境中運 Liu, Fei: Gao acid inhibit plant growth through the modulation of whereas PFOA exerted a stronger inhibitory effect on photosynthesis. Transcriptome analys D405 phytohormone signalling pathways: Evidence from 10.1016/j.scitotenv.2022.158287. Epub 2022 Aug 27. modulated plant growth and development were correlated with the phytohormones auxin an Oingging: Wang Ruting; Ju, Qiong; molecular and genetic analysis in Arabidopsis analyses using mutants related to auxin biosynthesis, receptors and transport and mutants Xu, Jin signalling transduction revealed that both PFOA and PFOS inhibited PR growth by modulatir pathways, and the ABA signalling pathway was also involved in PFOS-mediated PR growth shed new light on the molecular mechanisms of PFOA- and PFOS-mediated root system gro phytohormone signalling pathways in plants. The co-contamination by perfluoroalkyl acids (PFAAs) and heavy metals (HMs) is ubiquitou to sewage irrigation and land application of sludge. However, the joint effects of HMs and P clarified. This study explored the root uptake and acropetal translocation behaviors of C2-C8 L.) under the co-exposure of copper (Cu). The underlying uptake mechanisms of PFAAs wer The results showed that excessive Cu (100-400 $\,\mu\,$ mol/L) damaged the cell membrane of wh Zhang, Lu; Wang, Uptake and translocation of perfluoroalkyl acids with leakage. In the defective root system, the root concentrations of PFAAs decreased by 6%-73 環境中運 Qi; Chen, Hao; different carbon chain lengths (C2-C8) in wheat Environ Pollut. 2021 Apr 1;274:116550. doi: negatively associated with the carbon chain length of PFAAs. Along with the decrease in roo 2021 10.1016/j.envpol.2021.116550. Epub 2021 Jan 25. D406 (Triticum acstivnm L.) under the effect of copper Yao, Yiming: amount of ultrashort-chain (C2-C3) and short-chain (C4-C6) PFAAs translocated to the sho Sun, Hongwen exposure contrast, the acropetal translocation of long-chain (C8) PFAAs, perfluorooctanoic acid (PFO) (PFOS), was enhanced under Cu exposure due to the increase in root permeability as obser The shoot concentrations of PFOA and PFOS under Cu exposure were up to 5.5 and 11 time: respectively. These results suggested that PFOA and PFOS could enter wheat root more ea exposure and thereby their acropetal transportation to shoot was enhanced. Therefore, the chain PFAAs can be potentially underestimated if without considering the co-contamination Per- and polyfluoroalkyl substances (PFAS) such as perfluorooctanoic acid (PFOA) have rec emerging contaminants. Due to widespread application in household products and aqueous distributed in the environment, and bioaccumulate in the blood and tissues of mammals incl Fenton reaction, a hybrid biotic/abiotic hydroxyl radical (HO•)-generating system, previously Toporek, Yael: organic pollutants. In the present study, the microbially driven Fenton reaction was employed Shin, Hyun Batch cultures of the facultatively anaerobic bacteria Shewanella oneidensis were amended 環境中運 Resistance of perfluorooctanoic acid to degradation by FEMS Microbiol Lett. 2022 Jan 25;368(21-24):fnab158. doi: D407 Dong; 2022 aerobic conditions, S. oneidensis reduced oxygen to hydrogen peroxide (H2O2), while under 10.1093/femsle/fnab158. the microbially driven Fenton reaction DiChristina reduced Fe(III) to Fe(II). During aerobic-to-anaerobic transition periods, Fe(II) and H2O2 into Thomas J reaction to produce HO• radicals, which in turn interacted with PFOA. Batch reactors were c phases for four cycles, residual PFOA was extracted via liquid-liquid extraction and analyzed with tandem mass spectrometry. Unlike degradation of other organic pollutants, PFOA conc indicated that PEOA was resistant to degradation by the microbially-driven Fenton reaction Fenton reaction systems, these results most likely reflect the inability of HO• radicals to oxi

	備考	出	ン 文 ク 献 ① ラ	ン 文 ク 献 ② ラ
hm and 0.75 mm LLDPE and 0.1 mm ture (23 ° C), 35 ° C, and 50 ° C is dicating limited contaminant concentrations, c(r), were <8 μ g/L entrations were < 0.4 μ g/L (c(r)/c(o) A and PFOS. LLDPE partitioning Based on the best estimates of PFOA, CoEx had P(g)(CoEx) < 0.26 × C) while LLDPE had P(g)(LLDPE) < (50 ° C). For PFOS, CoEx and LLDPE , P(g)(CoEx) < 8.3 × 10(-16) m(2)/s and P(g)(LLDPE) < 52 × 10(-16) a comes available over time. The P(g) taminants of concern, excepting BPA,			С	
sentative perfluoroalkyl substances ation and physiological effects of anisms underlying PFOA- and PFOS- liana as the study material, we ry effect on primary root (PR) growth, is revealed that PFOA- and PFOS- d abscisic acid (ABA). Further genetic related to ABA biosynthesis and ng auxin biosynthesis and signalling nhibition. Collectively, these results owth and their effects on			В	
s in the surface environment subjected FAAs on plant roots are not well B PFAAs by wheat (Triticum acstivnm re verified in a defective root system. heat root to increase electrolytic % and the decrease rates were bt concentrations of PFAAs, the ot also decreased by 45%-84%. In A) and per fluorooctane sulfonic acid wed by increased electrolytic leakage. s higher than those in the control, sily through the breaks caused by Cu risk of plant accumulation of long- with HMs in the environment.			С	
evived recent heightened attention as film-forming foams, PFAS are globally uding humans. The microbially driven or degraded a wide variety of persistant d to attempt degradation of PFOA. with PFOA and Fe(III)-citrate. Under anaerobic conditions, S. oneidensis eracted chemically via the Fenton cycled between aerobic and anaerobic d by liquid chromatography combined entrations remained unchanged, which Similar to abiotic (purely chemical) datively degrade PFOA.			С	

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	情報抽	ン文 ク献 ① ラ ② ラ
D408	環境中運 命	Xiao, Jun; Huang, Juan; Wang, Ying; Qian, Xiuwen	The fate and behavior of perfluorooctanoic acid (PFOA) in constructed wetlands: Insights into potential removal and transformation pathway	2022	Sci Total Environ. 2022 Nov 17:160309. doi: 10.1016/j.scitotenv.2022.160309. Online ahead of print.	Although constructed wetland (CW) technology is widely used to eliminate emerging organic pollutants, the removal pathway of perfluoroalkyl and polyfluoroalkyl substances (PFASs) in CW system have not been fully understood yet. This study aims to deeply probe into the fate and behavior of perfluoroactanoic acid (PFOA) in CW system. Findings indicated that the removal efficiency of PFOA by CW system was 49.69-73.63 % with initial concentrations at 100-1000 μ g/L. Substrate was the main "sink" of PFOA into the CWs (46.22-50.83 %), and the plant uptake (1.99-2.48 %) accounted for a small proportion. Transformation products in the effluent of CW systems included a series of short-chain perfluorinated carboxylic acids (PFCAs), hydrogen-containing perfluoroalkanes and other organic fluorides. Activated pathways of xenobiotics biodegradation suggested that enzyme-mediated biochemical reactions might be responsible for the PFOA transformation. The transformation pathway included enzymatic decarboxylation, hydroxylation, hydrolysis, dehydrogenation and dehalogenation, as well as non-enzymatic reactions. These discoveries provide new insights into the in-depth understanding environmental behavior of PFOA in ecosystem and lay the foundation for further ecological remediation.			В
D409	環境中運命	Zhang, Qi; Wu, Xiaoli; Lyu, Xueyan; Gao, Bin; Wu, Jichun; Sun, Yuanyuan	Effects of anionic hydrocarbon surfactant on the transport of perfluorooctanoic acid (PFOA) in natural soils	2022	Environ Sci Pollut Res Int. 2022 Apr;29(17):24672-24681. doi: 10.1007/s11356-021-17680-3. Epub 2021 Nov 26.	The widespread usage of per- and polyfluoroalkyl substances (PFASs) has led to their ubiquitous co-existence with hydrocarbon surfactants in the subsurface environment. In this study, column experiments were conducted to investigate the effect of an anionic hydrocarbon surfactant (sodium dodecylbenzene sulfonate, SDBS, 1 and 10 mg/L) on the transport of perfluorooctanoic acid (PFOA) in two saturated natural soils under different cation type (Na(+) and Ca(2+)) conditions. Results showed that SDBS (10 mg/L) significantly enhanced the transport of PFOA in two soils. This was likely because SDBS had a stronger adsorption affinity to the soils than PFOA, and can outcompete PFOA for the finite adsorption sites on the soil surface. The effect of SDBS on PFOA transport varied greatly in the two soils. More negatively charged soil surface and greater soil particle size likely contributed to the more noticeable transport-enhancement of PFOA resulting from the presence of SDBS. Also, the enhancement effect of SDBS (10 mg/L) with Ca(2+) on PFOA transport was more significantly than that with Na(+). This was possibly due to the blocking effect of SDBS to the more positively charged soil surface induced by Ca(2+). Findings of this study point out the importance of anionic hydrocarbon surfactants on PFOA transport when assessing its environmental risks and implementing remediation efforts.			В
D410	環境中運	Awad, John; Brunetti, Gianluca; Juhasz, Albert; Williams, Mike; Navarro, Divina; Drigo, Barbara; Bougoure, Jeremy; Vanderzalm, Joanne; Beecham, Simon	Application of native plants in constructed floating wetlands as a passive remediation approach for PFAS-impacted surface water	2022	J Hazard Mater. 2022 May 5;429:128326. doi: 10.1016/j.jhazmat.2022.128326. Epub 2022 Jan 21.	Strategies for remediation of per- and polyfluoroalkyl substances (PFAS) generally prioritise highly contaminated source areas. However, the mobility of PFAS in the environment often results in extensive low-level contamination of surface waters across broad areas. Constructed Floating Wetlands (CFWs) promote the growth of plants in buoyant structures where pollutants are assimilated into plant biomass. This study examined the hydroponic growth of Juncus krausii, Baumea articulata and Phragmites australis over a 28-day period for remediation of perfluorooctanoic acid (PFOA) and perfluorooctane sulfonic acid (PFOS) contaminated (0.2 µg/L to 30 µg/L) urban stormwater. With increasing PFOA and PFOS concentrations, accumulation in plant species increased although root and shoot distribution varied depending on PFAS functional group. Less PFOA than PFOS accumulated in plant roots (0.006-0.16 versus 0.008-0.68 µg/g), while more PFOA accumulated in the plant shoots (0.02-0.55 versus 0.01-0.16 µg/g) indicating translocation to upper plant portions. Phragmites australis accumulated the highest overall plant tissue concentrations of PFOA and PFOS. The NanoSIMS data demonstrated that PFAS associated with roots and shoots was absorbed and not just surface bound. These results illustrate that CFWs have the potential to be used to reduce PFAS contaminants in surface waters.			В
D411	環境中運命	Lasee, Steven; Subbiah, Seenivasan; Deb, Sanjit; Karnjanapiboon wong, Adcharee; Payton, Paxton; Anderson, Todd A	The Effects of Soil Organic Carbon Content on Plant Uptake of Soil Perfluoro Alkyl Acids (PFAAs) and the Potential Regulatory Implications	2021	Environ Toxicol Chem. 2021 Mar;40(3):820-833. doi: 10.1002/etc.4786. Epub 2020 Jul 8.	Perfluoro alkyl acids (PFAAs) are known to bioconcentrate in plants grown in contaminated soils; the potential risk from consuming these plants is currently less understood. We determined that the current daily reference doses (RfDs) of the US Environmental Protection Agency (USEPA) could be met by consuming a single radish grown in soils with a perfluorooctanoic acid (PFOA) concentration of 9.7 ng/g or a perfluorooctane sulfonate (PFOS) concentration of 90.5 ng/g. Using a combination of our own research and literature data on plant uptake of PFAAs from soil, we developed equations for predicting PFAA bioconcentration factors (BCFs) for plant shoot and root tissues grown in soils with a known percentage of organic carbon. This calculated BCF was then applied to 6 scenarios with measured soil PFAA concentrations to estimate PFAA concentrations in plants and potential exposure to humans and animals consuming harvested vegetation. Five of the 6 scenarios showed potential for surpassing USEPA PFAA RfDs at soil concentrations as low as 24 ng/g PFOA and 28 ng/g PFOS. Environ Toxicol Chem 2021;40:832-845, © 2020 SETAC.			В

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン文 ン文 ク献 り ず の ず
D412	環境中運命	Stults, John F; Choi, Youn Jeong; Schaefer, Charles E; Illangasekare, Tissa H; Higgins, Christopher P	Estimation of Transport Parameters of Perfluoroalkyl Acids (PFAAs) in Unsaturated Porous Media: Critical Experimental and Modeling Improvements	2022	Environ Sci Technol. 2022 Jun 21;56(12):7963-7975. doi: 10.1021/acs.est.2c00819. Epub 2022 May 13.	Predicting the transport of perfluoroalkyl acids (PFAAs) in the vadose zone is critically important for PFAA site cleanup and risk mitigation. PFAAs exhibit several unusual and poorly understood transport behaviors, including partitioning to the air-water interface, which is currently the subject of debate. This study develops a novel use of quasi-saturated (residual air saturation) column experiments to estimate chemical partitioning parameters of both linear and branched perfluorooctane sulfonate (PFOS) in unsaturated soils. The ratio of linear-to-branched air-water interfacial partitioning constants for all six experiments was 1.62 ± 0.24, indicating significantly greater partitioning of linear PFOS isomers at the air-water interface. Standard breakthrough curve analysis and numerical inversion of HYDRUS models support the application of a Freundlich isotherm for PFOS air-water interfacial partitioning below a critical reference concentration (CRC). Data from this study and previously reported unsaturated column data on perfluorooctanoate (PFOA) were reevaluated to examine unsaturated systems for transport nonidealities. This reanalysis suggests both transport nonidealities and Freundlich isotherm behavior for PFOA below the CRC using drainage-based column methods, contrary to the assertions of the original authors. Finally, a combined Freundlich-Langmuir isotherm was proposed to describe PFAA air-water interfacial partitioning across the full range of relevant PFAA concentrations.			В
D413	環境中運命	Jahn, Kalle L; Lincoln, Sara A; Freeman, Katherine H; Saffer, Demian M	Preferential Retention and Transport of Perfluorooctanesulfonic Acid in a Dolomite Aquifer	2022	Ground Water. 2022 Sep 14. doi: 10.1111/gwat.13255. Online ahead of print.	Per- and polyfluoroalkyl substances (PFAS) can represent a significant human health risk if present in aquifers used as a drinking water source. Accurate assessment of PFAS exposure risks requires an improved understanding of field-scale PFAS transport in groundwater. Activities at a former firefighter training site in University Park, Pennsylvania introduced perfluorooctanesulfonic acid (PFOS) to the underlying dolomite aquifer. Groundwater sampling from 2015 to 2018 delineated a PFOS plume with two concentration maxima located approximately 20 and approximately 220 m downgradient of the training site, separated by a zone of lower concentrations. We use a combination of analytical and numerical models, informed by independent measurements of aquifer porosity, hydraulic conductivity, and organic carbon content, to interpret the field observations. Our analysis demonstrates that preferential retention and transport resulting from simple heterogeneity in bedrock sorption, as caused by organic carbon (OC) content variability, provides a plausible explanation for plume separation. Dissolved PFOS partitions strongly to organic solids (high K(oc)), so even a small OC (<1 wt%) significantly retards PFOS transport, whereas zones with little to no OC allow for transport rates that approximate those of a conservative solute. Our work highlights an important consideration for modeling the groundwater transport of PFOS, and other compounds with high K(oc) . In aquifers with discrete layers of varying OC, models using a uniform site-average OC will underestimate transport distances, thereby misrepresenting exposure risks for downgradient communities.			В
D414	環境中運命	Wattier, Bryanna D; Gonzales, Annelise K; Martinez, Nicole E	Perfluorooctanoic acid (PFOA) uptake in the mustard species Brassica juncea	2022	J Environ Qual. 2022 Nov 7. doi: 10.1002/jeq2.20431. Online ahead of print.	Perfluorooctanoic acid (PFOA), a surfactant, is a member of the perfluoroalkyl acids (PFAAs) family and is a contaminant of emerging concern for human and environmental health. PFOA is a persistent organic pollutant but currently little is known about (1) the potential ecological and toxicological effects of PFOA and (2) how PFOA moves in the environment. This study employs a radiotracer ((14) C-PFOA) to study the uptake and translocation of PFOA in hydroponically grown Brassica juncea (brown mustard), a representative crop species. Plants were exposed in quadruplicate over the course of seven days (with plants sampled on Days 4 and 7) to PFOA concentrations of 0, 1, 5, 10, and 15 mg/L. Uptake was quantified via liquid scintillation counting of samples from the nutrient solution, roots, stems, and leaves. Transfer factors (roots to shoots) ranged from 0.15 to 4.73 kg/kg. Bioconcentration factors (solution to plant) ranged from 0.36 to 62.29 L/kg. Factors were influenced by plant compartment, day sampled, and treatment level. This article is protected by copyright. All rights reserved.			В
D415	環境中運命	Ji, Yifan; Yan, Ni; Brusseau, Mark L; Guo, Bo; Zheng, Xilai; Dai, Mengfan; Liu, Hejie; Li, Xin	Impact of a Hydrocarbon Surfactant on the Retention and Transport of Perfluorooctanoic Acid in Saturated and Unsaturated Porous Media	2021	Environ Sci Technol. 2021 Aug 3;55(15):10480-10490. doi: 10.1021/acs.est.1c01919. Epub 2021 Jul 21.	The transport and retention behavior of perfluorooctanoic acid (PFOA) in the presence of a hydrocarbon surfactant under saturated and unsaturated conditions was investigated. Miscible-displacement transport experiments were conducted at different PFOA and sodium dodecyl sulfate (SDS) input ratios to determine the impact of SDS on PFOA adsorption at solid-water and airwater interfaces. A numerical flow and transport model was employed to simulate the experiments. The PFOA breakthrough curves for unsaturated conditions exhibited greater retardation compared to those for saturated conditions in all cases, owing to air-water interfacial adsorption. The retardation factor for PFOA with a low concentration of SDS (PFOA-SDS ratio of 10:1) was similar to that for PFOA without SDS under unsaturated conditions. Conversely, retardation was greater in the presence of higher levels of SDS (1:1 and 1:10) with retardation factors increasing from 2.4 to 2.9 and 3.6 under unsaturated conditions due to enhanced adsorption at the solid-water and air-water interfaces. The low concentration of SDS had no measurable impact on PFOA air-water interfacial adsorption coefficients (K(ia)) determined from the transport experiments. The presence of SDS at the higher PFOA-SDS concentration ratios increased the surface activity of PFOA, with transport-determined K(ia) values increased by 27 and 139%, respectively. The model provided very good independently predicted simulations of the measured breakthrough curves and showed that PFOA and SDS experienced various degrees of differential transport during the experiments. These results have implications for the characterization and modeling of poly-fluoroalkyl substances (PFAS) migration potential at sites wherein PFAS and hydrocarbon surfactants co-occur.			с

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)		出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ	
D416	環境中運命	Xiang, Lei; Chen, Xiao-Ting; Yu, Peng-Fei; Li, Xin-Hong; Zhao, Hai-Ming; Feng, Nai-Xian; Li, Yan-Wen; Li, Hui; Cai, Quan- Ying; Mo, Ce- Hui; Li, Qing X	Oxalic Acid in Root Exudates Enhances Accumulation of Perfluorooctanoic Acid in Lettuce	2020 10.1021/acs.est.0c04124. Epub 2020 Oct 8.		Perfluorooctanoic acid (PFOA) is bioaccumulative in crops. PFOA bioaccumulation potential varies largely among crop varieties. Root exudates are found to be associated with such variations. Concentrations of low-molecular-weight organic acids (LMWOAs) in root exudates from a PFOA-high-accumulation lettuce variety are observed significantly higher than those from PFOA-low-accumulation lettuce variety (p < 0.05). Root exudates and their LMWOAs components exert great influences on the linear sorption-desorption isotherms of PFOA in soils, thus activating PFOA and enhancing its bioavailability. Among root exudate components, oxalic acid is identified to play a key role in activating PFOA uptake, with >80% attribution. Oxalic acid at rhizospheric concentrations (0.02-0.5 mM) can effectively inhibit PFOA sorption to soils by decreasing hydrophobic force, electrostatic attraction, ligand exchange, and cation-bridge effect. Oxalic acid enhances dissolution of metallic ions, iron/aluminum oxides, and organic matters from soils and forms oxalate-metal complexes, based on nuclear magnetic resonance spectra, ultraviolet spectra, and analyses of metal ions, iron/aluminum organometallic complexes, and dissolved organic carbon. The findings not only reveal the activation process of PFOA in soils by root exudates, particularly oxalic acid at rhizospheric concentrations, but also give an insight into the mechanism of enhancing PFOA accumulation in lettuce varieties.		В	
D417	環境中運命	Liu, Guanhong; Stewart, Brittney Ashley; Yuan, Kai; Ling, Siyuan; Zhang, Meng; Wang, Guangju; Lin, Kuangfei	Comprehensive adsorption behavior and mechanism of PFOA and PFCs in various subsurface systems in China Sci Total Environ. 2021 Nov 10;794:1484 10.1016/j.scitotenv.2021.148463. Epub 2		Sci Total Environ. 2021 Nov 10;794:148463. doi: 10.1016/j.scitotenv.2021.148463. Epub 2021 Jun 25.	The adsorption-desorption performance of perfluorooctanoic acid (PFOA), one of the environmentally persistent pollutants which is refractory to degrade in soil, was investigated and reported. The adsorption-desorption process of PFOA was firstly conducted using different fractions (sand, coarse silt and fine silt) of soil collected from Shanghai, China. More than 50% of PFOA (2.0 mg/L) could be adsorbed by soils while only less than 10% of which could be desorbed once contamination occurs. The kinetics and particle diffusion rates of PFOA in different fractions of soil were calculated and analyzed in detail. Apart from this, the retention of short-chained PFCs, which can be generated as degradation products of PFOA, were also measured. In single solute systems, the adsorption of pollutants in soils dramatically increased as the chain length of PFCs grew longer. Similarly, in mixed solutions, preferential adsorption of longer-chained PFCs over shorter chains in soils were sited, attributable to the stronger hydrophobicity of the pollutants. However, the desorption of them performed in reverse, where the desorption rates of longer-chained PFCs were far lower than those of shorter ones. Furthermore, influencing factors including pH, temperature and co-existing matters were studied during the adsorption process. After comprehending the adsorption of PFOA in soil fractions, the situation of the adsorption of PFOA in various soils chosen from nine provinces in China was investigated and compared. There was an obvious discrepancy, whether it be from the rate or the amount of adsorption of PFOA (approximately 10%), in the nine different soils. Finally, a multiple linear regressive equation was employed to sort influencing parameters which are prone to affect the adsorption of PFOA in soils, the contribution of these are provided in order of relevance. These results demonstrate the adsorption performance and behavior of PFOA and PFCs in different soils, which can be utilized as a scientific reference for maximizing reme		В	
D418	環境中運命	Beltrán, Eulalia María; Ferná ndez-Torija, Carlos; Pablos, María Victoria; Porcel, Miguel Á ngel; García- Hortigüela, Pilar; González- Doncel, Miguel	The effect of PFOs on the uptake and translocation of emerging contaminants by crops cultivated under soil and soilless conditions	2021	Ecotoxicol Environ Saf. 2021 Jun 1;215:112103. doi: 10.1016/j.ecoenv.2021.112103. Epub 2021 Mar 16.	The Mediterranean is a region of substantial agriculture production that faces concurrent environmental stresses and freshwater pollution given the occurrence of emerging contaminants (ECs). Among these pollutants, the surface-active substances have been suggested to enhance the bioavailability of other ECs. This research evaluates a comparative uptake and translocation assessment of irrigation exposure to atenolol (ATN, 60 µg/L), carbamazepine (CBZ, 60 µg/L) and triclosan (TCS, 30 µg/L) alone vs. these combined with perfluorooctanesulfonic acid (PFOS, 10 µg/L) under semifield (i.e., soil experimental set) vs. hydroponics (i.e., soilless experimental set) growing conditions with lettuce, radish and tomato plants. Both experimental sets revealed efficient root uptake and translocation for the three ECs regardless of their co-existence with PFOS. The overall results of the uptake and translocation of the ECs in the lettuce and tomato plants suggested a simultaneous treatment-plant organ interaction, which was not affected by PFOS being present in both experimental sets. PFOS in irrigation water did not increase cellular perviousness to the other three ECs. These observations support the hypothesis of factors other than PFOS being responsible for the differential bioaccumulation and translocation potentials seen in both experimental sets. However, the radish plants co-irrigated with PFOS brought about increased movement of ECs from roots to aerial parts, more specifically ATN and CBZ in the soil experimental set, and ATN and TCS in the soilless set. These results support the notion that factors inherent to the physiological characteristics of this root vegetable contributed to ECs' increased tendency to move from roots to aerial parts. Despite the three ECs efficiently accumulating, the risk to humans from eating the edible parts of these plants grown under soil or soilless conditions was low.		В	

No.	分野 (参考)	著者	タイトル

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	出情 ン文 備考 対報 ク献 象抽 フ		ン 文 ン 文 ク 献 ク 献 ① ラ ② ラ
D419	環境中運 命	Schaefer, Charles E; Lemes, Maria C S; Schwichtenberg, Trever; Field, Jennifer A	Enrichment of poly- and perfluoroalkyl substances (PFAS) in the surface microlayer and foam in synthetic and natural waters	2022	J Hazard Mater. 2022 Oct 15;440:129782. doi: 10.1016/j.jhazmat.2022.129782. Epub 2022 Aug 17.	Bench-scale experiments were performed to interrogate poly- and perfluoroalkyl substance (PFAS) enrichment in the water surface microlayer (SML). In initial experiments using electrolyte-only solutions, the perfluorooctane sulfonate (PFOS) and perfluorooctane carboxylate (PFOA) enrichment in the SML were reasonably (with a factor of 2) described by the Gibbs adsorption equation coupled with a Freundlich-based interfacial adsorption model. Enrichment in the SML among perfluorinated sulfonates and perfluorinated carboxylates of varying chain lengths was proportional to their surface activity. The PFOS enrichment factor (EF), defined as the PFAS concentration in the SML divided by the concentration in the bulk water, was 18 in a 200 mg/l NaCl solution. The presence of elevated organic carbon levels in synthetic surface waters inhibited PFAS accumulation in the SML, with resulting EF values of approximately 1 for all PFAS. However, in the presence of elevated organic levels coupled with foam, PFAS enrichment in the foam was observed, with a foam EF of 25 measured for PFOS in synthetic surface waters. PFAS EF values measured in several natural surface waters without foam showed little variation among the waters tested, with PFOS EF values ranging between 6 and 10. Together, these results suggest that PFAS accumulation in the SML is largely controlled by PFAS sorption at the air-water interface for the conditions examined in this study, and the presence of foam with natural organics enhances PFAS uptake at the water surface.			В
D420	環境中運命	Liu, Siqian; Zhou, Jian; Zhu, Lingyan	Investigating Long-Distance Transport of Perfluoroalkyl Acids in Wheat via a Split-Root Exposure Technique	2022	J Vis Exp. 2022 Sep 28;(187). doi: 10.3791/64400.	Large amounts of perfluoroalkyl acids (PFAAs) have been introduced into the soil and accumulated by plants, posing potential risks to human health. It is imperative to investigate the accumulation and translocation of PFAAs within plants. Long-distance transport is an important pathway for PFAAs transferred from the plant leaves to the edible tissues through the phloem. However, it was previously difficult to assess the translocation potential of organic contamination in a short-term exposure period. The split-root experiment provides a solution to effectively uncover the long-distance translocation of PFAAs using a hydroponic experiment, which, in this study, was carried out in two 50 mL centrifuge tubes (A and B), of which centrifuge tube A had 50 mL of one-quarter strength Hoagland sterile nutrient solution, while centrifuge tube B had the same amount of nutrient concentration, and the target PFAAs (perfluorooctane sulfonic acid, PFOS, and perfluorooctane acid, PFOA) added at a given concentration. A whole wheat root was manually separated into two parts and inserted carefully into tubes A and B. The concentration of PFAAs in the roots, shoots of wheat, and solutions in tubes A and B were evaluated using LC-MS/MS, respectively, after being cultured in an incubator for 7 days and harvested. The results suggested that PFOA and PFOS experience a similar long-distance transport process through the phloem from the shoot to the root and could be released into the ambient environment. Thus, the split-root technique can be used to evaluate the long-distance transport of different chemicals.			В
D421	環境中運命	Xu, Bentuo; Qiu, Wenhui; Du, Juan; Wan, Zhenning; Zhou, John L; Chen, Honghong; Liu, Renlan; Magnuson, Jason T; Zheng, Chunmiao	Translocation, bioaccumulation, and distribution of perfluoroalkyl and polyfluoroalkyl substances (PFASs) in plants	2022	iScience. 2022 Mar 11;25(4):104061. doi: 10.1016/j.isci.2022.104061. eCollection 2022 Apr 15.	Perfluoroalkyl and polyfluoroalkyl substances (PFASs) are persistent in the environment and have been detected in a variety of plants such as vegetables, cereals, and fruits. Increasing evidence shows that plants are at a risk of being adversely affected by PFASs. This review concludes that PFASs are predominantly absorbed by roots from sources in the soil; besides, the review also discusses several factors such as soil properties and the species of PFASs and plants. In addition, following uptake by root, long-chain PFASs ($C \ge 7$ for PFCA and $C \ge 6$ for PFSA) were preferentially retained within the root, whereas the short-chain PFASs were distributed across tissues above the ground - according to the studies. The bioaccumulation potential of PFASs within various plant structures are further expressed by calculating bioaccumulation factor (BAF) across various plant species. The results show that PFASs have a wide range of BAF values within root tissue, followed by straw, and then grain. Furthermore, owing to its high water solubility than other PFASs, PFOA is the predominant compound accumulated in both the soil itself and within the plant tissues. Among different plant groups, the potential BAF values rank from highest to lowest as follows: leaf vegetables > root vegetables > flower vegetables > shoot vegetables. Several PFAS groups such as PFOA, PFBA, and PFOS, may have an increased public health risk based on the daily intake rate (ID). Finally, future research is suggested on the possible PFASs degradation occurring in plant tissues and the explanations at genetic-level for the metabolite changes that occur under PFASs stress.			В
D422	環境中運命	Mahinroosta, Reza; Senevirathna, Lalantha	The effectiveness of PFAS management options on groundwater quality in contaminated land using numerical modelling	2021	Chemosphere. 2021 Sep;279:130528. doi: 10.1016/j.chemosphere.2021.130528. Epub 2021 Apr 9.	The concentrations of PFOS and PFHxS in a contaminated site in regional New South Wales, Australia, were above the human health screening values for industrial land use. In this study, the effects of different management options on the quality of groundwater were investigated through numerical modelling. At first, a complete transfer model including the main features of advection, dispersion, adsorption and decay, was developed to simulate the long-term migration of PFOS from topsoil subjected to full climate interaction for 100 years. The sorption isotherm characteristics of the contaminated soil were determined from chemical analysis using LC/MS equipment. The model results were confirmed by PFOS values measured from a monitoring well in the proximity of the site. The model showed that PFOS values in groundwater increased gradually and exceeded the guideline values for drinking water. Three management options were suggested: a do-nothing approach, cut and replacement, and immobilisation of the topsoil up to 2 m depth. The numerical models showed that although all these strategies reduced the PFOS level in the groundwater significantly, the values were still higher than the guideline values for drinking water. This was because PFOS migrated in the ground beyond the site location. The cut and replacement and immobilisation strategies ensured that the PFOS values were lower than the guideline values for soil screening, but PFOS levels in the groundwater were not necessarily lower than the guideline values for drinking water after a long time.			В

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)		出 情 対 報 象 抽	ン文 ン文 ク献 ① ラ ② ラ
D423	環境中運命	Borthakur, Annesh; Cranmer, Brian K; Dooley, Gregory P; Blotevogel, Jens; Mahendra, Shaily; Mohanty, Sanjay K	Release of soil colloids during flow interruption increases the pore-water PFAS concentration in saturated soil	2021	Environ Pollut. 2021 Oct 1;286:117297. doi: 10.1016/j.envpol.2021.117297. Epub 2021 May 4.	Groundwater flow through aquifer soils or packed bed systems can fluctuate for various reasons, which could affect the concentration of natural colloids and per- and polyfluoroalkyl substances (PFAS) in the pore water. In such cases, PFAS concentration could either decrease due to matrix diffusion of PFAS or increase by the detachment of colloids carrying PFAS. Yet, the effect of flow fluctuation on PFAS transport or release in porous media has not been examined. To examine the relative importance of either process, we interrupted the flow during an injection of groundwater spiked with perfluorobutanoic acid (PFBA), perfluorooctanoic acid (PFOA), and bromide as conservative tracer through clay-rich soil, so that diffusive transport would be prominent during flow interruption. After flow interruption, the PFAS concentration did not decrease indicating an insignificant contribution of matrix diffusion. The concentration increased, potentially due to enhanced release of colloid-associated PFAS. Analysis of samples before and after flow interruption by particle size analysis and SEM confirmed an increase in soil colloid concentration after the flow interruption. XRD analysis of soil and the colloids proved that PFAS were associated with specific sites of the colloids. Due to a higher affinity of PFOA to soil colloids, the total PFOA concentration in the effluent samples increased more than PFBA after the flow interruption process. The results indicate that colloids may have a disproportionally higher role in the transport of PFAS in conditions that release colloids from porous media. Thus, fluctuations in groundwater flow can increase this colloid facilitated mobility of PFAS.			В
D424	環境中運命	Brusseau, Mark L; Guo, Bo	Air-water interfacial areas relevant for transport of per and poly-fluoroalkyl substances	2021	Water Res. 2021 Dec 1;207:117785. doi: 10.1016/j.watres.2021.117785. Epub 2021 Oct 21.	Per and polyfluoroalkyl substances (PFAS) present in the soil pose a long-term threat to groundwater. Robust characterization and modeling of PFAS retention and transport in unsaturated systems requires an accurate determination of the magnitude of airwater interfacial area (AWIA). Multiple methods are available for measuring or estimating air-water interfacial area, including x-ray microtomography (XMT), various aqueous and gas-phase interfacial tracer-test (ITT) methods, and thermodynamic-based estimation methods. AWIAs determined with the different methods can vary significantly. Therefore, it is critical to determine which measurement methods are relevant for application to PFAS retention and transport. This is achieved by employing AWIAs determined with different methods to simulate the results of miscible-displacement experiments reported in the literature for the transport of perfluorooctanoic acid (PFOA) in an unsaturated quartz sand. Measured PFOA breakthrough curves were successfully predicted using AWIA values measured by aqueous ITT methods. Conversely, AWIAs measured with the XMT method and estimated with the thermodynamic method under-predicted the magnitude of retardation and could not successfully simulate the measured transport data. These results indicate that the ITT method appears to provide the most appropriate AWIA values for robust characterization and modeling of PFAS transport in unsaturated systems. The long-term impact of employing different AWIA values on PFOA leaching in the vadose zone was simulated for a representative AFFF application scenario. The predicted timeframes for PFOA migration to groundwater varied from 3 to 6 to 20 years depending on which AWIA was used in the simulation. These relatively large differences would result in significantly different risk-assessment outcomes. These results illustrate that it is critical to employ the AWIA that is most representative of PFAS retention for accurate predictions of PFAS leaching in the vadose zone.			В
D425	環境中運命	Juhasz, Albert L; Kastury, Farzana; Herde, Carina; Tang, Wayne	Application of soil amendments for reducing PFAS leachability and bioavailability	2022	Environ Pollut. 2022 Aug 15;307:119498. doi: 10.1016/j.envpol.2022.119498. Epub 2022 May 23.	In this study, changes in PFAS leachability and bioavailability were determined following the application of RemBind®100 (R100) and RemBind®300 (R300; 1-10% w/w) to PFAS-contaminated soil ($\Sigma(28)$ PFAS 3.093-32.78 mg kg(-1)). Small differences were observed in PFAS immobilization efficacy when soil was amended with RemBind® products although adding 5% w/w of either product resulted in a >98% reduction in ASLP PFAS leachability. Variability in immobilization efficacy was attributed to differences in activated carbon composition which influenced physicochemical properties of RemBind® formulations and PFAS sorption. PFOS, PFHxS and PFOA relative bioavailability was also assessed in unamended and amended soil (5% w/w) using an in vivo mouse model. In unamended soil, PFAS relative bioavailability was >60% with differences attributed to physicochemical properties of soil which influenced electrostatic and hydrophobic interactions. However, when PFAS relative bioavailability was assessed in soil amended with 5% w/w R100, individual PFAS relative bioavailability was reduced to $16.1 \pm 0.8\%$ to $26.1 \pm 0.9\%$ with similar results observed when R300 (5% w/w) was utilised (14.4 $\pm 1.6\%$ to $24.3 \pm 0.8\%$). Results from this study highlight that soil amendments have the potential to reduce both PFAS leachability and relative bioavailability thereby decreasing mobility and potential exposure to soil-borne contaminants.			с
D426	環境中運命	Colomer-Vidal, Pere; Jiang, Longfei; Mei, Weiping; Luo, Chunling; Lacorte, Silvia; Rigol, Anna; Zhang, Gan	Plant uptake of perfluoroalkyl substances in freshwater environments (Dongzhulong and Xiaoqing Rivers, China)	2022	J Hazard Mater. 2022 Jan 5;421:126768. doi: 10.1016/j.jhazmat.2021.126768. Epub 2021 Jul 28.	This study provides new knowledge on the mobility, behavior, and partitioning of 17 perfluoroalkyl substances (PFASs) in the water-sediment-plant system along the Dongzhulong and Xiaoqing Rivers. The fate of PFASs in these rivers is also discussed. The study area is affected by the industrial production of perfluoroactanoic acid (PFOA). The Σ PFASs in water and sediments close to the industrial discharge were 84,000 ± 2000 ng/L and 2300 ± 200 ng/g dw, respectively, with the concentrations decreasing along the river due to dilution. PFOA was the dominant compound (74-97% of the Σ PFASs), although other PFASs were identified close to urban areas. Principal component analysis and solid-liquid distribution coefficients revealed that long-chain PFASs accumulated in the sediment whereas short-chain PFASs remained in the water all along the river. PFASs were taken up by plants and remobilized to different plant compartments according to shoot concentration factors (SCFs), root concentration factors (RCF), and transfer factors (TFs). Among the four plant species studied, floating plants absorbed high levels of PFASs, while rooted species translocated short-chain PFASs from the roots to the shoots. Therefore, floating species, due to their high uptake capacity and large proliferation rate, could eventually be used for phytoremediation.			В

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨 (原文)	備考	出 情 対 報 象 抽	ン文ン文 ク献 ク献 ① ラ ② ラ
D427	環境中運命	Jiang, Tao; Zhang, Weilan; Liang, Yanna	Uptake of individual and mixed per- and polyfluoroalkyl substances (PFAS) by soybean and their effects on functional genes related to nitrification, denitrification, and nitrogen fixation	2022	Sci Total Environ. 2022 Sep 10;838(Pt 4):156640. doi: 10.1016/j.scitotenv.2022.156640. Epub 2022 Jun 10.	In this study, we set up a soil-microbe-soybean system spiked with PFOA, PFOS, or a PFAS mixture of eight PFAS and investigated the distribution of PFAS in the system and impacts on the abundance and expression level of genes involved in the nitrogen (N) cycle. When soybean was exposed to the PFAS mixtures, synergistic uptake by shoots was detected. PFAS exhibited remarkable impacts on abundance of nitrification and denitrification genes in both bulk soil and rhizosphere as well as expression of N fixation gene in soybean nodules. The abundance of nitrification genes AOA and AOB amoA and denitrification gene nirK was significantly reduced ($p < 0.05$) in almost all treatments in bulk soil, except PFOA at 10 μ g/kg. The abundance of other functional genes, such as nirS and norZ was affected differently depending on PFAS concentrations and sample location, either bulk soil or the rhizosphere. Interestingly, the N fixation gene nifH in soybean nodules was overexpressed by a PFAS mixture at 100 μ g/kg. Hence, this work provided in-depth knowledge regarding the distribution of PFAS and their impacts on the N cycle for the studied system. Results from this study provide insights on assessing risks posed by individual or mixed PFAS to soybean.			В
D428	環境中運命	Felizeter, Sebastian; Jü rling, Heinrich; Kotthoff, Matthias; De Voogt, Pim; McLachlan, Michael S	Influence of soil on the uptake of perfluoroalkyl acids by lettuce: A comparison between a hydroponic study and a field study	2020	Chemosphere. 2020 Dec;260:127608. doi: 10.1016/j.chemosphere.2020.127608. Epub 2020 Jul 11.	This study explores whether mechanistic understanding of plant uptake of perfluoroalkyl acids (PFAAs) derived from hydroponic experiments can be applied to soil systems. Lettuces (Lactuca sativa) were grown in outdoor lysimeters in soil spiked with 4 different concentrations of 13 PFAAs. PFAA concentrations were measured in soil, soil pore water, lettuce roots, and foliage. The PFAA uptake by the lettuce was compared with uptake measured in a hydroponic study. The foliage:pore water concentration ratios in the lysimeter were similar to the foliage:water concentration ratios from the hydroponic experiment. In contrast, the root:pore water concentration is in the lysimeter were 1-2 orders of magnitude lower than in the hydroponic study for PFAAs with 6 or more perfluorinated carbons. Hence, hydroponic studies can be expected to provide a good quantitative measure of PFAA transfer from soil to foliage if one accounts for soil:pore water partitioning and differences in transpiration rate. However, hydroponic studies will be of little value for estimating PFAA transfer from soil to roots because sorption to the root surface is greatly enhanced under hydroponic conditions.			В
D429	環境中運命	Hwang, Jeong-In; Hinz, Francisca Ordonez; Albano, Joseph P; Wilson, Patrick Christopher	Enhanced dissipation of trace level organic contaminants by floating treatment wetlands established with two macrophyte species: A mesocosm study	2021	Chemosphere. 2021 Mar;267:129159. doi: 10.1016/j.chemosphere.2020.129159. Epub 2020 Dec 1.	This study evaluated removal efficiencies of six contaminants of emerging concern (CECs) in floating treatment wetland (FTW) mesocosms established with either Japanese Sweetflag (Acorus gramineus Sol. ex Aiton) or canna lilies (Canna Hybrida L. 'Orange King Humbert'). The CECs included: acetaminophen (APAP), atrazine (ATZ), carbamazepine (CBZ), perfluorooctanoic acid (PFOA), sulfamethoxazole (SMX), and 17β -estradiol (E2). Each treatment was planted with different numbers of plants (i.e., 0, 10, 15, and 20), and the experiments lasted for 17 weeks. Dissipation of CECs was greater in planted treatments than in non-planted controls, and the planting number had little effect on dissipation of CECs. All residues of APAP and E2 dissipated rapidly within 2 weeks in all planted treatments. At the end of the experiment, residues of ATZ and SMX completely dissipated in the canna treatments, but not in the sweetflag treatments (75.8-87.6% and 96.3-97.1%, respectively). During the 17 week study, moderate dissipation of CBZ was observed in treatments including cannas (79.5-82.6%) and sweetflag (69.4-82.3%), while less dissipation was observed for PFOA (9.0-15.0% with sweetflag and 58.4-62.3% with cannas). Principal component analysis indicates that aqueous persistency of CECs and species of plants used influenced the dissipation of CECs in FTWs. Of the two species evaluated, canna was the most promising plant species for FTW systems designed to remove these CECs from surface water.			С
D430	環境中運命	Zhong, Huifang; Liu, Wencheng; Li, Ningqi; Ma, Donghui; Zhao, Chunyan; Li, Juan; Wang, Yawei; Jiang, Guibin	Assessment of perfluorohexane sulfonic acid (PFHxS)-related compounds degradation potential: Computational and experimental approaches	2022	J Hazard Mater. 2022 Aug 15;436:129240. doi: 10.1016/j.jhazmat.2022.129240. Epub 2022 May 27.	Perfluorohexane sulfonic acid (PFHxS) and PFHxS-related compounds are listed in Annex A of the Stockholm Convention without specific exemptions. Substances that potentially degrade to PFHxS are considered as their related compounds. Unfortunately, the degradation behavior of PFHxS precursors, an important basis for the corresponding chemical regulation, remains unclear. Herein, based on the hypothesis that bond dissociation enthalpy (BDE) is the determining factor for the degradation of PFHxS precursors, the BDE of PFHxS-related precursors to produceC6F13SO2-groups was calculated. In addition, quantitative structure-activity relationship models based on partial least squares, partial least squares discrimination analysis, and support vector machine algorithms were developed to predict the BDE of 48 PFHxS precursors and distinguish the precursors with different degradation potential. Subsequent photodegradation experiments demonstrated that the order of degradation rates was consistent with that predicted by theoretical models. Importantly, perfluorohexanoic acid (PFHxA) and perfluorobutanoic acid, and not PFHxS, were detected as the degradation products of potential PFHxS precursors. Sulfonamides, phenyl unit, and other radicals in the non-nucleus part of PFHxS precursors were identified as the critical molecular segments that affect their degradation potential. Ultimately, by comparing BDE values, it was theoretically speculated that PFHxS related compounds exhibit a greater potential to generate PFHxA than PFHxS. Results in this study indicated for the first time that not all the compounds containing C6F13SO2-groups were guaranteed to degrade into PFHxS under natural conditions.			С

分野 タイトル 発行年 書誌情報 要旨 (原文) No 著者 (参考) The objectives of this research were to examine the transport of perfluorooctane sulfonic ac comprising different geochemical properties, and to compare the behavior to that observed PFOS retardation was relatively low for transport in all aquifer media. The PFOS breakthroug exhibited extensive concentration tailing, indicating that sorption/desorption was significant simulations indicated that rate-limited sorption/desorption was the primary cause of the nor Wang, Yake; PFOS transport in aquifer media to data reported for PFOS transport in two soils and a quar Khan, Naima: Sci Total Environ. 2021 Jul 20;779:146444. doi: 環境中運 Huang, Dandan; Transport of PEOS in aquifer sediment: Transport more extensive elution tailing for the soils, likely reflecting differences in the relative contrib D431 10.1016/j.scitotenv.2021.146444. Epub 2021 Mar 13. behavior and a distributed-sorption model Carroll, Kenneth to sorption. A three-component distributed-sorption model was developed that accounted fo C: Brusseau carbon, metal oxides, and silt + clay fraction. The model produced very good predictions of h Mark L organic-carbon contents (≤0.1%). Soil organic carbon was estimated to contribute 19-42% o except the sand, to which it contributed \sim 100%. The contribution of silt + clay ranged from sand. The only medium for which the contribution of metal-oxides was significant is Hanford 15%. Overall, the results of the study indicate that sorption of PFOS by these aquifer media soil constituents. Surface active per- and polyfluoroalkyl substances (PFAS) released in the environment gene worldwide. The sequestration of PFAS amphiphiles from aqueous media can be limited by th Dong, Dengpan; that plug the pores in the adsorbent material, rendering most of the active surface inaccess Kancharla, simulation approach has been used to investigate the structure of perfluorooctanoate ammo Samhitha. solutions, focusing on the understanding of ethanol addition on PFOA micelle formation and 環境中運 Hooper, Justin; Phys Chem Chem Phys. 2021 Apr 28;23(16):10029-10039. Controlling the self-assembly of perfluorinated D432 2021 slightly ellipsoidal in shape, PFOA micelles in pure water become more diffuse with increasi Tsianou Marina doi: 10.1039/d1cp00049g surfactants in aqueous environments smaller PFOA clusters in aqueous solutions with high ethanol concentration. A transition fro Bedrov, Dmitry behavior with the increase of ethanol concentration has been observed by both experiments Alexandridis. provide insight on how to achieve co-solvent conditions with other additives. An improved un Paschalis surfactant self-assembly in water can inform the fate and transport of PFAS in the environn aqueous media The impact of sluice operations on the distribution and fate of perfluoroalkyl acids (PFAAs) study, the distribution of PFAAs was investigated in water, suspended particles, sediment, a downstream sections of six sluice gates along the Wangyu River, China. The target PFAAs w Hua, Zulin: Lu phase (Σ PFAAs: 447.61 ± 180.26 ng/L), particle phase (Σ PFAAs: 2040.95 ± 1870.88 ng/g Ying; Chu, 39.42 ± 35.38 ng/g dw), and pore water phase (Σ PFAAs: 8172.54 \pm 4278.60 ng/L). Our da Kejian; Liu, short-chain PFAAs such as perfluorobutanoic acid (PFBA) and perfluorohexanoic acid (PFH) Shift in the distribution and fate of perfluoroalkyl acids Yuanyuan; Ma, Sediment pore water appeared as an essential repository and potential source for PFAA re-環境中運 J Environ Manage. 2022 Mar 1;305:114436. doi: D433 Yixin; Gu, Li; Wu, by sluice gates in the multi-environment media of 2022 levels of PFAAs in the dissolved and suspended particle phase upstream of the sluices were 10.1016/j.jenvman.2022.114436. Epub 2022 Jan 6. rivers downstream, while the situation in the sediment and pore water phase was the opposite. Slu Jianvi: Leelawattanan redistribution among the multi-environment media but did not change the PFAA compositior the partition behavior of perfluoroalkyl carboxylic acids (PFCAs) between particles and wate . Wachirasak: Kv Sereyvatanak pattern of PFOA, PFNA and PFOS from equilibrium to the migration state. Quantitative predi simulating fate of PFAAs in gate-controlled river, and the major factors affecting the distribution identified. Our findings provide insights into the redistribution mechanisms of PFAAs and an fate The ubiquitous EPS (extracellular polymeric substances), as a type of dissolved organic carb in water environment. When EPS meet the omnipresent PFOS (perfluorooctane sulfonate), t exert profound effect on behavior and fate of both, which is still not well known. We hypothe Xu, Shuyan; Zhu at real environmental levels may significantly influence behavior of EPS under solar irradiati Yitian; Zhu, Effects of PFOS at ng/L levels on photostability of In this study, 3D-EEM fluorescence spectroscopy and FTIR spectroscopy were used to probe 環境中運 Sci Total Environ. 2022 Nov 9;858(Pt 3):160119. doi: Pengfeng; Wang D434 extracellular polymeric substances under solar 2022 structure of EPS under solar irradiation in the absence and presence of PFOS (5-500 ng/L). 10.1016/j.scitotenv.2022.160119. Online ahead of print. Caigin; Zhang, PFOS at ng/L levels significantly affected responses of EPS to sunlight irradiation and the e rradiation by fluorescence and infrared spectroscopy Daoyong; Pan, components in EPS. Photostability of humic-like substances was significantly increased in t Xiangliang and unfolding of proteins induced by solar light were reduced by PFOS. In addition, degrada hydrophobic functional groups by sunlight was inhibited by PFOS. The novel findings provide environmental behavior of EPS and PFOS and understanding the effect of PFOS on carbon

	備考	出 情 対 報 象 抽	ン 文 ク 献 ① ラ	ン 文 ク 献 ② ラ				
id (PFOS) in aquifer sediment for PFOS transport in soil and sand. gh curves were asymmetrical and ly nonideal. The results of model nideal PFOS transport. Comparison of tz sand showed that PFOS exhibited utions of various media constituents or contributions from soil organic K(d) for the five media with lower soil f the total sorption for all media 51 to 80% for all media except the d, with an estimated contribution of comprised contributions from multiple			В					
erate great concern in the US and heir strong tendency to form micelles ble. A joint experimental and onium (PFOA) micelles in aqueous structure. Structurally compact and ing ethanol content, and break into m a co-surfactant to a co-solvent and simulations, while the latter also inderstanding of how to modulate PFAS beent and the PFAS sequestration from			C					
remains poorly understood. In this nd pore water from the upstream and erer widely distributed in the dissolved dw), sedimentary phase (Σ PFAAs: ta suggest predominant detections of xA) in the four environmental media. release to the river environment. The esignificantly lower than those uice operation caused PFAA n, which had the significant effect on er, as well as changed the migration iction models were developed for ution and fate of PFAAs were understanding of their environmental			В					
boon, plays a key role in carbon cycling hey must interact with each other and esized that the highly persistent PFOS on which may retard carbon turnover. e responses of composition and The experimental results showed that ffects were dependent on the he presence of PFOS; Degradation tion of both hydrophilic and e new insights for assessing the cycling in water environments.			С					
No.	分野 (参考)	著者	タイトル	発行年書誌情報	要旨(原文)	備考	出 対 報 抽	ン文 ン文 ク献 ① ラ ② ラ
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D435	環境中運命	Chen, Xiao-Ting; Yu, Peng-Fei; Xiang, Lei; Zhao, Hai-Ming; Li, Yan-Wen; Li, Hui; Zhang, Xiang-Yun; Cai, Quan-Ying; Mo, Ce-Hui; Wong, Ming Hung	Dynamics, thermodynamics, and mechanism of perfluorooctane sulfonate (PFOS) sorption to various soil particle-size fractions of paddy soil	2020 Ecotoxicol Environ Saf. 2020 Dec 15;206:111105. doi: 10.1016/j.ecoenv.2020.111105. Epub 2020 Aug 28.	Soil is an important sink for perfluorooctane sulfonate (PFOS) that is a typical persistent organic pollutant with high toxicity. Understanding of PFOS sorption to various particle-size fractions of soil provides an insight into the mobility and bioavailability of PFOS in soil. This study evaluated kinetics, isotherms, and mechanisms of PFOS sorption to six soil particle-size fractions of paddy soil at environmentally relevant concentrations (0.01-1 μ g/mL). The used soil particle-size fractions included coarse sand (120.4-724.4 mm), fine sand (45.7-316.2 mm), coarse silt (17.3-79.4 mm), fine silt (1.9-39.8 mm), clay (0.5-4.4 mm), and humic acid fractions (8.2-83.7 mm) labeled as F1~F6, respectively. PFOS sorption followed pseudo-second-order kinetics related to film diffusion and intraparticle diffusion, with speed-limiting phase acted by the latter. PFOS sorption isotherm data followed Freundlich model, with generally convex isotherms in larger size fractions (F1~F3) but concave isotherms in smaller size fractions (F4 and F5) and humic acid fraction (F6). Increasing organic matter content, Brunner-Emmet-Teller surface area, and smaller size fractions were conducive to PFOS sorption. Hydrophobic force, divalent metal ion-bridging effect, ligand exchange, hydrogen bonding, and protein-like interaction played roles in PFOS sorption. But hydrophobic force controlled the PFOS sorption, because its relevant organic matter governed the contribution of the soil fractions to the overall PFOS sorption. The larger size fractions dominated the PFOS sorption to the original soil because of their high mass percentages (~80%). This likely caused greater potential risks of PFOS migration into groundwater and bioaccumulation in crops at higher temperatures and c(e) values, based on their convex isotherms with an exothermic physical process.			С
D436	環境中運命	Brusseau, Mark L	Examining the robustness and concentration dependency of PFAS air-water and NAPL-water interfacial adsorption coefficients	2021 Water Res. 2021 Feb 15;190:116778. doi: 10.1016/j.watres.2020.116778. Epub 2020 Dec 23.	Determining robust values for the air-water or NAPL-water interfacial adsorption coefficient, K(IA), is key to characterizing and modeling PFAS transport and fate in several environmental systems. Direct, high-resolution measurements of surfactant adsorption at the fluid-fluid interface were aggregated from the literature. This data set was used to examine the accuracy and applicability of Γ and K(IA) measurements determined for three PFAS from transport experiments and surface-tension data. The transport-measured Γ and K(IA) data were observed to be fully consistent with the directly-measured data. Specifically, Γ values for the two methods were entirely coincident in the region of overlapping concentrations, which spanned ~4 orders-of-magnitude. Furthermore, the two data sets adhered to an identical Γ -C profile. These results conclusively demonstrate the accuracy of the transport-measured values. Γ and K(IA) values determined from the application of the Gibbs adsorption equation to measured surface-tension data were fully consistent with the directly-measured and transport-measured data sets, demonstrating their applicability for representing PFAS transport in environmental systems. The directly-measured data were used to examine the concentration dependency of K(IA) values, absent the potential confounding effects associated with the use of surface-tension or transport-measured data. The directly-measured data clearly demonstrate that K(IA) attains a constant, maximum limit at lower concentrations, consistent with the directly-measured data both produced observations of constant K(IA) values at lower concentrations, consistent with the directly-measured data. These outcomes are discussed in terms of surface activities, relative surface coverages, and critical concentrations.			С
D437	環境中運命	Umeh, Anthony C; Naidu, Ravi; Shilpi, Sonia; Boateng, Emmanuel B; Rahman, Aminur; Cousins, Ian T; Chadalavada, Sreenivasulu; Lamb, Dane; Bowman, Mark	Sorption of PFOS in 114 Well-Characterized Tropical and Temperate Soils: Application of Multivariate and Artificial Neural Network Analyses	2021 Environ Sci Technol. 2021 Feb 2;55(3):1779-1789. doi: 10.1021/acs.est.0c07202. Epub 2021 Jan 15.	The influence of soil properties on PFOS sorption are not fully understood, particularly for variable charge soils. PFOS batch sorption isotherms were conducted for 114 temperate and tropical soils from Australia and Fiji, that were well-characterized for their soil properties, including total organic carbon (TOC), anion exchange capacity, and surface charge. In most soils, PFOS sorption isotherms were nonlinear. PFOS sorption distribution coefficients (K(d)) ranged from 5 to 229 mL/g (median: 28 mL/g), with 63% of the Fijian soils and 35% of the Australian soils showing K(d) values that exceeded the observed median K(d). Multiple linear regression showed that TOC, amorphous aluminum and iron oxides contents, anion exchange capacity, pH, and silt content, jointly explained about 53% of the variance in PFOS K(d) in soils. Variable charge soils with net positive surface charges, and moderate to elevated TOC content, generally displayed enhanced PFOS sorption than in temperate or tropical soils with TOC as the only sorbent phase, especially at acidic pH ranges. For the first time, two artificial neural networks were developed to predict the measured PFOS K(d) (R(2) = 0.80) in the soils. Overall, both TOC and surface charge characteristics of soils are important for describing PFOS sorption.			С
D438	環境中運命	Abril, Concepció n; Santos, Juan Luis; Martín, Julia; Aparicio, Irene; Alonso, Esteban	Uptake and translocation of multiresidue industrial and household contaminants in radish grown under controlled conditions	2021 Chemosphere. 2021 Apr;268:128823. doi: 10.1016/j.chemosphere.2020.128823. Epub 2020 Oct 30.	The uptake, bioconcentration and translocation of 22 endocrine disrupting compounds (six perflurocarboxylic acids (PFAAs), perfluoroctanoic sulfonic acid, four anionic surfactants (alkylsulfates (ASC) from C12 to C16), bisphenol A (BPA), four preservatives (parabens), two biocides (triclosan (TCS) and triclocarban (TCB)) and five UV-filters (benzophenones)) in radish (Raphanus sativus) has been investigated. Radishes were grown in sewage sludge-amended soil under controlled conditions in a grown chamber. Degradation in soil adhered to root was higher than in soil and varied significantly from a family to another. The most recalcitrant compounds were PFCs, anionic surfactants and TCB. Perfluorinated compounds and AS-C12 were detected in all plant tissues and were the compounds with the highest bioconcentration factors (BCF). A decrease of BCF was observed for ASCs with the increase of the alkyl chain. Non-ionic compounds, except TCB, were mainly accumulated in bulb. Phenolic compounds were detected at lower concentration levels than non-phenolic compounds probably due to metabolisation in radish cells. The highest BCF in edible bulb were obtained for PFOS (BCF: 1.668), perfluoroctanoic acid (BCF: 0.534) and AS-C12 (BCF: 0.523). This study reports for the first-time multiresidue plant uptake and translocation of pollutants from different chemical classes (perfluorinated compounds, surfactants, plasticiser, preservatives, biocides and UV-filters) and with a wide variety of physical-chemical properties.			С

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン 文 ン 文 ク 献 ク 献 ① ラ ② ラ
D439	環境中運命	Zhu, Xiaojing; Song, Xin; Schwarzbauer, Jan	First insights into the formation and long-term dynamic behaviors of nonextractable perfluorooctanesulfonate and its alternative 6:2 chlorinated polyfluorinated ether sulfonate residues in a silty clay soil	2021	Sci Total Environ. 2021 Mar 20;761:143230. doi: 10.1016/j.scitotenv.2020.143230. Epub 2020 Oct 24.	Per- and polyfluoroalkyl substances (PFAS) are persistent and toxic contaminants that are ubiquitous in the environment. They can incorporate into soil as nonextractable residues (NER) which are not detectable with conventional analytical protocols but are still possible to remobilize with changes of surrounding conditions, and thus will be bioavailable again. Therefore, there is a need to investigate thoroughly the long-term fate of NER-PFAS. In this study, a 240-day incubation of perfluorooctanesulfonate (PFOS) and its alternative 6:2 chlorinated polyfluorinated ether sulfonate (F-53B) in a silty clay topsoil was carried out. Solvent extraction, alkaline hydrolysis and sequential chemical degradation were applied on periodically sampled soil to obtain extractable, moderately bound and deeply bound PFAS, respectively. The results confirmed the formation of NER of both compounds but with different preferences of incorporating mechanisms. NER-PFOS was formed predominantly by covalent binding (via head group) and strong adsorption (via tail group). The formation of NER-F-53B was mainly driven by physical entrapment. Both bound compounds within the incubation period showed three-stage behaviors including an initial period with slight release followed by a (re) incorporating stage and a subsequent remobilizing stage. This work provides some first insights on the long-term dynamic behaviors of nonextractable PFAS and will be conducive to their risk assessment and remediation (e.g. estimating potential NER-PFAS level based on their free extractable level, and selecting remediation methods according to their prevailing binding mechanisms).			С
D440	環境中運命	Qi, Lin; Li, Runwei; Wu, Yudi; Lin, Xinsong; Chen, Gang	Effect of solution chemistry on the transport of short- chain and long-chain perfluoroalkyl carboxylic acids (PFCAs) in saturated porous media	2022	Chemosphere. 2022 Sep;303(Pt 2):135160. doi: 10.1016/j.chemosphere.2022.135160. Epub 2022 May 28.	Perfluorocarboxylic acids (PFCAs) are one of the most widely detected classes of PFAS in the global environment after decades of intensive use. This study investigated the impact of perfluorinated carbon chain length on the transport behavior of PFCAs by testing and modeling two short-chain (PFPeA and PFHxA) and two long-chain PFCAs (PFOA and PFDA) in laboratory water-saturated columns. Moreover, their transport behavior was examined under different solution chemistry conditions, including pH, ionic strength, and cationic type. The experimental and simulation results indicated that the chain length had a limited impact on transport behaviors of PFPeA, PFHxA, and PFOA under various pH and ionic strengths, evidenced by their tracer-like breakthrough curves. In contrast, the mobility of PFDA was significantly affected by pH and ionic strengths. Additionally, the transport of all four PFCAs was inhabited in the presence of the divalent cation Ca(2+). This study could help predict migration behavior and assess the potential risk of PFCAs in the subsurface system.			С
D441	環境中運命	Farhat, Shahla K; Newell, Charles J; Lee, Sophia A; Looney, Brian B; Falta, Ronald W	Impact of matrix diffusion on the migration of groundwater plumes for Perfluoroalkyl acids (PFAAs) and other non-degradable compounds	2022	J Contam Hydrol. 2022 May;247:103987. doi: 10.1016/j.jconhyd.2022.103987. Epub 2022 Mar 8.	Groundwater fate and transport modeling results demonstrate that matrix diffusion plays a role in attenuating the expansion of groundwater plumes of "non-degrading" or highly recalcitrant compounds. This is especially significant for systems where preferred destructive attenuation processes, such as biological and abiotic degradation, are weak or ineffective for plume control. Under these conditions, models of nondestructive physical attenuation processes, traditionally dispersion or sorption, do not demonstrate sufficient plume control unless matrix diffusion is considered. Matrix diffusion has been shown to be a notable emergent impact of geological heterogeneity, typically associated with back diffusion and extending remediation timeframes through concentration tailing of the trailing edge of a plume. However, less attention has been placed on evaluating how matrix diffusion can serve as an attenuation mechanism for the leading edge of a plume of non-degrading compounds like perfluoroalkyl acids (PFAAs), including perfluoroactane sulfonate (PFOS). In this study, the REMChlor-MD model was parametrically applied to a generic unconsolidated and heterogeneous geologic site with a constant PFOS source and no degradation of PFOS in the downgradient edge of the plume. Low levels of mechanical dispersion and retardation were used in the model for three different geologic heterogeneity cases ranging from no matrix diffusion (e.g., sand only) to considerable matrix diffusion using low permeability ("low-k") layers/lenses and/or aquitards. Our analysis shows that, in theory, many non-degrading plumes may expand for significant time periods before dispersion alone would eventually stabilize the plume; however, matrix diffusion. Although many non-degrading plumes may continue to slowly expand over time, matrix diffusion resulted in lower concentrations and smaller plume footprints. Modeling multiple hydrogeologic settings showed that the effect of matrix diffusion is more significant in transmissive zones containing mult			с

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D442	環境中運命	Yan, Bei; Wang, Jian; Liu, Jinxia	STXM-XANES and computational investigations of adsorption of per- and polyfluoroalkyl substances on modified clay	2021	Water Res. 2021 Aug 1;201:117371. doi: 10.1016/j.watres.2021.117371. Epub 2021 Jun 17.	The study investigated molecular mechanisms of per- and polyfluoroalkyl substances (PFAS) on a surfactant modified clay (SMC), which rivals or exceeds the performance of granular activated carbon in removing long-chain PFAS from contaminated water. The adsorption isotherms of four anionic and one neutral PFAS from 1 × 10(-9) to 1 × 10(-5) mol/L were measured to be piecewise, accompanied by the expansion of the SMC interlayer. Based on the spatial distribution of perfluorocarboxylic acid (PFOA) on SMC at the submicron scale, achieved by synchrotron-based scanning transmission X-ray microscopy (STXM) coupled with X-ray absorption near-edge structure spectroscopy (XANES), PFOA molecules were confirmed to enter the interlayer space of SMC and could form charge-charge interaction with the intercalants (quaternary ammonia cations). Revealed by the all-atom molecular dynamics (MD) simulation and density functional theory-based quantum calculations, the interactions between the positively charged surfactant and representative PFAS include charge-charge, charge-dipole, and dipole-dipole interactions. The adsorption mechanisms vary from one PFAS structure to another in terms of adsorption energy and spatial arrangement. Those interactions overcome the interaction between PFAS and water, allowing PFAS to be retained in the SMC's interlayer space. The study provides fundamental insights into how PFAS interact with clay-based materials, supporting the use of the materials for PFAS treatment and remediation.		с
D443	環境中運命	Hou, Minmin; Jin, Qi; Na, Guangshui; Cai, Yaqi; Shi, Yali	Emissions, Isomer-Specific Environmental Behavior, and Transformation of OBS from One Major Fluorochemical Manufacturing Facility in China	2022	Environ Sci Technol. 2022 Jun 21;56(12):8103-8113. doi: 10.1021/acs.est.2c01287. Epub 2022 Jun 10.	Sodium p-perfluorous nonenoxybenzenesulfonate (OBS), a novel alternative to perfluorooctane sulfonic acid (PFOS), has been widely used in various fields in China and has certain toxic effects similar to PFOS. This study monitored OBS and 15 legacy PFASs in surface water, sediment, soil, and crucian carp near a fluorochemical manufacturing factory (FMF) in Suqian, China, focusing on the emission, isomer-specific environmental fate, and transformation of OBS. One to four orders of magnitude higher concentrations of OBS than other polyfluoroalkyl substances (PFASs) in all samples indicate that industrial emission is an important point source of OBS in the surrounding environment. The concentrations of OBS in surface water, sediment, and soil decreased exponentially as the distance from the FMF increases. The proportions of OBS-c, the dominant isomer, increased in the order: water ($75.5 \pm 6.4\%$), sediment ($85.7 \pm 10\%$), fish (muscle: $94.1 \pm 0.99\%$; blood: $93.5 \pm 1.4\%$), suggesting its preferential accumulation in sediment and fish than other isomers. Mono-hydroxylated transformation products of OBS were first identified in water, sediment, and fish, suggesting its hydroxylation may exist in the real environment. The transformation of OBS may explain its significantly lower bioaccumulation than PFOS in fish. However, considering the higher BAF of OBS than the regulatory bioaccumulation and the possible stronger toxicity of its transformation products, further studies on its bioaccumulation are warranted.		В
D444	環境中運	Dal Ferro, Nicola; Pellizzaro, Alessandro; Fant, Massimo; Zerlottin, Mirco; Borin, Maurizio	Uptake and translocation of perfluoroalkyl acids by hydroponically grown lettuce and spinach exposed to spiked solution and treated wastewaters	2021	Sci Total Environ. 2021 Jun 10;772:145523. doi: 10.1016/j.scitotenv.2021.145523. Epub 2021 Feb 2.	Perfluoroalkylated acids (PFAAs) are ubiquitous xenobiotic substances characterized by high persistence, bioaccumulation potential and toxicity, which have attracted global attention due to their widespread presence in both water and biota. In this study, the main objective was to assess PFAAs uptake and accumulation in lettuce (Lactuca sativa L.) and spinach (Spinacia oleracea L.) when fed with reclaimed wastewaters that are usually discharged onto a surface water body. Lettuce and spinach were grown in hydroponic solutions, exposed to two different municipal wastewater treatment plant (WWTP) effluents and compared with a spiked-PFAAs aqueous solution (nominal concentration of 500 ng L(-1) for each perfluoroalkyl acid). Eleven perfluoroalkyl carboxylic acids and three perfluoroalkyl sulfonic acids were determined in the hydroponic solution, as well as quantified at the end of the growing cycle in crop roots and shoots. Water and dry plant biomass extracts were analyzed by liquid chromatography-electrospray ionization tandem spectrometry LC-MS/MS technique. The bioconcentration factor of roots (RCF), shoots (LCF), and the root-shoot translocation factor (TF) were quantified. In general, results showed that PFAAs in crop tissues increased at increasing PFAAs water values. Moreover some PFAAs concentrations (especially PFBA, PFBS, PFHxA, PFHpA, PFHxS) were different in both shoots and roots of lettuce and spinach, regardless of the type of water. The long C-chain PFAAs (\geq 9) were always below the detection threshold in WWTPs effluents. However, when PFAAs were detected, similar bioconcentration parameters were found between crops regardless the type of water. A sigmoidal RCF pattern was found as the perfluorinated chain length increased, plus a linear TF decrease. Comparing bioconcentration factor results with findings of previous studies, lettuce RCF value of PFCAs with perfluorinated chain length \leq 9 and PFSAs was up to 10 times greater.		C

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D445	環境中運命	Langberg, Håkon A; Hale, Sarah E; Breedveld, Gijs D; Jenssen, Bjørn M; Jartun, Morten	A review of PFAS fingerprints in fish from Norwegian freshwater bodies subject to different source inputs	2022	Environ Sci Process Impacts. 2022 Feb 23;24(2):330-342. doi: 10.1039/d1em00408e.	The extensive use of per- and polyfluorinated alkyl substances (PFAS) has resulted in many environmental point and diffuse sources. Identifying the source responsible for a pollution hot spot is vital for assessing remediation measures, however, as there are many possible sources of environmental PFAS pollution, this can be challenging. Chemical fingerprinting has been proposed as an approach to identify contamination sources. Here, concentrations and profiles (relative distribution profiles) of routinely targeted PFAS in freshwater fish from eight sites in Norway, representing three different sources: (1) production of paper products, (2) the use of aqueous film forming foams (AFFF), and (3) long-range atmospheric transport, were investigated. The data were retrieved from published studies. Results showed that fingerprinting of PFAS in fish can be used to identify the dominant exposure source(s), and the profiles associated with the different sources were described in detail. Based on the results, the liver was concluded to be better suited for source tracking compared to muscle. PFAS fingerprints originating from AFFF were dominated by perfluorooctanesulfonate (PFOS) and other perfluoroalkanesulfonic acids (PFSA). Fingerprints originating from the perfluoroalkanesulfonic acids (PFSA). Low Σ PFAS concentrations and ratios of specific PFCA pairs (PFUNDA/PFDA and PFTrDA/PFDoDA). Low Σ PFAS concentrations were detected in fish exposed mainly to PFAS via long-range atmospheric transport. In contrast, Σ PFAS concentrations were high and high percentages of PFOS were detected in fish exposed to pollution from production of paper products. The source-specific fingerprints described here can be used for source tracking.			с
D446	環境中運命	Lesmeister, Lukas; Lange, Frank Thomas; Breuer, Jörn; Biegel-Engler, Annegret; Giese, Evelyn; Scheurer, Marco	Extending the knowledge about PFAS bioaccumulation factors for agricultural plants - A review	2021	Sci Total Environ. 2021 Apr 20;766:142640. doi: 10.1016/j.scitotenv.2020.142640. Epub 2020 Oct 3.	A main source of perfluoroalkyl and polyfluoroalkyl substances (PFASs) residues in agricultural plants is their uptake from contaminated soil. Bioaccumulation factors (BAFs) can be an important tool to derive recommendations for cultivation or handling of crops prior consumption. This review compiles >4500 soil-to-plant BAFs for 45 PFASs from 24 studies involving 27 genera of agricultural crops. Grasses (Poaceae) provided most BAFs with the highest number of values for perfluoroactancic acid and perfluoroactane sulfonic acid. Influencing factors on PFAS transfer like compound-specific properties (hydrophobicity, chain length, functional group, etc.), plant species, compartments, and other boundary conditions are critically discussed. Throughout the literature, BAFs were higher for vegetative plant compartments than for reproductive and storage organs. Decreasing BAFs per additional perfluorinated carbon were clearly apparent for aboveground parts (up to 1.16 in grains) but not always for roots (partly down to zero). Combining all BAFs per single perfluoroalkyl carboxylic acid (C4-C14) and sulfonic acid (C4-C10), median log BAFs decreased by -0.25(\pm 0.029) and -0.24(\pm 0.013) per fluorinated carbon, respectively. For the first time, the plant uptake of ultra-short-chain (\leq C3) perfluoroalkyl acids (PFAAs) was reviewed and showed a ubiquitous occurrence of trifluoroacetic acid in plants independent from the presence of other PFAAs. Based on identified knowledge gaps, it is suggested to focus on the uptake of precursors to PFAAs, PFAAs \leq C3, and additional emerging PFASs such as GenX or fluorinated ethers in future research. Studies regarding the uptake of PFASs by sugar cane, which accounts for about one fifth of the global crop production, are completely lacking and are also recommended. Furthermore, aqueous soil leachates should be tested as an alternative to the solvent extraction of soils as a base for BAF calculations.			В
D447	環境中運命	Cao, Xianghui; Huo, Shouliang; Zhang, Hanxiao; Zheng, Jiaqi; He, Zhuoshi; Ma, Chunzi; Song, Shuai	Source emissions and climate change impacts on the multimedia transport and fate of persistent organic pollutants, Chaohu watershed, eastern China	2021	J Environ Sci (China). 2021 Nov;109:15-25. doi: 10.1016/j.jes.2021.02.028. Epub 2021 Mar 11.	Emission intensity and climate change control the transport flux and fate of persistent organic pollutants (POPs) in multiple environmental compartments. This study applied a multimedia model (BETR model) to explore alternations in the spatio-temporal trends of concentrations and transport flux of benzopyrene (BaP), phenanthrene (Phe), perfluorooctane sulfonates (PFOS) and polychlorinated biphenyls (PCBs) in the Chaohu watershed, located in the lower reaches of the Yangtze River, China in response to changes in source emissions and climate. The potential historic and future risks of these pollutants also were assessed. The results suggest that current trends in concentrations and transport were similar to that of their emissions between 2005 and 2018. During the next 100 years, temporal trends and spatial patterns were not predicted to change significantly, which is consistent with climate change. Based on sensitivity and correlation analyses, climate change had significant effects on multi-media concentrations and transport fluxes of BaP, Phe, PFOS and PCBs, and rainfall intensity was the predominant controlling factor. Risk quotients (RQs) of BaP and Phe-in soil increased from 0.42 to 0.95 and 0.06 to 0.35, respectively, from 2005 to 2090, indicating potential risks. The RQs of the other examined contaminants exhibited little potential risk in soil, water, or sediment. Based on spatial patterns, it was inferred that the ecosystem around Lake Chaohu is the most at risk. The study provides insights needed for local pollution control of POPs in the Chaohu watershed. In addition, the developed approach can be applied to other watersheds world-wide.			В

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D448	環境中運命	Lyu, Ying; Wang, Baohua; Du, Xinqiang; Guo, Bo; Brusseau, Mark L	Air-water interfacial adsorption of C4-C10 perfluorocarboxylic acids during transport in unsaturated porous media	2022	Sci Total Environ. 2022 Jul 20;831:154905. doi: 10.1016/j.scitotenv.2022.154905. Epub 2022 Mar 30.	The impact of chain length on air-water interfacial adsorption of perfluorocarboxylic acids (PFCAs) during transport in unsaturated quartz sand was investigated. Short-chain (C4-C7: PFBA, PFPeA, PFHxA, PFHpA) and long chain (C8-C10: PFOA, PFNA, PFDA) PFCAs were selected as a representative homologous series. Surface tensions were measured to characterize surface activities of the selected PFCAs. Miscible-displacement column experiments were conducted for each of the PFCAs to characterize the magnitudes of air-water interfacial adsorption under transport conditions. The transport of the long-chain PFCAs exhibited greater retardation than the short-chain PFCAs. Air-water interfacial adsorption (AWIA) was the predominant source of retention (≥63%) for the long-chain PFCAs. Conversely, AWIA contributed less to retention than did solid-phase sorption for the short-chain PFCAs, with the former contributions ranging from 4% to 40%. Direct examination of the breakthrough-curve profiles as well as mathematical-modeling results demonstrated that transport of the two longest-chain PFCAs was influenced by nonlinear AWIA, whereas that of the shorter-chain PFCAs was not. This disparate behavior is consistent with the input concentration used for the transport experiments in comparison to the respective surface activities and critical reference concentrations of the different PFCAs. Quantitative-structure/property-relationship (QSPR) analysis was applied to characterize the influence of molecular size on air-water interfacial adsorption. The logs of the air-water interfacial adsorption coefficients (K(ia)) determined from the transport experiments are a monotonic function of molar volume, consistent with prior QSPR analyses of surface-tension measured values. The K(ia) values determined from the transport experiments are very similar to those measured from surface-tension data, indicating that the transport experiments produced robust measurements of AWIA.			С
D449	環境中運命	Choi, Youn Jeong; Helbling, Damian E; Liu, Jinxia; Olivares, Christopher I; Higgins, Christopher P	Microbial biotransformation of aqueous film-forming foam derived polyfluoroalkyl substances	2022	Sci Total Environ. 2022 Jun 10;824:153711. doi: 10.1016/j.scitotenv.2022.153711. Epub 2022 Feb 8.	Per- and polyfluoroalkyl substances (PFASs) used in aqueous film-forming foam (AFFF) comprise some perfluoroalkyl substances but a larger variety of polyfluoroalkyl substances. Despite their abundance in AFFF, information is lacking on the potential transformation of these polyfluoroalkyl substances. Due to the biological and chemical stability of the repeating perfluoroalkyl - (CF(2))(n)- moiety common to all known AFFF-derived PFASs, it is not immediately evident whether the microbial biotransformation mechanisms observed for other organic contaminants also govern the microbial biotransformation of polyfluoroalkyl substances. Herein, we aim to: 1) review the literature on the aerobic or anaerobic microbial biotransformation of AFFF-derived polyfluoroalkyl substances in environmental media; 2) compile and summarize proposed microbial biotransformation pathways for major classes of polyfluoroalkyl substances; 3) identify the dominant biotransformation intermediates and terminal biotransformation products; and 4) discuss these findings in the context of environmental monitoring and source allocation. This analysis revealed that much more is currently known about aerobic microbial biotransformations of fluorotelomer and electrochemical fluorination-derived polyfluoroalkyl substances, but differences may be largely due to head group composition. Dealkylation, oxidation, and hydrolytic reactions appear to be particularly important for microbial biotransformation of AFFF-derived polyfluoroalkyl substances, and these biotransformations may lead to formation of some semi-stable intermediates. Finally, this review discusses key knowledge gaps and opportunities for further research.			С
D450	環境中運命	Bastow, Trevor P; Douglas, Grant B; Davis, Greg B	Volatilization Potential of Per- and Poly-fluoroalkyl Substances from Airfield Pavements and during Recycling of Asphalt	2022	Environ Toxicol Chem. 2022 Sep;41(9):2202-2208. doi: 10.1002/etc.5425. Epub 2022 Aug 18.	Per- and poly-fluoroalkyl substances (PFAS) in water are typically present in their ionic (nonvolatile) forms; however, these can transition to their nonionic (volatile) forms when in contact with organic solvents and organic matrices. In particular, when PFAS are dissolved in organic solvents such as residues left from firefighting foams, fuels, and bitumen present in asphalt, the equilibrium between ionic and nonionic forms can trend toward more volatile nonionic forms of PFAS. We assessed the volatility of common PFAS based on calculated and available experimental data across ambient temperature ranges experienced by airfield pavements and at elevated temperatures associated with reworking asphalts for reuse. Volatilities are shown to be comparable to hydrocarbons in the semivolatile range, suggesting that volatilization is a viable loss mechanism for some PFAS that are nonvolatile in water. The present study points to future investigative needs for this unexplored mass loss mechanism and potential exposure pathway. Environ Toxicol Chem 2022;41:2202-2208. © 2022 Commonwealth of Australia. Environmental Toxicology and Chemistry published by Wiley Periodicals LLC on behalf of SETAC.			с
D451	環境中運命	Li, Yijing; Thompson, Jack; Wang, Zhiyao; Br äunig, Jennifer; Zheng, Qiuda; Thai, Phong K; Mueller, Jochen F; Yuan, Zhiguo	Transformation and fate of pharmaceuticals, personal care products, and per- and polyfluoroalkyl substances during aerobic digestion of anaerobically digested sludge	2022	Water Res. 2022 Jul 1;219:118568. doi: 10.1016/j.watres.2022.118568. Epub 2022 May 11.	Post-anaerobic aerobic digestion (PAAD) is a promising strategy to further reduce the volume and improve the quality of anaerobically digested sludge (ADS). However, the effect of PAAD process on the fate of pharmaceuticals and personal care products (PPCPs) and per- and polyfluoroalkyl substances (PFAS) remains largely unknown. In this study, fourteen PPCPs and fifteen PFAS were detected in ADS and evaluated regarding their fate and transformation in a laboratory aerobic digester operated with a hydraulic retention time of 13 days under 22 °C. Twelve PPCPs demonstrated significant (p < 0.05) decrease in their total concentrations (dissolved and adsorbed fractions combined) with six compounds presenting substantial transformation (> 80%) after aerobic digestion. On the contrary, PFAS were not removed and their concentrations were either increased (increasing ratio: 91 - 571%) or consistent in the sludge during PAAD process, suggesting their recalcitrance to post aerobic digestion. More than half of PPCPs and PFAS demonstrated medium to strong sorption onto solids with their solid fraction higher than 50% in the ADS. After PAAD process, sorption of four PPCPs and three PFAAs to solids was enhanced in sludge.			С

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D452	環境中運命	Li, Yijing; Brä unig, Jennifer; Angelica, Guerrero C; Thai, Phong K; Mueller, Jochen F; Yuan, Zhiguo	Formation and partitioning behaviour of perfluoroalkyl acids (PFAAs) in waste activated sludge during anaerobic digestion	2021	Water Res. 2021 Feb 1;189:116583. doi: 10.1016/j.watres.2020.116583. Epub 2020 Oct 30.	The formation and fate of perfluoroalkyl acids (PFAAs) in sludge during anaerobic digestion (AD) is of global importance since the sludge is a significant source of PFAAs to the environment. The formation of PFAAs from polyfluorinated compounds, namely PFAA precursors, is poorly understood in AD. This study aims to investigate the formation of PFAAs from precursors and their partitioning behaviour in waste activated sludge (WAS) during AD process. To achieve this, three isotope-labelled PFAAs were spiked and monitored along with indigenous PFAAs and precursors over eight weeks in a laboratory-scale anaerobic digester, fed with sludge from a local wastewater treatment plant and operated with a hydraulic retention time of 12 days under 35 °C. In addition to isotope-labelled PFAAs, twelve native PFAAs and eight polyfluorinated compounds were detected in the feed and digested sludges. A mass-balance model, validated by the spiking experiment, was applied to predict the concentrations of PFAAs and precursors assuming no formation/degradation in AD. The measured concentrations of short-chain PFAAs (perfluoroalkyl carboxylates (PFCAs): C < 8; perfluoroalkane sulfonates (PFSAs): C < 6) in the AD sludge were significantly (p < 0.05) higher than the model-predicted concentrations, indicating the formation of these PFAAs from precursors in AD. In contrast, the formation of long-chain PFAAs (PFCAs: C \geq 8; PFSAs: C \geq 6) was not observed. Moreover, the degradation of two polyfluoroalkyl phosphates (PAPs) (6:2 PAP and 6:2/8:2 diPAP) occurred, evidenced by their measured concentrations that were statistically lower than the mass-balance predictions. Further, the AD process reduced the amount of PFAAs absorbed/adsorbed to sludge, particularly for the long-chain ones, due to the breakdown of solids.			С
D453	環境中運命	Sharifan, Hamidreza; Bagheri, Majid; Wang, Dan; Burken, Joel G; Higgins, Christopher P; Liang, Yanna; Liu, Jinxia; Schaefer, Charles E; Blotevogel, Jens	Fate and transport of per- and polyfluoroalkyl substances (PFASs) in the vadose zone	2021	Sci Total Environ. 2021 Jun 1;771:145427. doi: 10.1016/j.scitotenv.2021.145427. Epub 2021 Jan 26.	Per- and polyfluoroalkyl substances (PFASs) are a heterogeneous group of persistent organic pollutants that have been detected in various environmental compartments around the globe. Emerging research has revealed the preferential accumulation of PFASs in shallow soil horizons, particularly at sites impacted by firefighting activities, agricultural applications, and atmospheric deposition. Once in the vadose zone, PFASs can sorb to soil, accumulate at interfaces, become volatilized, be taken up in biota, or leach to the underlying aquifer. At the same time, polyfluorinated precursor species may transform into highly recalcitrant perfluoroalkyl acids, changing their chemical identity and thus transport behavior along the way. In this review, we critically discuss the current state of the knowledge and aim to interconnect the complex processes that control the fate and transport of PFASs in the vadose zone. Furthermore, we identify key challenges and future research needs. Consequently, this review may serve as an interdisciplinary guide for the risk assessment and management of PFAS-contaminated sites.			С
D454	環境中運命	Gefell, Michael J; Huang, Hai; Opdyke, Dan; Gustafson, Kyle; Vlassopoulos, Dimitri; McCray, John E; Best, Sam; Carey, Minna	Modeling PFAS Fate and Transport in Groundwater, with and Without Precursor Transformation	2022	Ground Water. 2022 Jan;60(1):6-14. doi: 10.1111/gwat.13152. Epub 2021 Dec 7.	Groundwater professionals require tools to evaluate a variety of technical issues related to per- and polyfluoroalkyl substances (PFAS). These include the potential impact of PFAS precursors on groundwater plumes of perfluoroalkyl acids (PFAAs). Numerical modeling results show that, by adjusting the mass loading rate, source zones with or without a precursor can produce similar PFAA plumes. However, if a precursor is present, it can impact PFAA plume concentrations and extend PFAA plume durations by decades. Additional research regarding in situ precursor transformation rates-and improvements in source area characterization-will further advance the predictive value of modeling.			С
D455	環境中運命	Just, Hildegard; Göckener, Bernd; Lämmer, René; Wiedemann- Krantz, Lars; Stahl, Thorsten; Breuer, Jörn; Gassmann, Matthias; Weidemann, Eva; Bücking, Mark; Kowalczyk, Janine	Degradation and Plant Transfer Rates of Seven Fluorotelomer Precursors to Perfluoroalkyl Acids and F-53B in a Soil-Plant System with Maize (Zea mays L.)	2022	J Agric Food Chem. 2022 Jul 27;70(29):8920-8930. doi: 10.1021/acs.jafc.1c06838. Epub 2022 Jul 15.	Fluorotelomer precursors in soil constitute a reservoir for perfluoroalkyl acids (PFAAs) in the environment. In the present study, precursor degradation and transfer rates of seven fluorotelomer precursors and F-53B (chlorinated polyfluoroalkyl ether sulfonates) were investigated in pot experiments with maize plants (Zea mays L.). The degradation of fluorotelomer precursors to perfluoroalkyl carboxylic acids (PFCAs) and their uptake spectra corresponded to those of fluorotelomer alcohol (FTOH) in terms of the number of perfluorobutanoic, and perfluorobexanoic acid), whereas long-chain PFCAs mainly remained in the soil. In particular, fluorotelomer phosphate diesters (diPAPs) were retained in the soil and showed the highest degradation potential including evidence of α -oxidative processes. F-53B did not degrade to PFAAs and its constituents were mainly detected in the roots with minor uptake into the shoots. The results demonstrate the important role of precursors as an entry pathway for PFCAs into the food chain.			С

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン 文 ク 献 ① ラ ② ラ
D456	環境中運命	Weidemann, Eva; Lämmer, René; Stahl, Thorsten; Göckener, Bernd; Bücking, Mark; Breuer, Jörn; Kowalczyk, Janine; Just, Hildegard; Boeddinghaus, Runa S; Gassmann, Matthias	Leaching and Transformation of Perfluoroalkyl Acids and Polyfluoroalkyl Phosphate Diesters in Unsaturated Soil Column Studies	2022	Environ Toxicol Chem. 2022 Sep;41(9):2065-2077. doi: 10.1002/etc.5417. Epub 2022 Jul 26.	Per- and polyfluoroalkyl substances (PFAS) are environmentally ubiquitous, anthropogenic substances with adverse effects on organisms, which shows the need to study their environmental fate and leaching behavior. In the present soil columns study, the leaching behavior and fate of nontransformable and transformable (precursors) were investigated. Ten nontransformable PFAS in two different soils, two precursors and two field soils, which were already contaminated with a mixture of PFAS, and two uncontaminated controls, were set up for a time span of 2 years. At the end of the study, the molecular balance could not be closed for nontransformable PFAS. This effect was positively correlated to the fluorinated carbon chain length. The precursors, which were both polyfluoroalkyl phosphate diesters (diPAP), had different transformation products and transformation rates, with a higher rate for 6:2 diPAP than 8:2 diPAP. After 2 years, amounts of diPAP were still found in the soil with no significant vertical movement, showing high adsorption to soils. Transformation products were estimated to be simultaneously formed. They were predominantly found in the percolation water; the amounts left in soil were negligible. Up to half of the initial precursor amounts could not be balanced and were considered missing amounts. The results of contaminated field soil experiments showed the challenge to estimate PFAS leaching without knowing all occurring precursors and complex transformation dynamics. For this purpose, it was shown that a broad examination of contaminated soil with different analytical methods can help with qualitative estimations of leaching risks. For a better quantitative estimation, analytical determination of more PFAS and a quantification of the missing amounts are needed. Environ Toxicol Chem 2022;41:2065-2077.			С
D457	環境中運命	van der Veen, Ike; Schellenberger, Steffen; Hanning, Anne-Charlotte; Stare, Ann; de Boer, Jacob; Weiss, Jana M; Leonards, Pim E G	Fate of Per- and Polyfluoroalkyl Substances from Durable Water-Repellent Clothing during Use	2022	Environ Sci Technol. 2022 May 3;56(9):5886-5897. doi: 10.1021/acs.est.1c07876. Epub 2022 Apr 11.	To make outdoor clothing water- or dirt-repellent, durable water-repellent (DWR) coatings based on side-chain fluorinated polymers (SFPs) are used. During use of outdoor clothing, per- and polyfluoroalkyl substances (PFASs) can be emitted from the DWR to the environment. In this study, the effects of aging, washing, and tumble drying on the concentration of extractable PFASs in the DWR of perfluorohexane-based short-chain SFPs (FC-6 chemistry) and of perfluorooctane-based long-chain SFPs (FC-8 chemistry) were assessed. For this purpose, polyamide (PA) and polyester (PES) fabrics were coated with FC-6- and FC-8-based DWRs. Results show that aging of the coated fabrics causes an increase in concentration and formation of perfluoroalkyl acids (PFAAs). The effect of aging on the volatile PFASs depends on the type of fabric. Washing causes a decrease in PFAA concentrations, and in general, volatile PFASs are partly washed out of the textiles. However, washing can also increase the extractable concentration of volatile PFASs in the fabrics. This effect becomes stronger by a combination of aging and washing. Tumble drying does not affect the PFAS concentrations in textiles. In conclusion, aging and washing of fabrics coated with the DWR based on SFPs release PFASs to the environment.			C
D458	環境中運命	Nguyen, Thi Minh Hong; Brä unig, Jennifer; Thompson, Kristie; Thompson, Jack; Kabiri, Shervin; Navarro, Divina A; Kookana, Rai S; Grimison, Charles; Barnes, Craig M; Higgins, Christopher P; McLaughlin, Michael J; Mueller, Jochen F	Influences of Chemical Properties, Soil Properties, and Solution pH on Soil-Water Partitioning Coefficients of Per- and Polyfluoroalkyl Substances (PFASs)	2020	Environ Sci Technol. 2020 Dec 15;54(24):15883-15892. doi: 10.1021/acs.est.0c05705. Epub 2020 Nov 28.	The aim of this study was to assess the soil-water partitioning behavior of a wider range of per- and polyfluoroalkyl substances (PFASs) onto soils covering diverse soil properties. The PFASs studied include perfluoroalkyl carboxylates (PFCAs), perfluoroalkane sulfonates (PFSAs), fluorotelomer sulfonates (FTSs), nonionic perfluoroalkane sulfonamides (FASAs), cyclic PFAS (PFEtCHxS), per- and polyfluoroalkyl ether acids (GenX, ADONA, 9CI-PF3ONS), and three aqueous film-forming foam (AFFF)- related zwitterionic PFASs (AmPr-FHxSA, TAmPr-FHxSA, 6:2 FTSA-PrB). Soil-water partitioning coefficients (log Kd values) of the PFASs ranged from less than zero to approximately three, were chain-length-dependent, and were significantly linearly related to molecular weight (MW) for PFASs with MW > 350 g/mol (R2 = 0.94, p < 0.0001). Across all soils, the Kd values of all short-chain PFASs (<5 - CF2- moieties) were similar and varied less (<0.5 log units) compared to long-chain PFASs (>0.5 to 1.5 log units) and zwitterions AmPr- and TAmPr-FHxSA (~1.5 to 2 log units). Multiple soil properties described sorption of PFASs better than any single property. The effects of soil properties on sorption were different for anionic, nonionic, and zwitterionic PFASs. Solution pH could change both PFASs increased when solution pH decreased from approximately eight to three. Short-chain PFASs were less sensitive to solution pH than long-chain PFASs. The results indicate the complex interactions of PFASs with soil surfaces and the need to consider both PFAS type and soil properties to describe mobility in the environment.			C

No.	分野 (参考)	著者	タイトル	発行年 書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン 文 ン 文 ク 献 ク 献 ① ラ ② ラ
D459	環境中運命	Evangelou, Michael W H; Robinson, Brett H	The Phytomanagement of PFAS-Contaminated Land	2022 Int J Environ Res Public Health. 2022 Jun 2;19(11):6817. doi: 10.3390/ijerph19116817.	Globally, several hundred thousand hectares of both agricultural and urban land have become contaminated with per- and polyfluoroalkyl substances (PFAS). PFAS compounds are resistant to degradation and are mobile in soil compared to other common contaminants. Many compounds have KD values (matrix/solution concentration quotients) of <10. PFAS compounds endanger the health of humans and ecosystems by leaching into groundwater, exposure via dust, and, to a lesser extent, through plant uptake. This review aims to determine the feasibility of phytomanagement, the use of plants, and the use of soil conditioners to minimize environmental risk whilst also providing an economic return in the management of PFAS-contaminated land. For most sites, PFAS combinations render phytoextraction, the use of plants to remove PFAS from soil, inviable. In contrast, low Bioaccumulation Coefficients (BAC; plant and soil concentration quotients) timber species or native vegetation may be usefully employed for phytomanagement to limit human/food chain exposure to PFAS. Even with a low BAC, PFAS uptake by crop plants may still exceed food safety standards, and therefore, edible crop plants should be avoided. Despite this limitation, phytomanagement may be the only economically viable option to manage most of this land. Plant species and soil amendments should be chosen with the goal of reducing water flux through the soil, as well as increasing the hydrophobic components in soil that may bind the C-F-dominated tails of PFAS into receiving waters. Future work should focus on the interactions of PFAS with soil microbiota; secondary metabolites such as glomalin may immobilize PFAS in soil.			В
D460	環境中運命	Weber, Eric J; Tebes-Stevens, Caroline; Washington, John W; Gladstone, Rachel	Development of a PFAS reaction library: identifying plausible transformation pathways in environmental and biological systems	2022 Environ Sci Process Impacts. 2022 May 25;24(5):689-753. doi: 10.1039/d1em00445j.	Perfluoroalkyl and polyfluoroalkyl substances (PFAS) are used in many consumer applications due to their stain repellency, surfactant properties, ability to form water-proof coatings and use in fire suppression. The production, application, transport, use and disposal of PFAS and PFAS-treated products have resulted in their wide-spread occurrence in environmental and biological systems. Concern over exposure to PFAS and their transformation products and metabolites has necessitated the development of tools to predict the transformation of PFAS in environmental systems and metabolism in biological systems. We have developed reaction libraries for predicting transformation products and metabolites in a variety of environmental and biological reaction systems. These reaction libraries are based on generalized reaction schemes that encode the process science of PFAS reported in the peer-reviewed literature. The PFAS reaction libraries will be executed through the Chemical Transformation Simulator, a web-based tool that is available to the public. These reaction libraries are intended for predicting the environmental transformation and metabolism of PFAS only.			С
D461	環境中運 命	Tong, Xuneng; Mohapatra, Sanjeeb; Zhang, Jingjie; Tran, Ngoc Han; You, Luhua; He, Yiliang; Gin, Karina Yew- Hoong	Source, fate, transport and modelling of selected emerging contaminants in the aquatic environment: Current status and future perspectives	Water Res. 2022 Jun 15;217:118418. doi: 10.1016/j.watres.2022.118418. Epub 2022 Apr 7.	The occurrence of emerging contaminants (ECs), such as pharmaceuticals and personal care products (PPCPs), perfluoroalkyl and polyfluoroalkyl substances (PFASs) and endocrine-disrupting chemicals (EDCs) in aquatic environments represent a major threat to water resources due to their potential risks to the ecosystem and humans even at trace levels. Mathematical modelling can be a useful tool as a comprehensive approach to study their fate and transport in natural waters. However, modelling studies of the occurrence, fate and transport of ECs in aquatic environments have generally received far less attention than the more widespread field and laboratory studies. In this study, we reviewed the current status of modelling ECs based on selected representative ECs, including their sources, fate and various mechanisms as well as their interactions with the surrounding environments in aquatic ecosystems, and explore future development and perspectives in this area. Most importantly, the principles, mathematical derivations, ongoing development and applications of various ECs models in different geographical regions are critically reviewed and discussed. The recommendations for improving data quality, monitoring planning, model development and applications were also suggested. The outcomes of this review can lay down a future framework in developing a comprehensive ECs modelling approach to help researchers and policymakers effectively manage water resources impacted by rising levels of ECs.			С
D462	環境中運命	Vo, Hoang Nhat Phong; Nguyen, Thi Minh Hong; Ngo, Huu Hao; Guo, Wenshan; Shukla, Pradeep	Biochar sorption of perfluoroalkyl substances (PFASs) in aqueous film-forming foams-impacted groundwater: Effects of PFASs properties and groundwater chemistry	2022 Chemosphere. 2022 Jan;286(Pt 1):131622. doi: 10.1016/j.chemosphere.2021.131622. Epub 2021 Jul 21.	The widespread use of per- and polyfluoroalkyl substances (PFASs)-related products such as aqueous film-forming foams (AFFF) has led to increasing contamination of groundwater systems. The concentration of PFASs in AFFF-impacted groundwater can be several orders of magnitude higher than the drinking water standard. There is a need for a sustainable and effective sorbent to remove PFASs from groundwater. This work aims to investigate the sorption of PFASs in groundwater by biochar column. The specific objectives are to understand the influences of PFASs properties and groundwater chemistry to PFASs sorption by biochar. The PFASs-spiked Milli-Q water (including 19 PFASs) and four aqueous film-forming foams (AFFF)-impacted groundwater were used. The partitioning coefficients (log K(d)) of long chain PFASs ranged from 0.77 to 4.63 while for short chain PFASs they remained below 0.68. For long chain PFASs (C \geq 7), log K(d) increased by 0.5 and 0.8 for each CF(2) moiety of PFCAs and PFSAs, respectively. Dissolved organic matter (DOM) was the most influential factor in PFASs sorption over pH, salinity, and specific ultraviolet absorbance (SUVA). DOM contained hydrophobic compounds and metal ions which can form DOM-PFASs complexes to provide more sorption sites for PFASs. The finding is useful for executing PFASs remediation by biochar filtration column, especially legacy long chain PFASs, for groundwater remediation.			С

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン文 ン文 ク献 り献 (1) ラ (2) ラ
D463	環境中運命	Liu, Shiyang; Jin, Biao; Arp, Hans Peter H; Chen, Wenwen; Liu, Yi; Zhang, Gan	The Fate and Transport of Chlorinated Polyfluorinated Ether Sulfonates and Other PFAS through Industrial Wastewater Treatment Facilities in China	2022	Environ Sci Technol. 2022 Mar 1;56(5):3002-3010. doi: 10.1021/acs.est.1c04276. Epub 2022 Feb 8.	Wastewater from certain industrial processes can be primary emission sources of per- and polyfluoroalkyl substances (PFAS) and fluorinated alternatives like chlorinated polyfluorinated ether sulfonates (CI-PFESA). Two such industrial processes are electroplating and textile printing and dyeing (PD). This study focused on the fate of CI-PFESA in wastewater from these two industrial processes, in comparison to other PFAS, as they went through different wastewater treatment plants located in southeast China. The total target PFAS concentrations were 520 ± 30 and 4200 ± 270 ng/L at the effluents of the PD WWTP and electroplating WWTP, respectively. Specifically, 6:2 CI-PFESA (18%) and 8:2 CI-PFESA (0.7%) were abundant in electroplating-wastewater. CI-PFESA were also detected in PD wastewater but at trace concentrations and were likely present due to diffuse emissions. The dissolved-phase CI-PFESA and PFAS mass flows through the WWTPs were fairly constant throughout both facilities. The majority of CI-PFESA was captured by sludge sedimentation. However, there were individual treatment processes that could cause the wastewater concentrations to fluctuate, and also could lead to relative enrichment of specific CI-PFESA as indicated by the 6:2/8:2 CI-PFESA ratios. CI-PFESA and perfluoroalkyl sulfonic acids were more influenced by the investigated			С
D464	環境中運命	Viticoski, Roger L; Wang, Danyang; Feltman, Meredith A; Mulabagal, Vanisree; Rogers, Stephanie R; Blersch, David M; Hayworth, Joel S	Spatial distribution and mass transport of Perfluoroalkyl Substances (PFAS) in surface water: A statewide evaluation of PFAS occurrence and fate in Alabama	2022	Sci Total Environ. 2022 Aug 25;836:155524. doi: 10.1016/j.scitotenv.2022.155524. Epub 2022 Apr 27.	treatment processes than perfluorocarboxylic acids. Per- and polyfluoroalkyl substances (PFAS) have been previously detected near suspected sources in Alabama, but the overall extent of contamination across the state is unknown. This study evaluated the spatial distribution of 17 PFAS within the ten major river basins in Alabama and provided insights into their transport and fate through a mass flux analysis. Six PFAS were identified in 65 out of the 74 riverine samples, with mean Σ (6)PFAS levels of 35.2 ng L(-1). The highest Σ (6)PFAS concentration of 237 ng L(-1) was detected in the Coosa River, a transboundary river that receives discharges from multiple sources in Alabama and Georgia. PFAS distribution was not observed to be uniform across the state: while the Coosa, Alabama, and Chattahoochee rivers presented relatively high mean Σ (6)PFAS concentrations of 191, 100 and 28.8 ng L(-1), respectively, PFAS were not detected in the Conecuh, Escatawpa, and Yellow rivers. Remaining river systems presented mean Σ (6)PFAS concentrations between 7.94 and 24.7 ng L(-1). Although the short-chain perfluoropentanoic acid (PFPeA) was the most detected analyte (88%), perfluorobutanesulfonic acid (PFBS) was the substance with the highest individual concentration of 79.4 ng L(-1). Consistent increases in the mass fluxes of PFAS were observed as the rivers flowed through Alabama, reaching up to 63.3 mg s(-1), indicating the presence of numerous sources across the state. Most of the mass inputs would not have been captured if only aqueous concentrations were evaluated, since concentration is usually heavily impacted by environmental conditions. Results of this study demonstrate that mass flux is a simple and powerful complementary approach that can be used to broadly understand trends in the transport and fate of PFAS in large river systems.			В
D465	環境中運命	Tokranov, Andrea K; LeBlanc, Denis R; Pickard, Heidi M; Ruyle, Bridger J; Barber, Larry B; Hull, Robert B; Sunderland, Elsie M; Vecitis, Chad D	Surface-water/groundwater boundaries affect seasonal PFAS concentrations and PFAA precursor transformations	2021	Environ Sci Process Impacts. 2021 Dec 15;23(12):1893- 1905. doi: 10.1039/d1em00329a.	Elevated concentrations of per- and polyfluoroalkyl substances (PFAS) in drinking-water supplies are a major concern for human health. It is therefore essential to understand factors that affect PFAS concentrations in surface water and groundwater and the transformation of perfluoroalkyl acid (PFAA) precursors that degrade into terminal compounds. Surface-water/groundwater exchange can occur along the flow path downgradient from PFAS point sources and biogeochemical conditions can change rapidly at these exchange boundaries. Here, we investigate the influence of surface-water/groundwater boundaries on PFAS transport and transformation. To do this, we conducted an extensive field-based analysis of PFAS concentrations in water and sediment from a flow-through lake fed by contaminated groundwater and its downgradient surface-water/groundwater boundary (defined as ≤ 100 cm below the lake bottom). PFAA precursors comprised $45 \pm 4.6\%$ of PFAS (PFAA precursors + 18 targeted PFAA) in the predominantly oxic lake impacted by a former fire-training area and historical wastewater discharges. In shallow porewater downgradient from the lake, this percentage decreased significantly to $25 \pm 11\%$. PFAA precursor concentrations decreased by 85% between the lake and 84-100 cm below the lake bottom. PFAA concentrations increased significantly within the surface-water/groundwater boundary and in downgradient groundwater during the winter months despite lower stable concentrations in the lake water source. These results suggest that natural biogeochemical fluctuations. Results of this work highlight the importance of dynamic biogeochemical conditions along the hydrological flow path from PFAS point sources to potentially affected drinking water supplies.			В
D466	環境中運命	Tang, Tianhao; Liu, Xiaochun; Wang, Longqian; Zuh, Achuo Anitta; Qiao, Weichuan; Huang, Jun	Uptake, translocation and toxicity of chlorinated polyfluoroalkyl ether potassium sulfonate (F53B) and chromium co-contamination in water spinach (Ipomoea aquatica Forsk)	2020	Environ Pollut. 2020 Nov;266(Pt 1):115385. doi: 10.1016/j.envpol.2020.115385. Epub 2020 Aug 9.	Bioaccumulation and toxicity of per-and polyfluoroalkyl substances and metal in plants have been confirmed, however their contamination in soil and plants still requires extensive investigation. In this study the combined effects of chlorinated polyfluoroalkyl ether potassium sulfonate (F53B) and chromium (Cr) on water spinach (Ipomoea aquatica Forsk) were investigated. Compared with each single stress, the combination of F53B and Cr (VI) reduced the biomass and height and increasingly accumulated in the roots and destroyed the cell structure. Besides, the co-contamination led to the immobilization of F53B and Cr (VI) in soil, which affected their migration in soil and transfer to plants. The antioxidant response and photosynthesis of the plant weakened under the single Cr (VI) and enhanced under the single F53B treatment; however the contamination of F53B and Cr (VI) could also reduce this effect, as confirmed by the gene expression of MTa, psbA and psbcL genes. This study provides an evidence of the environmental risks resulting from the coexistence of F53B and Cr (VI).			С

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン文ン文 ク献 ① ラ ② ラ
D467	環境中運命	Björnsdotter, Maria K; Yeung, Leo W Y; Kä rrman, Anna; Jogsten, Ingrid Ericson	Mass Balance of Perfluoroalkyl Acids, Including Trifluoroacetic Acid, in a Freshwater Lake	2022	Environ Sci Technol. 2022 Jan 4;56(1):251-259. doi: 10.1021/acs.est.1c04472. Epub 2021 Dec 20.	Perfluoroalkyl acids (PFAAs) are highly persistent chemicals that are ubiquitously found in the environment. The atmospheric degradation of precursor compounds has been identified as a source of PFAAs and might be an important pathway for contamination. Lake Vättern is one of Sweden's largest lakes and is an important source for drinking water. In addition to contamination via atmospheric deposition, the lake is subject to several potential contamination sources via surface water inflow. The relevance of different sources is not well understood. A mass balance of selected PFAAs was assembled based on measured concentrations in atmospheric deposition, surface water from streams that constitute the main inflow and outflow, and surface water in the lake. The largest input was seen for trifluoroacetic acid (150 kg/year), perfluoropropanoic acid (1.6 kg/year), perfluorobutanoic acid (4.0 kg/year), and perfluoro-octanoic acid (1.5 kg/year). Both atmospheric deposition and surface water inflow was found to be important input pathways. There was a positive correlation between the input of most perfluoroalkyl carboxylic acids via atmospheric deposition and global radiation and between the input via surface water inflow and catchment area. These findings highlight the importance of atmospheric oxidation of volatile precursor compounds for contamination in surface waters.			В
D468	環境中運命	Fabregat-Palau, Joel; Vidal, Miquel; Rigol, Anna	Modelling the sorption behaviour of perfluoroalkyl carboxylates and perfluoroalkane sulfonates in soils	2021	Sci Total Environ. 2021 Dec 20;801:149343. doi: 10.1016/j.scitotenv.2021.149343. Epub 2021 Jul 30.	A simple parametric model was developed to predict the sorption of perfluoroalkyl substances (PFASs) in soils. Initially, sorption and desorption solid-liquid distribution coefficients (K(d) and K(d,des) respectively) of eight PFASs (five perfluoroalkyl carboxylates, PFCAs, and three perfluoroalkane sulfonates, PFSAs) in seven soils with organic carbon (OC) content ranging from 1.6 to 41% were quantified using batch experiments. The information obtained helped to fill the gaps in a literature-based database of K(d) values of PFASs, which was lacking data on soils with high OC content. The overall dataset finally comprised 435 entries. Normalized sorption coefficients for the soil OC and mineral fraction contents (K(OC) and K(MIN) respectively) were deduced for each PFAS by correlating the corresponding K(d) values obtained under a wide range of experimental conditions with the fraction of organic carbon (f(OC)) of the soils. Furthermore, the sorption mechanisms in each phase were shown to depend mainly on PFAS chain length. The dependence of K(OC) and K(MIN) values on PFAS chain length defined the basic equations to construct the model for predicting PFAS sorption, applicable to both PFCAs and PFSAs with chain lengths ranging from 3 to 11 fluorinated carbons. The validation of the proposed model confirmed its ability to predict the K(d) of PFASs based only on the soil OC and silt+clay contents and PFAS chain length. Therefore, it can be used in the first stages of a risk assessment process aiming at estimating the potential mobility of PFASs in soils after a contamination event. SYNOPSIS: This study develops a new parametric model to predict the sorption of perfluoroalkyl substances (PFASs) in soils.			С
D469	環境中運命	Guo, Jia; Zhou, Jian; Liu, Siqian; Shen, Lina; Liang, Xiaoxue; Wang, Tiecheng; Zhu, Lingyan	Underlying Mechanisms for Low-Molecular-Weight Dissolved Organic Matter to Promote Translocation and Transformation of Chlorinated Polyfluoroalkyl Ether Sulfonate in Wheat	2022	Environ Sci Technol. 2022 Nov 15;56(22):15617-15626. doi: 10.1021/acs.est.2c04356. Epub 2022 Oct 22.	Dissolved organic matter (DOM) such as fulvic acid (FA) and humic acid (HA) in soil considerably affects the fate of per- and polyfluoroalkyl substances (PFASs). However, the effect of DOM on their behavior in plants remains unclear. Herein, hydroponic experiments indicate that FA and HA reduce the accumulation of an emerging PFAS of high concern, 6:2 chlorinated polyfluoroalkyl ether sulfonate (6:2 CI-PFESA), in wheat roots by reducing its bioavailability in the solution. Nevertheless, FA with low molecular weight (MW) promotes its absorption and translocation from the roots to the shoots by stimulating the activity and the related genes of the plasma membrane H(+)-ATPase, whereas high-MW HA shows the opposite effect. Moreover, in vivo and in vitro experiments indicate that 6:2 CI-PFESA undergoes reductive dechlorination, which is regulated mainly using nitrate reductase and glutathione transferase. HA and FA, particularly the latter, promote the dechlorination of 6:2 CI-PFESA in wheat by enhancing electron transfer efficiency and superoxide production. Transcriptomic analysis indicates that FA also stimulates catalytic activity, cation binding, and oxidoreductase activity, facilitating 6:2 CI-PFESA transformation in wheat.			с
D470	環境中運命	Jiang, Lan; Xu, Yue; Zhang, Xiaoyu; Xu, Bingfeng; Xu, Ximeng; Ma, Yixing	Developing a QSPR Model of Organic Carbon Normalized Sorption Coefficients of Perfluorinated and Polyfluoroalkyl Substances	2022	Molecules. 2022 Aug 31;27(17):5610. doi: 10.3390/molecules27175610.	Perfluorinated and polyfluoroalkyl substances (PFASs) are known for their long-distance migration, bioaccumulation, and toxicity. The transport of PFASs in the environment has been a source of increasing concerned. The organic carbon normalized sorption coefficient (K(oc)) is an important parameter from which to understand the distribution behavior of organic matter between solid and liquid phases. Currently, the theoretical prediction research on log K(oc) of PFASs is extremely limited. The existing models have limitations such as restricted application fields and unsatisfactory prediction results for some substances. In this study, a quantitative structure-property relationship (QSPR) model was established to predict the log K(oc) of PFASs, and the potential mechanism affecting the distribution of PFASs between two phases from the perspective of molecular structure was analyzed. The developed model had sufficient goodness of fit and robustness, satisfying the model application requirements. The molecular weight (MW) related to the hydrophobicity of the compound; lowest unoccupied molecular orbital energy (E(LUMO)) and maximum average local ionization energy on the molecular surface (ALIE(max)), both related to electrostatic properties; and the dipole moment (μ), related to the polarity of the compound; are the key structural variables that affect the distribution behavior of PFASs. This study carried out a standardized modeling process, and the model dataset covered a comprehensive variety of PFASs. The model can be used to predict the log K(oc) of conventional and emerging PFASs effectively, filling the data gap of the log K(oc) of uncommon PFASs. The explanation of the mechanism of the model has proven to be of great value for understanding the distribution behavior and migration trends of PFASs between sediment/soil and water, and for estimating the potential environmental risks generated by PFASs.			С

分野 著者 タイトル 発行年 書誌情報 要旨 (原文) No (参考) Understanding the interactions between dissolved organic matter (DOM) and perfluoroalkyl predicting the distribution, transport, and fate of PFAAs in aquatic environments. Based on Taihu Lake Basin combined with laboratory experiments, we obtained DOM and PFAA conc nvestigated key factors of DOM affecting PFAA variability and capture of PFAAs by DOM. R concentrations of PFAAs were 73.4-689 ng/L in surface water and that PFAAs were domina Li, Xiao-Qing; acids and perfluorooctane sulfonic acid. The main components of DOM included tyrosine-, f nteractions between dissolved organic matter and Water Res. 2022 Jun 1;216:118324. doi: 環境中運 Hua, Zu-Lin; The Mantel test revealed a significant positive correlation between DOM and PFAAs (P = 0. D471 perfluoroalkyl acids in natural rivers and lakes: A case Zhang, Jian-Yun 10.1016/j.watres.2022.118324. Epub 2022 Mar 19 dentified as the most crucial factors affecting PFAA variability. The laboratory experiments study of the northwest of Taihu Lake Basin, China Gu. Li aggregate into a microgel. Furthermore, 19.1-50.9% of PFAAs, DOM characteristic peaks, an can be removed during aggregation, indicating the capacity of DOM binding organic/inorgar substances were more effectively removed than the protein-like substances. The distributio perfluorohexanoic acid significantly correlated with their perfluorinated carbon numbers (r = nsights into the interactions between DOM and PFAAs, improving the understanding of the PFAAs in aquatic environments. Enrichment of ionic poly/perfluoroalkyl substances (PFASs) in aqueous aerosol (AA) is an in atmosphere. In this study, the enrichment behaviors of 12 legacy and emerging PFASs in AA solutions were investigated. The enrichment factors (EF) displayed a general increasing tren Li, Yao: Yu, length. For the first time, a robust Quantitative Structure-Property Relationship (QSPR) mod Xiaoyong; Chen, Underlying mechanisms for the impacts of molecular method was established with fifteen quantum chemical descriptors. Four molecular descript 環境中運 Sci Total Environ. 2022 Jan 10;803:150003. doi: D472 Xin[.] Yin Jun structures and water chemistry on the enrichment of molecular weight (MW), the maximal value of the molecular surface potential (V(s, max)) an 2022 10.1016/j.scitotenv.2021.150003. Epub 2021 Aug 30. Zhong, Wenjue; poly/perfluoroalkyl substances in aqueous aerosol as the key structural variables affecting the PFASs enrichment. Inorganic salts and humic ac Zhu, Lingyan seawater, facilitated the PFASs enrichment as a result of enhanced hydrophobicity and the cations. The typical cationic and anionic surfactants, cetyltrimethylammonium bromide and the enrichment due to the competition between PFASs and surfactants. It is interesting that sulfonate (F53B) had the highest EF among the 12 PFASs, implying its strong potential of at Sea-spray (or sea-salt) aerosol (SSA) formation and their subsequent atmospheric transpor to play a prominent role in the occurrence of ionizable perfluoroalkyl substances (PFAS) in the remote regions. However, field studies on SSA's role as vector of transport of PFAS are lack Casas, Gemma: Martínez-Varela seawater (SW), the sea-surface microlayer (SML) and SSA were sampled simultaneously at Alícia; Roscales, Enrichment of perfluoroalkyl substances in the sea-Antarctica). Average PFAS concentrations were 313 pg L(-1), 447 pg L(-1), and 0.67 pg m(-3 環境中運 Environ Pollut. 2020 Dec;267:115512. doi: D473 Jose L; Vilarespectively. The enrichment factors of PFAS in the SML and SSA ranged between 1.2 and 5 surface microlayer and sea-spray aerosols in the 2020 10.1016/j.envpol.2020.115512. Epub 2020 Aug 27. Costa, Maria; Southern Ocean respectively. This amplification of concentrations in the SML is consistent with the surfacta Dachs, Jordi; Jin enrichment of PFAS in atmospheric SSA may be facilitated by the large surface area of SSA énez, Begoña organic matter. This is the first field work assessing the simultaneous occurrence of PFAS i measured amplification of concentrations in marine aerosols supports the role of SSA as a r atmospheric transport of PFAS. The prevalence of per- and polyfluoroalkyl substances (PFASs) in agricultural soils has raise associated with the consumption of PFAS-contaminated agricultural products. The present translocation of nine PFASs in lettuce using a hydroponic setting. During the uptake experim Wang, Wenfeng exhibited greater accumulations in lettuce roots, while short-chain PFASs (< C7) manifester Insight into the uptake and translocation of per- and 環境中運 Yuan, Shu; The average root concentration factors of PFASs were positively correlated with their log K(Environ Sci Pollut Res Int. 2022 Dec;29(56):85454-85464 D474 polyfluoroalkyl substances in hydroponically grown 2022 doi: 10.1007/s11356-022-21886-4. Epub 2022 Jul 7. relationship was found between the average translocation factors of PFASs and their molection Kwon, Jung lettuce PFASs by lettuce roots was enhanced after heating the roots to increase the cell membrane Hwar perfluorododecanoic acid increased significantly in shoots of lettuce plants without roots as Results of the present study indicate that sorption to root surface tissues and efficiency in p strip are two important factors that affect the uptake and distribution of PFASs within plant

	備考	出 情 対 報 象 抽	ン 文 ク 献 ① ラ	ン 文 ク 献 ② ラ
acids (PFAAs) is essential for ield investigations in the northwest of entrations as well as compositions and esults indicated that the total ted by C3-7 perfluoroalkyl carboxylic ulvic-, and tryptophan-like substances. 0001). Fulvic-like substances were revealed that DOM can spontaneously d several metals (Ca, Mg, Cu, and Fe) ic substances. The fulvic-like n coefficients of all PFAAs except = 0.975, p<0.001). Our results provided distribution, transport, and fate of			С	
nportant pathway for them to enter in both single solute and mixed and with the fluorinated carbon chain lel coupled with partial least-square cors, including dipole moment (μ), and molecular volume (V) were identified cid (HA) which are common in bridging effect caused by divalent sodium dodecyl sulfate, both inhibited to 6:2 chlorinated polyfluorinated ether mosphere transport.			С	
t and deposition have been suggested he maritime Antarctica and other ing. Following a multiphase approach, South Bay (Livingston Island, B) in SW, the SML and SSA, 5, and between 522 and 4690, nt properties of PFAS, while the large and the sorption of PFAS to aerosol n SW, the SML and SSA. The large elevant vector for long-range			С	
ad concerns regarding the health risks study investigated the uptake and nents, long-chain PFASs (\geq C8) ad preferential transport to the shoots. ow) values. A significantly negative ular volume. Sorption of long-chain permeability. The accumulation of compared to whole lettuce plants. bassing through the root Casparian S.			В	

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン文ン文 ク献 ① ラ ② ラ
D475	環境中運命	Richardson, Matthew J; Kabiri, Shervin; Grimison, Charles; Bowles, Karl; Corish, Stephen; Chapman, Mark; McLaughlin, Michael J	Per- and Poly-Fluoroalkyl Substances in Runoff and Leaching from AFFF-Contaminated Soils: a Rainfall Simulation Study	2022	Environ Sci Technol. 2022 Nov 10. doi: 10.1021/acs.est.2c05377. Online ahead of print.	The mobilization and transport of per- and poly-fluoroalkyl substances (PFASs) via surface runoff (runoff) from aqueous film- forming foam (AFFF)-contaminated soils during rainfall, flooding, or irrigation has not been thoroughly evaluated, and the effectiveness of carbonaceous sorbents in limiting PFASs in runoff is similarly unquantified. Here, laboratory-scale rainfall simulations evaluate PFAS losses in runoff and in leaching to groundwater (leachate) from AFFF-contaminated soils varying in texture, PFAS composition and concentration, and remediation treatment. Leaching dominated PFAS losses in soils with a concentration of Σ PFAS = 0.2-2 mg/kg. However, with higher soil PFAS concentrations (Σ PFAS = 31 mg/kg), leachate volumes were negligible and runoff dominated losses. The concentration and variety of PFASs were far greater in leachates regardless of the initial concentrations in soil. Losses of PFASs were dependent on the C-chain length for leachates and more on the initial concentration in soil for runoff. Suspended materials did not meaningfully contribute to runoff losses. While concentrations of most PFASs declined significantly after the first rainfall event, desorption and transport in both runoff and leachates persisted over several rainfall events. Finally, results showed that sorption to AC mostly occurred during, not prior to, rainfall events and that 1% w/w AC substantially reduced losses in runoff and leachates from all soils.			С
D476	環境中運命	Sha, Bo; Johansson, Jana H; Benskin, Jonathan P; Cousins, Ian T; Salter, Matthew E	Influence of Water Concentrations of Perfluoroalkyl Acids (PFAAs) on Their Size-Resolved Enrichment in Nascent Sea Spray Aerosols	2021	Environ Sci Technol. 2021 Jul 20;55(14):9489-9497. doi: 10.1021/acs.est.0c03804. Epub 2020 Sep 4.	Perfluoroalkyl acids (PFAAs) are persistent organic substances that have been widely detected in the global oceans. Previous laboratory experiments have demonstrated effective enrichment of PFAAs in nascent sea spray aerosols (SSA), suggesting that SSA are an important source of PFAAs to the atmosphere. In the present study, the effects of the water concentration of PFAAs on their size-resolved enrichment in SSA were examined using a sea spray simulation chamber. Aerosolization of the target compounds in almost all sizes of SSA revealed a strong linear relationship with their water concentrations ($p < 0.05$, $r(2) > 0.9$). The enrichment factors (EF) of the target compounds showed no correlation with their concentrations in the chamber water, despite the concentrations varying by a factor of 500 (\sim 0.3 to \sim 150 ng L(-1)). The particle surface-area-to-volume ratio appeared to be a key predictor of the enrichment of perfluoroalkyl carboxylic acids (PFCAs) with \geq 7 perfluorinated carbons and perfluoroalkanesulfonic acids (PFSAs) with \geq 6 perfluorinated carbons in supermicron particles ($p < 0.05$, $r(2) > 0.8$), but not in submicron particles. The different enrichment behaviors of PFAAs in submicron and supermicron particles might be a result of the different production mechanisms of film droplets and jet droplets. The results suggest that the variability in seawater concentrations of PFAAs has little influence on EFs and that modeling studies designed to quantify the source of PFAAs via SSA emissions do not need to consider this factor.			В
D477	環境中運命	Schaefer, Charles E; Drennan, Dina; Nickerson, Anastasia; Maizel, Andrew; Higgins, Christopher P	Diffusion of perfluoroalkyl acids through clay-rich soil. Journal of Contaminant Hydrology, 241, p.103814	2021	J Contam Hydrol. 2021 Dec;243:103882. doi: 10.1016/j.jconhyd.2021.103882. Epub 2021 Oct 4.	No abstract available			D
D478	環境中運 命	Richard H; Thompson, Timothy; Stroo, Hans F; Leeson,	US Department of Defense-Funded Fate and Transport Research on Per- and Polyfluoroalkyl Substances at Aqueous Film-Forming Foam-Impacted Sites	2021	Environ Toxicol Chem. 2021 Jan;40(1):37-43. doi: 10.1002/etc.4694. Epub 2020 Jun 2.	No abstract available			D
D479	環境中運命	Ferrario, Claudia; Valsecchi, Sara; Lava, Roberto; Bonato, Marco; Polesello, Stefano	Determination of perfluoroalkyl acids in different tissues of graminaceous plants	2021	Anal Methods. 2021 Apr 7;13(13):1643-1650. doi: 10.1039/d0ay02226h. Epub 2021 Mar 22.	A method for the determination of 12 perfluoroalkyl acids (PFAA) in vegetal samples was proposed. The analytical procedure was developed to optimize the detection of short-chain PFAA (C < 8) due to their higher potential to be translocated and bioaccumulated in plants than long-chain congeners. The method, based on ultrasonic extraction, clean-up and HPLC-MS/MS analysis, determined PFAA in different plant tissues allowing the PFAA distribution and partition in vegetal compartments to be studied. The performance of this analytical procedure was validated by analysing samples (root, stem and leaf) of reed grass. The validated method was then applied to graminaceous plants from an agricultural area impacted by a fluorochemical plant discharge (Northern Italy). The PFAA congeners were detected in most of the samples with Σ PFAA concentrations in the whole plant ranging from <lod 10.4="" a="" accumulation="" also="" and="" animals.<="" approach="" are="" assessment="" because="" breeding="" chain="" cob="" comestible="" consumption.="" corn="" data="" due="" edible="" for="" forage,="" fractions="" furthermore="" g(-1)="" greater="" human="" in="" information="" intended="" investigation="" is="" kernel.="" levels="" ng="" not="" of="" on="" particularly="" parts,="" pfaa="" plant="" proposed="" provide="" rate="" recorded="" relevant="" remaining="" risk="" td="" than="" the="" to="" transfer="" trophic="" useful="" vegetable="" with="" ww=""><td></td><td></td><td>В</td></lod>			В

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 村 報 掛	ン文ン文 ク献ク献 ① ラ ② ラ
D480	環境中運命	Coppola, Gianluca; Polesello, Stefano; Ferrario, Claudia; Peruzzo, Massimo; Lava, Roberto; Mazzola,	Does the partitioning of perfluoroalkyl acids to soil depend on their chain length?	2022	Integr Environ Assess Manag. 2022 Nov;18(6):1747-1749. doi: 10.1002/ieam.4681.	No abstract available			D
D481	環境中運命	Silva, Jeff A K; Guelfo, Jennifer L; Šimůnek, Jiří; McCray, John E	Simulated leaching of PFAS from land-applied municipal biosolids at agricultural sites	2022	J Contam Hydrol. 2022 Dec;251:104089. doi: 10.1016/j.jconhyd.2022.104089. Epub 2022 Sep 30.	Biosolids are an important resource for agricultural practice but have recently received increased focus as a potential source of per- and polyfluoroalkyl substances (PFAS) in the environment. Few studies have investigated the transport of PFAS through the unsaturated zone under conditions relevant to biosolids application sites. Herein, the unsaturated flow and transport model HYDRUS is used to evaluate the leaching of per- and polyfluoroalkyl substances (PFAS) from land-applied biosolids used in agricultural practice to determine the impacts of PFAS leaching on underlying groundwater resources. This numerical case study was based on conditions and operations at two test sites in central Illinois where biosolids were applied at agronomic rates and where PFAS contents and desorption characteristics were previously characterized. Each site possessed different vadose zone soil textural heterogeneity. Simulations were performed under actual present-day meteorological conditions and extended 150 years beyond the initial biosolids application. These long-term simulations demonstrate how soil equilibrium sorption/desorption processes within the biosolids-amended surface soils effectively control the transport rate of individual PFAS to groundwater. Airwater interfacial (AWI) adsorption, which is sometimes considered to be a significant source of PFAS retention in vadose zone soils, was observed to have minimal impacts on PFAS leaching rates within the biosolids-amended surface soils at these sites. Additionally, the impact of AWI adsorption was found to be most significant for PFAS transport within the underlying vadose zone soils represented herein. The results of multiple long-term simulations were used to develop an empirical equation that relates predicted maximum PFAS pore-water concentrations reaching the saturated zone with changes in PFAS concentrations in the biosolids-amended soil for various biosolids re-application events. This approach is shown to be very useful in developing site-specific PFAS is or sou			C
D482	環境中運命	Lämmer, René; Weidemann, Eva; Göckener, Bernd; Stahl, Thorsten; Breuer, Jörn; Kowalczyk, Janine; Just, Hildegard; Boeddinghaus, Runa S; Gassmann, Matthias; Kling, Hans-Willi; Bü cking, Mark	Evaluation of the Transformation and Leaching Behavior of Two Polyfluoroalkyl Phosphate Diesters in a Field Lysimeter Study	2022	J Agric Food Chem. 2022 Nov 16;70(45):14329-14338. doi: 10.1021/acs.jafc.2c03334. Epub 2022 Nov 2.	In this study, 6:2 and 8:2 polyfluoroalkyl phosphate diester (diPAP) were individually investigated in lysimeters under near-natural conditions. Leachate was sampled for 2 years, as was the soil after the experiment. In the leachate of the diPAP-spiked soils, perfluorocarboxylic acids (PFCAs) of different chain lengths were detected [23.2% (6:2 diPAP variant) and 20.8% (8:2 diPAP variant) of the initially applied molar amount]. After 2 years, the soils still contained 36-37% 6:2 diPAP and 41-45% 8:2 diPAP, respectively, in addition to smaller amounts of PFCAs (1.5 and 10.6%, respectively). Amounts of PFCAs found in the grass were low (<0.1% in both variants). The recovery rate of both 6:2 diPAP and 8:2 diPAP did not reach 100% (63.9 and 83.2%, respectively). The transformation of immobile diPAPs into persistent mobile PFCAs and their transport into the groundwater shows a pathway for human exposure to hazardous PFCAs through drinking water and irrigation of crops.			С
D483	環境中運命	Wang, Wenfeng; Rhodes, Geoff; Zhang, Wei; Yu, Xiangyang; Teppen, Brian J; Li, Hui	Implication of cation-bridging interaction contribution to sorption of perfluoroalkyl carboxylic acids by soils	2022	Chemosphere. 2022 Mar;290:133224. doi: 10.1016/j.chemosphere.2021.133224. Epub 2021 Dec 9.	Sorption of four perfluoroalkyl carboxylic acids (PFCAs) including perfluoropentanoic acid, perfluoroheptanoic acid, perfluorodecanoic acid, and perfluorododecanoic acid by three soils with cation exchange sites occupied by K(+), Ca(2+), or Fe(3+) was measured using the batch equilibration method. We hypothesize that partitioning in soil organic matters (SOM) is the primarily operative mechanism for PFCA sorption by K(+)-soils, and sorption by Ca(2+)- or Fe(3+)-soils could be enhanced via cation-bridging interaction. The measured sorption isotherms for all four PFCAs by soils were linear within the aqueous concentration between 0 and 60 μ g/L, and the distribution coefficients ranged between 14.8 and 173 L/kg. Long-chain PFCAs manifested greater sorption by the soils with higher SOM content. Compared to sorption by K(+)-soils, sorption of PFCAs by Ca(2+)- and Fe(3+)-soils increased by 19.9-90.2% and 38.5-219%, respectively. The relative contributions of cation-bridging interaction to the overall PFCA sorption were estimated to be 16.6-48.7% for Ca(2+)-soils and 27.8-67.7% for Fe(3+)-soils. These results demonstrate that multivalent exchangeable cations could play an important role, yet previously ignored, in controlling sorption and transport of PFCAs in soils.			C

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 象抽 ① ラ ② ラ
D484	環境中運命	Liu, Yalan; Mendoza-Perilla, Paola; Clavier, Kyle A; Tolaymat, Thabet M; Bowden, John A; Solo-Gabriele, Helena M; Townsend, Timothy G	Municipal solid waste incineration (MSWI) ash co- disposal: Influence on per- and polyfluoroalkyl substances (PFAS) concentration in landfill leachate	2022	Waste Manag. 2022 May 1;144:49-56. doi: 10.1016/j.wasman.2022.03.009. Epub 2022 Mar 17.	Municipal solid waste incineration (MSWI) ash is often managed through co-disposal with unburned wastes in landfills, a practice previously reported to result in enhanced leaching of pollutants (e.g., heavy metals) in landfill leachate. The objective of this study was to evaluate the effect of co-disposed unburned wastes on per- and polyfluoroalkyl substances (PFAS) in MSWI ash landfill leachate. Leachate was collected from four landfills containing MSWI ash, either as a sole waste stream or co-disposed of with sewage sludge and MSW screenings. Samples of ash and unburned materials were collected and assessed separately for leachable PFAS in the laboratory. All samples were analyzed for 26 PFAS. Results showed that greater ash content was associated with lower leachate PFAS concentrations. The pure ash monofill exhibited the lowest PFAS in landfill leachate (290 ng L(-1)) while the landfill contained a large amount of unburned waste had the highest PFAS (11,000 ng L(-1)). For laboratory leaching tests, average Σ (26)PFAS concentration in lab ash leachate (310 ng L(-1)) was 10 and 24 times lower than observed in lab sewage sludge leachate (3,200 ng L(-1)) and lab MSW screenings leachate (7,500 ng L(-1)), respectively. Leachate from the ash-only landfill had Σ (26)PFAS concentration similar to what was measured in the ash itself. On the contrary, Σ (26)PFAS concentration similar to those in PFAS-rich unburned waste itself, regardless of the percentages of landfille duburned wastes. We hypothesize that leachate generated in co-disposal scenarios preferentially flows through PFAS-rich unburned materials and that biotransformation of precursors enhanced by unburned waste degradation further contributes to higher concentrations of terminal PFAS in ash co-disposal sites. Landfill operators should expect PFAS in leachates to be higher when PFAS-rich unburned wastes are disposed of alongside MSWI ash, even if the unburned fraction is small.		В
D485	環境中運 命	Borthakur, Annesh; Wang, Meng; He, Meng; Ascencio, Katia; Blotevogel, Jens; Adamson, David T; Mahendra, Shaily; Mohanty, Sanjay K	Perfluoroalkyl acids on suspended particles: Significant transport pathways in surface runoff, surface waters, and subsurface soils	2021	J Hazard Mater. 2021 Sep 5;417:126159. doi: 10.1016/j.jhazmat.2021.126159. Epub 2021 May 19.	Eroded particles from the source zone could transport a high concentration of perfluoroalkyl acids (PFAAs) to sediments and water bodies. Yet, the contribution of suspended particles has not been systematically reviewed. Analyzing reported studies, we quantitatively demonstrate that suspended particles in surface water can contain significantly higher concentrations of PFAAs than the sediment below, indicating the source of suspended particles are not the sediment but particles eroded and carried from the source zone upstream. The affinity of PFAAs to particles depends on the particle composition, including organic carbon fraction and iron or aluminum oxide content. In soils, most PFAAs are retained within the top 5 m below the ground surface. The distribution of PFAAs in the subsurface varies based on site properties and local weather conditions. The depth corresponding to the maximum concentration of PFAA in soil decreases with an increase in soil organic carbon or rainfall amount received in the catchment areas. We attribute a greater accumulation of PFAAs near the upper layer of the subsurface to an increase in the accumulation of particles eroded from source zone, thereby making the aerobic subsurface zone serve as a long-term source of groundwater pollution. Collectively, these results suggest that suspended particles, often an overlooked vector for PFAAs, can be a dominant pathway for the transport of PFAAs in environments.		C
D486	環境中運命	Mei, Weiping; Sun, Hao; Song, Mengke; Jiang, Longfei; Li, Yongtao; Lu, Weisheng; Ying, Guang-Guo; Luo, Chunling; Zhang, Gan	Per- and polyfluoroalkyl substances (PFASs) in the soil-plant system: Sorption, root uptake, and translocation	2021	Environ Int. 2021 Nov;156:106642. doi: 10.1016/j.envint.2021.106642. Epub 2021 May 15.	Per- and polyfluoroalkyl substances (PFASs) are ubiquitous in the environment but pose potential risks to ecosystems and human health. The soil-plant system plays an important role in the bioaccumulation of PFASs. Because most PFASs in the natural environment are anionic and amphiphilic (both lipophilic and hydrophilic), their sorption and accumulation behaviors differ from those of neutral organic and common ionic compounds. In this review, we discuss processes affecting the availability of PFASs in soil after analyzing the potential mechanisms underlying the sorption and uptake of PFASs in the soil-plant system. We also summarize the current knowledge on root uptake and translocation of PFASs in plants. We found that the root concentration factor of PFASs for plants grown in soil was not significantly correlated with hydrophobicity, whereas the translocation factor was significantly and negatively correlated with PFAS hydrophobicity regardless of whether plants were grown hydroponically or in soil. Further research on the cationic, neutral, and zwitterionic forms of diverse PFASs is urgently needed to comprehensively understand the environmental fates of PFASs in the soil-plant system. Additional research directions are suggested, including the development of more accurate models and techniques to evaluate the bioavailability of PFASs, the effects of root exudates and rhizosphere microbiota on the bioavailability and plant uptake of PFASs, and the roles of different plant organelles, lipids, and proteins in the accumulation of PFASs by plants.		C

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 タ献 の献 の献 象抽 ① ラ ② ラ
D487	環境中運命	Joudan, Shira; Orlando, John J; Tyndall, Geoffrey S; Furlani, Teles C; Young, Cora J; Mabury, Scott A	Atmospheric Fate of a New Polyfluoroalkyl Building Block, C(3)F(7)OCHFCF(2)SCH(2)CH(2)OH	2022	Environ Sci Technol. 2022 May 17;56(10):6027-6035. doi: 10.1021/acs.est.0c07584. Epub 2021 Apr 22.	Many per- and polyfluoroalkyl substances (PFAS) have been regulated or phased-out of usage due to concerns about persistence, bioaccumulation potential, and toxicity. We investigated the atmospheric fate of a new polyfluorinated alcohol 2-(1,1,2-trifluoro-2-heptafluoropropyloxy-ethylsulfanyl)-ethanol (C(3)F(7)OCHFCF(2)SCH(2)CH(2)OH, abbreviated FESOH) by assessing the kinetics and products of the gas-phase reaction of FESOH with chlorine atoms and hydroxyl radicals. Experiments performed in a stainless-steel chamber interfaced to an FTIR were used to determine reaction kinetics and gas-phase products. We report reaction rate constants of k(Cl + FESOH) = (1.5 \pm 0.6) \times 10(-11) cm(3) molecule(-1) s(-1) and k(OH + FESOH) = (4.2 \pm 2.0) \times 10(-12) cm(3) molecule(-1) s(-1). This leads to a calculated FESOH gas-phase lifetime of 2.8 \pm 1.3 days with respect to reaction with OH, assuming [OH] = 10(6) molecule(1) cm(-3). Gas-phase products of FESOH oxidation included at least two aldehydes, likely C(3)F(7)OCHFCF(2)SCH(2)C(0)H and C(3)F(7)OCHFCF(2)SC(0)H, and secondary products including COF(2), SO(2) and C(3)F(7)OC(O)F. Additional gas-phase experiments performed in a Teflon chamber were used to assess aqueous products by collecting gaseous samples offline into an aqueous sink prior to analysis with ultrahigh performance liquid chromatography-tandem mass spectrometry, resulting in four acidic products: C(3)F(7)OCHFCF(2)SCH(2)C(0)OH, C(3)F(7)OCHFCF(2)S(0)(0)OH, C(3)F(7)OCHFCF(2)S(0)(O)OH).		С
D488	環境中運命	Saifur, Sumaiya; Gardner, Courtney M	Loading, transport, and treatment of emerging chemical and biological contaminants of concern in stormwater	2021	Water Sci Technol. 2021 Jun;83(12):2863-2885. doi: 10.2166/wst.2021.187.	Stormwater is a largely uncontrolled source of pollution in rural and urban environments across the United States. Concern regarding the growing diversity and abundance of pollutants in stormwater, as well as their impacts on water quality, has grown significantly over the past several decades. In addition to conventional contaminants like nutrients and heavy metals, stormwater is a well-documented source of many contaminants of emerging concern, which can be toxic to both aquatic and terrestrial organisms and remain a barrier to maintaining high quality water resources. Chemical pollutants like pharmaceuticals and personal care products, industrial pollutants such as per- and polyfluoroalkyl substances, and tire wear particles in stormwater are of great concern due to their toxic, genotoxic, mutagenic and carcinogenic properties. Emerging microbial contaminants such as pathogens and antibiotic resistance genes also represent significant threats to environmental water quality and human health. Knowledge regarding the transport, behavior, and the remediation capacity of these pollutants in runoff is key for addressing these pollutants in situ and minimizing ecosystem perturbations. To this end, this review paper will analyze current understanding of these contaminants in stormwater runoff in terms of their transport, behavior, and bioremediation potential.		C
D489	環境中運命	Nickerson, Anastasia; Maizel, Andrew C; Olivares, Christopher I; Schaefer, Charles E; Higgins, Christopher P	Simulating Impacts of Biosparging on Release and Transformation of Poly- and Perfluorinated Alkyl Substances from Aqueous Film-Forming Foam- Impacted Soil	2021	Environ Sci Technol. 2021 Dec 7;55(23):15744-15753. doi: 10.1021/acs.est.1c03448. Epub 2021 Nov 8.	Poly- and perfluorinated alkyl substances (PFASs) frequently co-occur with fuel-derived contaminants because of the use of aqueous film-forming foam (AFFF). Biosparging is a common remediation technology that injects oxygen into the saturated zone to encourage aerobic biodegradation, thereby altering aquifer redox conditions and potentially facilitating the biotransformation of polyfluorinated substances. Between 136 and 280 pore volumes of nitrogen-sparged or oxygen-sparged artificial groundwater amended with toluene were pumped through four saturated, AFFF-impacted soil columns to assess impacts on PFAS release and transformation. Column effluents and soils were analyzed for PFASs by high-resolution mass spectrometry. Significantly higher concentrations of five PFASs eluted from O(2)-sparged columns compared to N(2)-sparged columns shortly after sparging was initiated. The mass fractions eluted of many zwitterionic, sulfonamide-based PFASs were higher in both sets of columns than unaltered, non-biostimulated columns. Mass balance calculations suggested the transformation of sulfonamide-based precursors to perfluorinated sulfonamides (i.e., perfluorohexanesulfonamide) in oxygen- and nitrogen-sparged columns: recoveries of perfluorinated sulfonamides were 158-235% for C3-C6 homologs but recoveries of several prominent sulfonamide-based zwitterions were low. For example, the recovery of n-carboxyethyldimethyl-ammoniopropyl perfluorohexanesulfonamide was 9-13%. These results suggest biosparging can enhance the transformation and release of PFASs in saturated soils, which has important implications for site characterization and remediation.		C

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D490	環境中運命	Bolan, Nanthi; Sarkar, Binoy; Vithanage, Meththika; Singh, Gurwinder; Tsang, Daniel C W; Mukhopadhyay, Raj; Ramadass, Kavitha; Vinu, Ajayan; Sun, Yuqing; Ramanayaka, Sammani; Hoang, Son A; Yan, Yubo; Li, Yang; Rinklebe, J örg; Li, Hui; Kirkham, M B	Distribution, behaviour, bioavailability and remediation of poly- and per-fluoroalkyl substances (PFAS) in solid biowastes and biowaste-treated soil	2021 Environ Int. 2021 Oct;155:106600. doi: 10.1016/j.envint.2021.106600. Epub 2021 May 5.	Aqueous film-forming foam, used in firefighting, and biowastes, including biosolids, animal and poultry manures, and composts, provide a major source of poly- and perfluoroalkyl substances (PFAS) input to soil. Large amounts of biowastes are added to soil as a source of nutrients and carbon. They also are added as soil amendments to improve soil health and crop productivity. Plant uptake of PFAS through soil application of biowastes is a pathway for animal and human exposure to PFAS. The complexity of PFAS mixtures, and their chemical and thermal stability, make remediation of PFAS in both solid and aqueous matrices challenging. Remediation of PFAS in biowastes, as well as soils treated with these biowastes, can be achieved through preventing and decreasing the concentration of PFAS in biowaste sources (i.e., prevention through source control), mobilization of PFAS in contaminated soil and subsequent removal through leaching (i.e., soil washing) and plant uptake (i.e., phytoremediation), sorption of PFAS, thereby decreasing their mobility and bioavailability (i.e., immobilization), and complete removal through thermal and chemical oxidation (i.e., destruction). In this review, the distribution, bioavailability, and remediation of PFAS in soil receiving solid biowastes, which include biosolids, composts, and manure, are presented.			С
D491	環境中運命	Evich, Marina G; Davis, Mary J B; McCord, James P; Acrey, Brad; Awkerman, Jill A; Knappe, Detlef R U; Lindstrom, Andrew B; Speth, Thomas F; Tebes-Stevens, Caroline; Strynar, Mark J; Wang, Zhanyun; Weber, Eric J; Henderson, W Matthew; Washington, John W	Per- and polyfluoroalkyl substances in the environment	2022 Science. 2022 Feb 4;375(6580):eabg9065. doi: 10.1126/science.abg9065. Epub 2022 Feb 4.	Over the past several years, the term PFAS (per- and polyfluoroalkyl substances) has grown to be emblematic of environmental contamination, garnering public, scientific, and regulatory concern. PFAS are synthesized by two processes, direct fluorination (e.g., electrochemical fluorination) and oligomerization (e.g., fluorotelomerization). More than a megatonne of PFAS is produced yearly, and thousands of PFAS wind up in end-use products. Atmospheric and aqueous fugitive releases during manufacturing, use, and disposal have resulted in the global distribution of these compounds. Volatile PFAS facilitate long-range transport, commonly followed by complex transformation schemes to recalcitrant terminal PFAS, which do not degrade under environmental conditions and thus migrate through the environment and accumulate in biota through multiple pathways. Efforts to remediate PFAS-contaminated matrices still are in their infancy, with much current research targeting drinking water.			с
D492	環境中運命	Silva, Jeff A K; Martin, William A; McCray, John E	Air-water interfacial adsorption coefficients for PFAS when present as a multi-component mixture	J Contam Hydrol. 2021 Jan;236:103731. doi: 10.1016/j.jconhyd.2020.103731. Epub 2020 Oct 16.	Surface tension isotherms and calculated air-water interfacial (AWI) adsorption data are presented for solution mixtures of per- and polyfluoroalkyl substances (PFAS), specifically a series of binary and one ternary mixtures of homologous linear perfluorocarboxylic acids (PFCAs) in a simulated groundwater, and two 8-component mixtures containing both PFCAs and linear perfluoroalkane sulfonates (PFSAs). In all cases, non-ideal competitive adsorption was observed that favored the most surface- active component(s) of the solution mixture. The multi-component extended Langmuir (EL) isotherm model was observed to accurately predict the competitive adsorption observed in the binary and ternary PFCA solution mixtures. However, the predictive utility of the EL model was observed to diminish when mixtures contained both PFCAs and PFSAs, which differ in their hydrophile structure, resulting in overpredictions and underpredictions of the AWI adsorption isotherms derived from measured data depending on the specific components present in the solution mixtures. Observations indicate that the individual component adsorptive affinities for the AWI can change in response to competitive preferential adsorption as their solution concentrations increase that is not being captured by the EL model. Our results demonstrate that alternative mathematical models are needed that support concentration dependent affinity coefficients for non-similar mixtures of PFAS, such that the transport of individual target PFAS components within a larger mixture of components can be accurately predicted across a wider range of solution concentration.			с

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D493	環境中運命	Anderson, Richard H; Feild, James B; Dieffenbach- Carle, Heidi; Elsharnouby, Omneya; Krebs, Rita K	Assessment of PFAS in collocated soil and porewater samples at an AFFF-impacted source zone: Field- scale validation of suction lysimeters	2022	Chemosphere. 2022 Dec;308(Pt 1):136247. doi: 10.1016/j.chemosphere.2022.136247. Epub 2022 Aug 29.	Per- and polyfluoroalkyl substances (PFAS) measurable in soil porewater authoritatively represent the mobile mass fraction critical to accurate assessment of leaching from source zones. This study evaluated PFAS occurrence in lysimeter-collected porewater samples for two depth intervals at a decades-old aqueous film-forming foam (AFFF)-impacted field site quarterly for a year. Notably, site-wide Log(10) (Σ PFAS) concentrations did not significantly differ among sampling events despite highly variable sample yields due to a heterogeneous and dynamic soil moisture regime. However, Log(10) (Σ PFAS) concentrations were significantly higher in the shallow interval concordant with higher mean soil concentrations and higher total organic carbon (TOC) reflecting net retention, which is supported by soil-to-groundwater annual mass discharge estimates less than 0.2% of the total source mass for any given PFAS. Interestingly, PFAS-specific Log(10) (soil-to-porewater ratios) significantly increased with soil concentration in both depth intervals contrary to concentration dependence resulting from the saturation of sorption sites potentially implicating self-assembly as an additional operative retention mechanism. Overall, these data validate the use of suction lysimeters for short-term site characterization deployments and emphasize the importance of in situ porewater samples for interrogating PFAS transport within source zones.			С
D494	環境中運命	Che, Shun; Jin, Bosen; Liu, Zekun; Yu, Yaochun; Liu, Jinyong; Men, Yujie	Structure-Specific Aerobic Defluorination of Short- Chain Fluorinated Carboxylic Acids by Activated Sludge Communities	2021	Environ Sci Technol Lett. 2021 Aug 10;8(8):668-674. doi: 10.1021/acs.estlett.1c00511. Epub 2021 Jul 26.	Per- and polyfluoroalkyl substances (PFAS) are a large group of manmade chemicals that impose emerging environmental concerns. Among them, short-chain per- and polyfluorinated carboxylic acids represent an important subgroup used as building blocks of biologically active chemicals and functional materials. Some are also considered PFAS alternatives, and some could be byproducts of the physicochemical treatment of PFAS. However, little is known about the environmental fate of short-chain fluorinated carboxylic acids (FCAs) and their defluorination/transformation by microorganisms. To fill the knowledge gap, we investigated the structure-reactivity relationships in the aerobic defluorination of C(3)-C(5) FCAs by activated sludge communities. Four structures exhibited greater than 20% defluorination, with 3,3,3-trifluoropropionic acid being almost completely defluorinated. We further analyzed the defluorination/transformation pathways and inferred the structures susceptible to aerobic microbial defluorination. We also demonstrated that the defluorination was via cometabolism. The findings advance the fundamental understanding of aerobic microbial defluorination and help assess the environmental fate of PFAS. Since some short-chain PFAS, such as 3,3,3-trifluoropropionic acid, are the incomplete defluorination byproducts of advanced reduction processes, their defluorination by activated sludge communities sheds light on the development of cost-effective chemical-biological PFAS treatment train systems.			C
D495	環境中運命	Rovero, Matt; Cutt, Diana; Griffiths, Rachel; Filipowicz, Urszula; Mishkin, Katherine; White, Brad; Goodrow, Sandra; Wilkin, Richard T	Limitations of Current Approaches for Predicting Groundwater Vulnerability from PFAS Contamination in the Vadose Zone	2021	Ground Water Monit Remediat. 2021 Sep 30;41(4):62-75. doi: 10.1111/gwmr.12485.	was reviewed. K(d) values spanned three to five log units indicating that no single value would be appropriate for use in estimating PFAS impacts to groundwater using existing soil-water partition equations. Regression analysis was used to determine if the soil or solution parameters might be used to predict K(d) values. None of the 15 experimental parameters collected could individually explain variability in reported K(d) values. Significant associations between K(d) and soil calcium and sodium content were found for many of the selected PFAS, suggesting that soil cation content may be critical to PFAS sorption, as previously noted in sources like Higgins and Luthy (2006), while organic carbon content was significant only at elevated levels (>5%). Unexplained discrepancies between the results from studies where PFAS were introduced to soil and desorbed in the laboratory and those that used material from PFAS-impacted sites suggest that laboratory experiments may be overlooking some aspects critical to PFAS sorption. Future studies would benefit from the development and use of standardized analytical methods to improve data quality and the establishment of soil parameters appropriate for collection to produce more complete data sets for predictive analysis.		С	С
D496	環境中運命	Le, Song-Thao; Gao, Yi; Kibbey, Tohren C G; Glamore, William C; O'Carroll, Denis M	Predicting the impact of salt mixtures on the air-water interfacial behavior of PFAS	2022	Sci Total Environ. 2022 May 1;819:151987. doi: 10.1016/j.scitotenv.2021.151987. Epub 2021 Nov 26.	Salts are known to have strong impacts on environmental behavior of per- and polyfluoroalkyl substances (PFAS) including air- water interfacial adsorption. Multivalent salts impact interfacial adsorption to a greater extent than monovalent salts. Models to make a priori predictions of PFAS interfacial adsorption in the presence of multiple salts with different ionic charges are needed given the need to predict PFAS environmental fate. This study further develops a mass-action model to predict the interfacial behavior of PFAS as a function of both salt valency and concentration. The model is validated using surface tension data for a series of monovalent and divalent salt mixtures over a wide range of ionic strengths (i.e., from no added salt to 0.5 M) as well as comparison to data from literature. This model highlights the disproportionate impact of multivalent salts on interfacial adsorption and the practical utility of the model for predicting interfacial adsorption in the presence of multiple monovalent and multivalent inorganic salts. Results suggest that failure to account for divalent salt, even when concentrations are much smaller than monovalent salt, under most environmentally relevant aqueous phase conditions will result in significant underpredictions of PFAS interfacial adsorption. Simple examples of PFAS distribution in a range of salt conditions in the vadose zone and in aerated-water treatment reactors highlight the predictive utility of the model.			С

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No.	分野 (参考)	著者	タイトル	発行年 書誌情報	要旨(原文)	備考	出 情 対 報 抽	ン文 ン文 ク献 ① ラ ② ラ
D497	環境中運命	Kibbey, Tohren C G; Jabrzemski, Rafal; O'Carroll, Denis M	Predicting the relationship between PFAS component signatures in water and non-water phases through mathematical transformation: Application to machine learning classification	2021 Chemosphere. 2021 Nov;282:131097. doi: 10.1016/j.chemosphere.2021.131097. Epub 2021 Jun 5.	Per- and polyfluoroalkyl substances (PFAS) are widespread in the environment, as a result of decades of use across a range of applications. While PFAS contamination often enters the environment in the aqueous phase, PFAS is regularly detected in a range of different phases, including soils, sediments and biota. Although PFAS at a given site may originate from the same sources, the compositions observed in different phases are nearly always different, a fact that can complicate source allocation efforts. This paper presents a quantitative method for prediction of the relative composition of PFAS in different phases for components for which differences in behavior are primarily driven by hydrophobicity. The derived equations suggest that under these conditions, the relative compositions in different phases in contact with water should be independent of overall affinity for the phase, and as such should be the same for all non-water phases. The result is illustrated with data from individual samples, as well as from site-wide evaluations for a range of different phases. The results of the work provide a useful tool to reconcile PFAS composition differences in distribution between phases. Furthermore, the results may be useful in forensic applications for classification of PFAS across different phases. The use of the resulting equations to transform water data to train a supervised learning algorithm for forensic analysis of PFAS in non-water phases is illustrated.			с
D498	環境中運命	Gnesda, William R; Draxler, Elliot F; Tinjum, James; Zahasky, Christopher	Adsorption of PFAAs in the Vadose Zone and Implications for Long-Term Groundwater Contamination	2022 Environ Sci Technol. 2022 Nov 17. doi: 10.1021/acs.est.2c03962. Online ahead of print.	Perfluoroalkyl acids (PFAAs) are persistent environmental contaminants that sorb to air-water and solid interfaces throughout the vadose zone. These sorption processes lead to decadal leaching of PFAS from the source zones to groundwater systems. While these processes are increasingly well understood, critical gaps exist in describing the vertically variable adsorption in the presence of vadose zone heterogeneity and methods for efficiently upscaling the laboratory observations to predict field-scale PFAA transport and retardation. In this work, we build upon fundamental theories and scalable relationships to define a semi-analytical framework for synthesizing and upscaling PFAA adsorption in heterogeneous vadose zone systems. Solid-phase and air-water interfacial adsorption are quantified mechanistically for several PFAAs and then applied to a contaminated site in Northern Wisconsin. The results highlight the dominance of air-water and organic carbon solid-phase adsorption processes in the vadose zone. Strong sorption heterogeneity—driven by depth-dependent adsorption mechanisms—produces complex spatially variable retardation profiles. We develop vadose zone retardation potentials to quantify this field-scale heterogeneity and propose vertical integration methods to upscale spatially resolved information for transport modeling. This work highlights the importance of accounting for multiscale and multiprocess heterogeneity for accurately describing and predicting the long-term fate and transport of PFAAs in the subsurface.			с
D499	環境中運命	Le, Song-Thao; Gao, Yi; Kibbey, Tohren C G; Glamore, William C; O'Carroll, Denis M	A new framework for modeling the effect of salt on interfacial adsorption of PFAS in environmental systems	2021 Sci Total Environ. 2021 Nov 20;796:148893. doi: 10.1016/j.scitotenv.2021.148893. Epub 2021 Jul 6.	Per- and polyfluoroalkyl substances (PFAS) are surface active contaminants of great environmental concern, due to their widespread historical use and their environmental persistence. Salts are known to have a profound influence on the interfacial behaviors of all ionic surfactants, including some of the most commonly detected PFAS. This work describes a new mass-action model for predicting the interfacial behavior of surfactants as a function of salt concentration. The three-parameter model is fit to interfacial tension data over a range of salt concentrations, and is then able to predict interfacial adsorption isotherms for the entire range from no added salt, up to 0.5 M added salt. The phenomenological nature of the model means that it is likely to provide more robust predictions for new systems and conditions than some of the existing empirical approaches, and the minimal number of adjustable parameters ensures that unique calibrations are possible with limited data. The model is found to be consistent with experimental data, and is bracketed by experimental values at low PFAS concentrations. Of particular interest, the model predicts the existence of sigmoidal adsorption isotherms at low salt concentrations, a deviation from isotherms calculated the commonly-used Szyszkowski equation; the observation is supported by a maximum in measured interfacial adsorption coefficient calculated from low-concentration surface tension measurements. Because adsorption affinities can vary by orders of magnitude with changing salt concentration, the ability to predict the effects of salt on adsorption is of critical importance for quantitative prediction of PFAS behavior in the environment.			с
D500	環境中運	Shimoaka, Takafumi; Fukumi, Aki; Shioya, Nobutaka; Hasegawa, Takeshi	Perfluoroalkanes remain on water surface even after volatilization: Affinity analysis of fluorinated solvent with water surface	2022 J Colloid Interface Sci. 2022 Apr;611:390-396. doi: 10.1016/j.jcis.2021.12.059. Epub 2021 Dec 14.	Perfluoroalkyl (R(f)) compounds are known to have a poor solubility for most solvents except fluorinated solvents, which is known as a fluorous property. In Langmuir (L) film studies of R(f) compounds, fluorinated solvents such as perfluoro-n-alkanes are generally used as a good solvent for depositing a sample monolayer on the water surface. On the other hand, a single R(f) chain with a short length such as C(6)F(13)- is known to exhibit a totally different character from a condensed matter to have a strong affinity to a water molecule on the water surface via the dipole-dipole interaction, which is known as the dipole interactive (DI) property. On considering the DI property, the solvents of perfluoro-n-alkanes would remain on water for a long time, which may disturb the formation of L film on water. In the present study, details of a liquid layer of perfluoro-n-alkanes are highly volatile, the relevant vibration bands did not disappear even after two hours, which means that they remain on the water surface. Fortunately, however, the remained solvent, C(6)F(14), has been found no disturbing factor for preparation of L films.			С

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No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D501	環境中運命	Ebrahimi, Farshad; Lewis, Asa J; Sales, Christopher M; Suri, Rominder; McKenzie, Erica R	Linking PFAS partitioning behavior in sewage solids to the solid characteristics, solution chemistry, and treatment processes	2021	Chemosphere. 2021 May;271:129530. doi: 10.1016/j.chemosphere.2020.129530. Epub 2021 Jan 2.	Per- and polyfluoroalkyl substances (PFAS) have gained increasing attention due to the potential health risks that they present. Secondary sludge and biosolids are known as notable PFAS emission routes to the environment. In this study, partitioning behavior of 14 PFAS were investigated across four secondary wastewater treatment types (activated sludge, trickling filter, biological nutrient removal, and rotating biological contactor; n = 10) and three sludge stabilization methods (composting, aerobic digestion, and anaerobic digestion; n = 6). Batch experiments were conducted to evaluate how PFAS sorption to secondary sludge and biosolid was affected by various treatment methods, solid properties, and solution chemistry parameters. Insignificant differences in compound-specific partitioning coefficients (K(d)) were observed among the four secondary treatment methods. However, sludge stabilization resulted in significantly different partitioning behavior among biosolid samples, in which anaerobically digested biosolids generally had significantly higher K(d) values compared to aerobically digested and composted biosolids (anaerobic digestion > aerobic digestion > composting). Multiple linear regression models were developed to explain analyte-specific K(d) values across the biosolid samples and identified that solid-specific property significance was as follows: protein fraction > organic matter fraction > lipid fraction. Stabilization generally decreased the PFAS sorption capacity relative to the secondary sludge samples. Furthermore, PFAS K(d) increased with elevated calcium concentrations and ionic strengths and decreased with increasing pH values in sludge and biosolid samples. These findings could inform the decision-making process to reduce the release of PFAS to the environment.		С
D502	環境中運命	Casas, Gemma; Martinez-Varela, Alícia; Vila- Costa, Maria; Jim énez, Begoña; Dachs, Jordi	Rain Amplification of Persistent Organic Pollutants	2021	Environ Sci Technol. 2021 Oct 5;55(19):12961-12972. doi: 10.1021/acs.est.1c03295. Epub 2021 Sep 23.	Scavenging of gas- and aerosol-phase organic pollutants by rain is an efficient wet deposition mechanism of organic pollutants. However, whereas snow has been identified as a key amplification mechanism of fugacities in cold environments, rain has received less attention in terms of amplification of organic pollutants. In this work, we provide new measurements of concentrations of perfluoroalkyl substances (PFAS), organophosphate esters (OPEs), and polycyclic aromatic hydrocarbons (PAHs) in rain from Antarctica, showing high scavenging ratios. Furthermore, a meta-analysis of previously published concentrations in air and rain was performed, with 46 works covering different climatic regions and a wide range of chemical classes, including PFAS, OPEs, PAHs, polychlorinated biphenyls and organochlorine compounds, polybromodiphenyl ethers, and dioxins. The rain-aerosol (K(RP)) and rain-gas (K(RG)) partition constants averaged 10(5.5) and 10(4.1), respectively, but showed large variability. The high field-derived values of K(RG) are consistent with adsorption onto the raindrops as a scavenging mechanism, in addition to gas-water absorption. The amplification of fugacities by rain deposition was up to 3 orders of magnitude for all chemical classes and was comparable to that due to snow. The amplification of concentrations and fugacities by rain underscores its relevance, explaining the occurrence of organic pollutants in environments across different climatic regions.		В
D503	環境中運命	Wallis, Ilka; Hutson, John; Davis, Greg; Kookana, Rai; Rayner, John; Prommer, Henning	Model-based identification of vadose zone controls on PFAS mobility under semi-arid climate conditions	2022	Water Res. 2022 Oct 15;225:119096. doi: 10.1016/j.watres.2022.119096. Epub 2022 Sep 10.	Contamination through per-and poly-fluoroalkyl substances (PFAS) have occurred globally in soil and groundwater systems at military, airport and industrial sites due to the often decades-long periodic application of firefighting foams. At PFAS contaminated sites, the unsaturated soil horizon often serves as a long-term source for sustained PFAS contamination for both groundwater and surface water runoff. An understanding of the processes controlling future mass loading rates to the saturated zone from these source zones is imperative to design efficient remediation measures. In the present study, hydrochemical data from a site where PFAS transport was observed as a result of the decades-long application of AFFF were used to develop and evaluate conceptual and numerical models that determine PFAS mobility across the vadose zone under realistic field-scale conditions. The simulation results demonstrate that the climate-driven physical flow processes within the vadose zone exert a dominating control on the retention of PFAS. Prolonged periods of evapotranspiration exceeding rainfall under the semi-arid conditions trigger periods of upward flux and evapoconcentration, leading to the observed persistence of PFAS compounds in the upper ca. 2 metres of the vadose zone, despite cessation of AFFF application to soils since more than a decade. Physico-chemical retention mechanisms, namely sorption to the air-water interface (AWI) and sediment surfaces, contribute further to PFAS retention. The simulations demonstrate how PFAS downward transport is effectively confined to short periods following discrete rain events when soils display a high degree of saturation. During these periods, AWI sorption is at a minimum. In addition, high PFAS concentrations measured and simulated below the source zone reduce the effect of the AWI further due to a decrease in surface tension associated with elevated PFAS concentrations. Consequently, time-integrated PFAS migration and retardation illuminates that the field-relevant PFAS transpor		C

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D504	環境中運命	McDonough, Jeffrey T; Anderson, Richard H; Lang, Johnsie R; Liles, David; Matteson, Kasey; Olechiw, Theresa	Field-Scale Demonstration of PFAS Leachability Following In Situ Soil Stabilization	2021	ACS Omega. 2021 Dec 27;7(1):419-429. doi: 10.1021/acsomega.1c04789. eCollection 2022 Jan 11.	A field-scale validation is summarized comparing the efficacy of commercially available stabilization amendments with the objective of mitigating per- and polyfluoroalkyl substance (PFAS) leaching from aqueous film-forming foam (AFFF)-impacted source zones. The scope of this work included bench-scale testing to evaluate multiple amendments and application concentrations to mitigate PFAS leachability and the execution of field-scale soil mixing in an AFFF-impacted fire-training area with nearly 2.5 years of post-soil mixing monitoring to validate reductions in PFAS leachability. At the bench scale, several amendments were evaluated and the selection of two amendments for field-scale evaluation was informed: FLUORO-SORB Adsorbent (FS) and RemBind (RB). Five ~28 m(3) test pits (approximately 3 m wide by 3 m long by 3 m deep) were mixed at a site using conventional construction equipment. One control test pit (Test Pit 1) included Portland cement (PC) only (5% dry weight basis). The other four test pits (Test Pits 2 through 5) compared 5 and 10% ratios (dry weight basis) of FS and RB (also with PC). Five separate monitoring events included two to three sample cores collected from each test pit for United States Environmental Protection Agency (USEPA) Method 1315 leaching assessment. After 1 year, a mass balance for each test pit was attempted comparing the total PFAS soil mass before, during, and after leach testing. Bench-scale and field-scale data were in good agreement and demonstrated >99% decrease in total PFAS leachability (mass basis; >98% mole basis) as confirmed by the total oxidizable precursor assay, strongly supporting the chemical stabilization of PFAS.		С	
D505	環境中運	Le, Song-Thao; Gao, Yi; Kibbey, Tohren C G; O'Carroll, Denis M	Calculating PFAS interfacial adsorption as a function of salt concentration using model parameters determined from chemical structure	2022	Sci Total Environ. 2022 Nov 20;848:157663. doi: 10.1016/j.scitotenv.2022.157663. Epub 2022 Jul 27.	Per- and polyfluoroalkyl substances (PFAS) are widely-detected environmental contaminants known to concentrate at surfaces and interfaces. Many of the most commonly-detected PFAS function as ionic surfactants under environmental conditions. The interfacial behaviors of ionic surfactants, including PFAS, are strongly dependent on salt concentration and composition, with interfacial affinity potentially varying by orders of magnitude for the same compound under different conditions. The work described here presents a tool for predicting the salt-dependent adsorption of PFAS compounds based entirely on chemical structure, something of great value for predicting the real-world environmental behavior of many of the large numbers of PFAS compounds for which experimental data are not available. The approach combines two different previously-developed models, one a mass-action model designed to predict the effects of salts on interfacial adsorption of ionic PFAS (the UNSW-OU salt model), and the second a group-contribution model designed to predict interfacial adsorption of PFAS in the absence of salt based on chemical structure. The challenge of combining the two models comes from the fact that both are based on different isotherms. The salt model can produce sigmoidal isotherms under salt-limited conditions (an isotherm shape that is supported by experimental evidence), while the group-contribution model can generate Langmuir parameters from calculations based on chemical structure. Equations were derived to determine salt model isotherm parameters from Langmuir parameters (either from the group-contribution model or experimental sources) by matching surface tension curves in the vicinity of the concentration of highest second derivative. Refined group-contribution model parameters were determined based on data from an additional 40 surface tension curves to allow improved structure-based predictions for important classes of PFAS that were not sufficiently well-represented in the original model. The resulting equatio			С
D506	環境中運命	Zahra Ghahremani, Pierrette Iradukunda, Arvin Farid	Post-wildfire soil and aquifer contamination: A review	2021	Japanese Geotechnical Society Special Publication, 9 巻 5 号 175-179, doi: 10.3208/jgssp.v09.cpeg004	The need to understand the effects of wildfires and post-fire contamination of soil and groundwater has grown as a result of the expansion of the extent and severity of wildfires around the world. In addition to their direct hazards, wildfires can also contribute to human and environmental health concerns due to secondary contamination, e.g., wildfire suppression such as aqueous film-forming foams (AFFF) can release per- and polyfluoroalkyl substances (PFAS) into the soil, which are very mobile, toxic, and persistent. Both direct seepage through the topsoil and biotransformation of fluorotelomers (FTs) determine the fate of PFAS in soils and aquifers. Research has indicated that phase partitioning behavior, such as sorption to soils and sediments, controls the fate and transport of chemicals in the environment According to various studies, the main soil or sediment characteristics that control PFAS' sorption behavior include organic carbon (OC), pH, index cations, and ionic strength. However, neither OC, pH, nor clay-content alone could explain the sorption behavior of PFAS. More research is needed to help to understand the role of co-contaminants on the sorption behavior of PFAS, the role of surface charge on the sorption of PFAS and identify the areas of research need.			В
D507	環境中運命	小高 良介, 益永 茂樹	東京湾におけるフッ素系界面活性剤の環境挙動	2006	水環境学会誌, 29 巻 4 号 221-228, doi: 10.2965/jswe.29.221	The perfluorinated surfactants, perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA) have been reported to be present in the environment. Their behaviors in the environmental, however, are still unknown. In this study, we measured their concentrations in seawater and sediment from Tokyo Bay and in the waters of six major rivers that run into the bay. Then, their mass balances and behaviors in the bay were estimated. PFOS and PFOA existed mainly in the dissolved phase in water. The estimated annual input of PFOS from the rivers was 74 ~ 346 kg · year-1, which was similar to the total amount of PFOS outflow to the ocean (20 ~ 350 kg · year-1) and the amount of PFOS sedimentation to the bottom of the bay (1.3 kg · year-1). On the other hand, the estimated annual input of PFOA from the rivers was 29 ~ 148 kg · year-1, which was much smaller than the total amount of PFOA outflow to the ocean (140 ~ 1900 kg · year-1). The amount of PFOA sedimentation was estimated to be negligible. These results suggest that the major source of PFOS in the bay is riverine transport. The results also indicate the existence of unknown PFOA sources around the coast of the bay and/or the possibility of a significant PFOA atmospheric deposition to the bay. The sediment was not a significant sink for the two compounds.			В

分野 タイトル 発行年 書誌情報 要旨 (原文) No 著者 (参考) Elimination of persistent organic pollutants (POPs) under national and international regulati "secondary" emissions continue from residues deposited in soil, water, ice and vegetation du Terry F. future, secondary source controlled world, POPs will follow the carbon cycle and biogeocher Bidleman, Liisa transport, accumulation and fate. Climate change is likely to affect mobilisation of POPs thr M. Jantunen. altered precipitation and wind patterns, flooding, loss of ice cover in polar regions, melting g Perihan Binnu microbiology which affect degradation and transformation. Chiral compounds offer advantag 環境中運 Kurt-Karakus, Chiral Chemicals as Tracers of Atmospheric Sources Mass Spectrom (Tokyo). 2013;2(Spec Iss):S0019. doi: D508 2013 pathways because of their ability to distinguish racemic (newly released or protected from m 10.5702/massspectrometry.S0019. Fiona Wong. and Fate Processes in a World of Changing Climate (microbially degraded) sources. This paper discusses the rationale for this approach and sug Hayley Hung, could aid investigation of climate-mediated exchange and degradation processes. Multiyear Jianmin Ma, Gary trans-chlordane and α -HCH, at a Canadian Arctic air monitoring station show enantiomer c Stern, Bruno suggesting varying source contributions which may be under climatic control. Large-scale sh Rosenberg metabolism of chiral POPs in soil and water might influence the enantiomer composition of advantageous to include enantiospecific analysis in POPs monitoring programs. 乾 秀之, 浜坂 康 環境中運 貴, 矢吹 芳教, 望 第38回農薬環境科学研究会 D509 2022 日本農薬学会誌, 47 巻 1 号 13-16 本文は概要のみ 月 証,片岡 良太 髙木 和広 Anaerobic incubations were performed with biosolids obtained from an industrial wastewate contained perfluorooctanoic acid (PFOA), and with per- and polyfluoroalkyl substances- (PF biosolids that were spiked with PFOA. Biosolid slurries were incubated for 150 days as is, af Huang, Shan; Acidimicrobium sp. Strain A6 or ferrihydrite, or with both, Acidimicrobium sp. Strain A6 and Sima, Matthew; run in parallel. Only the biosolids augmented with both, Acidimicrobium sp. Strain A6 and fel J Hazard Mater. 2022 Feb 15;424(Pt D):127699. doi: Anaerobic degradation of perfluorooctanoic acid Long, Ying; D510 生分解性 PFOA concentration, in excess of 50% (total, dissolved, and solid associated). Higher conce 2022 Messenger, (PFOA) in biosolids by Acidimicrobium sp. strain A6 10.1016/j.jhazmat.2021.127699. Epub 2021 Nov 6. spiked with PFOA and no previous PFAS exposure allowed to track the production of fluoride Courtney; Jaffé, buildup of fluoride over the incubation time was observed in these biosolid incubations spik Peter R the concentration of perfluoroheptanoic acid (PFHpA) over the incubations of the filter cake was observed, indicating the presence of a non-identified precursor in these biosolids. Resu PFAS contaminated biosolids, after augmentation with Fe(III) and Acidimicrobium sp. Strain Acidimicrobiaceae sp. strain A6 (A6), is an anaerobic autotrophic bacterium capable of oxidi reducing ferric iron and is also able to defluorinate PFAS under these growth conditions. A6 Ruiz-Urigüen, microbial electrolysis cells (MECs) by using the anode as the electron acceptor in lieu of fer Melany; Shuai, Chemosphere. 2022 Apr;292:133506. doi: amended with perfluorooctanoic acid (PFOA) were incubated in MECs to investigate its abil Biodegradation of PFOA in microbial electrolysis cells D511 生分解性 Weitao; Huang reactors. Results show a significant decrease in PFOA concentration after 18 days of operati 10.1016/j.chemosphere.2021.133506. Epub 2022 Jan 4. by Acidimicrobiaceae sp. strain A6 Shan: Jaffé. removing NH(4)(+). The buildup of fluoride and shorter chain perfluorinated products was de Peter R potential, active A6, and amended with PFOA, confirming the biodegradation of PFOA in the for further studies on the application of A6-based per- and polyfluorinated alkyl substances electrochemical systems for water treatment. Zwitterionic per- and polyfluoroalkyl substances (PFASs) used in aqueous film-forming foan environmental fates once released at military bases, airports, fire-training areas, and accide for the first time the transformation potential of four electrochemical fluorination (ECF)-base betaines and two tertiary amines) in aerobic soils. The two perfluoroalkyl sulfonamide deriva perfluorooctanesulfonate (PFOS), while the amide derivatives were precursors to perfluoroo Liu. Min: Munoz zwitterions and four other previously reported zwitterions or cations were compared for thei Gabriel; Vo Duy Environ Sci Technol. 2021 Apr 20;55(8):4698-4708. doi: Stability of Nitrogen-Containing Polyfluoroalkyl kinetics. Structural differences, especially the nitrogen head groups, largely influenced the p 生分解性 Sung; Sauvé, Sé D512 Substances in Aerobic Soils 10.1021/acs.est.0c05811. Epub 2021 Mar 19. aerobic soils. The perfluoroalkyl sulfonamide-based compounds showed higher microbial sta bastien; Liu, perfluoroalkyl amide-based ones. Their stability in aerobic soils is ranked based on the mag linxia substance to disappear): quaternary ammonium pprox carboxyl betaine \gg tertiary amine > ami quaternary ammonium or betaine groups showed high stability in soils, with the longest DT(while those with tertiary amine or amine oxide groups showed DT(50) of weeks or months. provide insights into the degradation pathways and persistence in surface soils of other per present in AFFFs.

	備考	出 情 対 報 象 抽	ン 文 ク 献 ① ラ	ン 文 ク 献 ② ラ
ons reduces "primary" emissions, but uring former years of usage. In a nical processes will determine their ough e.g., increased temperature, laciers, and changes in soil and water ges for following transport and fate nicrobial attack) and nonracemic ggests applications where chiral POPs measurements of two chiral POPs, ompositions which cycle seasonally, nifts in the enantioselective atmospheric residues, and it would be			С	
			D	
er treatment plant (WWTP) that (AS) free, laboratory-generated, ter augmenting with either errihydrite. Autoclaved controls were rrihydrite showed a decrease in the ntrations of PFOA in the biosolids e to verify PFOA defluorination. The ed with PFOA. A significant increase in samples from the industrial WWTP Its show that anaerobic incubation of A6 can result in PFAS defluorination.			С	
zing ammonium (NH(4)(+)) while is exoelectrogenic and can grow in ric iron. Therefore, cultures of A6 ity to defluorinate PFAS in such ion, while producing current and etected only in MECs with applied se systems. This work sets the stage (PFAS) bioremediation in microbial			С	
ns (AFFFs) could face diverse ntal release sites. Here, we studied ed PFAS zwitterions (two carboxyl atives were precursors to ctane carboxylate (PFOA). These r transformation pathways and ersistence of these compounds in ability than the corresponding nitude of DT(50) (time for 50% of ne oxide. The PFASs containing 50) likely to be years or decades, These eight ECF-based precursors fluoroalkyl cations and zwitterions			С	

	No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)
D	513	生分解性	Berhanu, Ashenafi; Mutanda, Ishmael; Taolin, Ji; Qaria, Majjid A; Yang, Bin; Zhu, Daochen	A review of microbial degradation of per- and polyfluoroalkyl substances (PFAS): Biotransformation routes and enzymes	2022	Sci Total Environ. 2022 Nov 8;859(Pt 1):160010. doi: 10.1016/j.scitotenv.2022.160010. Online ahead of print.	Since the 1950s, copious amounts of per- and polyfluoroalkyl substances (PFAS) (dubbed "for into the environment, causing heavy contamination of soil, surface water, and groundwater s environment are frequently exposed to PFAS through food, water, consumer products, as we manufacturing industries. PFAS are a large group of synthetic organic fluorinated compounds structures that are extremely resistant to microbial degradation. Their persistence, toxicity to tendencies, and adverse health and ecological effects have earned them a "top priority pollut bodies. Despite that a number of physicochemical methods exist for PFAS treatment, they su high costs, use of high energy and incomplete mineralization (destruction of the CF bond). Co and enzymatic treatment of PFAS are highly sought after as they offer a complete, cheaper, s friendly alternative. In this critical review, we provide an overview of the classification, proper the environment relevant to microbial degradation. We discuss latest developments in the bid transformation routes, transformation products and degradative enzymes. Finally, we highligh and prospects of bioremediation approaches in treating PFAS and proffer possible solutions
D	514	生分解性	Gonzalez, Dana; Thompson, Kyle; Quiñones, Oscar; Dickenson, Eric; Bott, Charles	Assessment of PFAS fate, transport, and treatment inhibition associated with a simulated AFFF release within a WASTEWATER treatment plant	2021	Chemosphere. 2021 Jan;262:127900. doi: 10.1016/j.chemosphere.2020.127900. Epub 2020 Aug 6.	Sequencing batch reactors (SBRs) were operated for 36 days to simulate the potential waster fate and transport of per- and polyfluoroalkyl substances (PFAS) that could be associated with aqueous film forming foam (AR-AFFF) from on-site methanol fire suppression systems. The days of exposure to AFFF were associated with small reductions in mixed liquor solids conter on denitrification or biological phosphorus removal were observed. The addition of AFFF was fluorotelomer sulfonate (6:2 FTS) in influent, effluent, and solids samples in the SBR. The fol proposed: an unidentified fluorotelomer precursor quickly degraded to 6:2 FTS, which then sid degradation intermediates and terminal, short-chain perfluorocarboxylic acid products. Data proxy for AFFF-associated PFAS, were extrapolated to estimate that a removal of approxima solids wasting would occur after 4 days at a full-scale treatment plant. This information can potential impacts on downstream processes, including potable reuse and biosolids productio
D	515	生分解性	Zhang, Zhiming; Sarkar, Dibyendu; Biswas, Jayanta Kumar; Datta, Rupali	Biodegradation of per- and polyfluoroalkyl substances (PFAS): A review	2022	Bioresour Technol. 2022 Jan;344(Pt B):126223. doi: 10.1016/j.biortech.2021.126223. Epub 2021 Oct 28.	Per- and polyfluoroalkyl substances (PFAS) are a group of chemicals widely manufactured for applications in the past decades due to their remarkable stability as well as hydrophobic and have been recognized as emerging environmental contaminants of concern due to their toxic thereby attracting intensive research seeking effective technologies for their removal from th review is to provide a thorough analysis of the biodegradation of PFAS in multiple environme outlook. By discussing targeted PFAS species, degradation intermediates, degradation efficie comprehensive summary of the known microbial species and their degradation pathways are pathways for different types of PFAS species are summarized in two major categories, biode cleavage of C-F bond. Existing uncertainties and future research directions for PFAS biodegr
D	516	生分解性	Wu, Jian-Yi; Gu, Li; Hua, Zu-Lin; Liang, Zhong- Yan; Chu, Ke- Jian; He, Xin-Xin	Per-, poly-fluoroalkyl substances (PFASs) pollution in benthic riverine ecosystem: Integrating microbial community coalescence and biogeochemistry with sediment distribution	2021	Chemosphere. 2021 Oct;281:130977. doi: 10.1016/j.chemosphere.2021.130977. Epub 2021 May 25.	Per-, Poly-fluoroalkyl substances (PFASs) accumulation in benthic environments is mainly depresents a significant challenge to river remediation. However, less attention has been paid distribution on PFASs accumulation, and how PFASs influence microbial community coalesce. In order to identify correlations between PFASs distribution and benthic microbial community study and quantified the ecological constrains of material transportation on benthic microorg (PFHxA) contributed most to the taxonomic heterogeneity of both archaeal (12.199%) and bac Genera Methanoregula (R(2) = 0.292) and Bacillus (R(2) = 0.791) were identified as indicato Phylogenetic null modeling indicated that deterministic processes (50.0-82.2%) dominated in stochasticity (94.4-97.8%) dominated in bacteria. Furthermore, spatial mixing of PFASs influe archaeal genomes, and phosphorus mineralization of bacterial genomes ($p < 0.05$). Overall, we community assembly and highlighted the constrains of PFASs influence on benthic geochem new insights into riverine remediation.

	備考	出 情 対 報 象 抽	ン 文 ク 献 ① ラ	ン 文 ク 献 ② ラ
AS) (dubbed "forever chemicals") have been dumped groundwater sources. Humans, animals, and the roducts, as well as waste streams from PFAS- ted compounds with widely diverse chemical ence, toxicity to life on earth, bioaccumulation p priority pollutant" designation by regulatory atment, they suffer from major drawbacks regarding ne CF bond). Consequently, microbial degradation lete, cheaper, sustainable, and environmentally fication, properties, and interaction of PFAS within nents in the biodegradation of PFAS by microbes, ally, we highlight the existing challenges, limitations, sible solutions and future research directions.			С	
potential wastewater treatment impacts as well as a associated with a release of alcohol resistant systems. The results of this study indicate that two or solids content and nitrification rates. No impacts on of AFFF was associated with increases in 6:2 ne SBR. The following biotransformation pathway is 6, which then slowly degraded to several identified products. Data for 6:2 FTS, which was used as a al of approximately 70% of AFFF via effluent and formation can be used to better understand olids production.			С	
anufactured for industrial and commercial vdrophobic and lipophobic nature. PFAS species e to their toxicity and environmental persistence, emoval from the environment. The objective of this iple environmental matrices and offer a future radation efficiencies, and microbial species, a n pathways are presented. The biodegradation tegories, biodegradation with and without the r PFAS biodegradation are provided.			В	
nts is mainly determined by material mixing and in has been paid to the effects of sediment munity coalescence and biogeochemical processes. bial community functions, we conducted a field enthic microorganisms. Perfluorohexanoic acid 2.199%) and bacterial (13.675%) communities. Fied as indicators that respond to PFASs. b) dominated in spatial assembly of archaea, while of PFASs influenced broadly in nitrogen cycling of 0.05). Overall, we quantified the effect of PFASs on nthic geochemical potentials, which may provide			С	

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン 文 ン 文 ク 献 ク 献 ① ラ ② ラ
D517	生分解性	Yu, Yaochun; Zhang, Kunyang; Li, Zhong; Ren, Changxu; Chen, Jin; Lin, Ying- Hsuan; Liu, Jinyong; Men, Yujie	Microbial Cleavage of C-F Bonds in Two C(6) Per- and Polyfluorinated Compounds via Reductive Defluorination	2020	Environ Sci Technol. 2020 Nov 17;54(22):14393-14402. doi: 10.1021/acs.est.0c04483. Epub 2020 Oct 29.	The C-F bond is one of the strongest single bonds in nature. Although microbial reductive dehalogenation is well known for the other organohalides, no microbial reductive defluorination has been documented for perfluorinated compounds except for a single, nonreproducible study on trifluoroacetate. Here, we report on C-F bond cleavage in two C(6) per- and polyfluorinated compounds via reductive defluorination by an organohalide-respiring microbial community. The reductive defluorination was demonstrated by the release of F(-) and the formation of the corresponding product when lactate was the electron donor, and the fluorinated compound was the sole electron acceptor. The major dechlorinating species in the seed culture, Dehalococcoides, were not responsible for the defluorination as no growth of Dehalococcoides or active expression of Dehalococcoides-reductive defluorination. These findings expand our fundamental knowledge of microbial reductive dehalogenation and warrant further studies on the enrichment, identification, and isolation of responsible microorganisms and enzymes. Given the wide use and emerging concerns of fluorinated organics (e.g., per- and polyfluoroalkyl substances), particularly the perfluorinated ones, the discovery of microbial defluorination under common anaerobic conditions may provide valuable insights into the environmental fate and potential bioremediation strategies of these notorious contaminants.			с
D518	生分解性	Yu, Yaochun; Che, Shun; Ren, Changxu; Jin, Bosen; Tian, Zhenyu; Liu, Jinyong; Men, Yujie	Microbial Defluorination of Unsaturated Per- and Polyfluorinated Carboxylic Acids under Anaerobic and Aerobic Conditions: A Structure Specificity Study	2022	Environ Sci Technol. 2022 Apr 19;56(8):4894-4904. doi: 10.1021/acs.est.1c05509. Epub 2022 Apr 4.	The recently discovered microbial reductive defluorination of two C(6) branched and unsaturated fluorinated carboxylic acids (FCAs) provided valuable insights into the environmental fate of per- and polyfluoroalkyl substances (PFASs) and potential bioremediation strategies. However, a systematic investigation is needed to further demonstrate the role of C ==C double bonds in the biodegradability of unsaturated PFASs. Here, we examined the structure-biodegradability relationships of 13 FCAs, including nine commercially available unsaturated FCAs and four structurally similar saturated ones, in an anaerobic defluorinating enrichment and an activated sludge community. The anaerobic and aerobic transformation/defluorination pathways were elucidated. The results showed that under anaerobic conditions, the α , β -unsaturation is crucial for FCA biotransformation via reductive defluorination and/or hydrogenation pathways. With sp(2) C-F bonds being substituted by C-H bonds, the reductive defluorination capability of specific unsaturated FCA structures with trifluoromethyl (-CF(3)) branches at the α/β -carbon. Such FCA structures can undergo anaerobic abiotic defluorination in the presence of reducing agents and significant aerobic microbial defluorination. Given the diverse applications and emerging concerns of fluorochemicals, this work not only advances the fundamental understanding of the fate of unsaturated PFASs in natural and engineered environments but also may provide insights into the design of readily degradable fluorinated alternatives to existing PFAS compounds.			с
D519	蓄積性	Knight, Emma R; Bräunig, Jennifer; Janik, Leslie J; Navarro, Divina A; Kookana, Rai S; Mueller, Jochen F; McLaughlin, Michael J	An investigation into the long-term binding and uptake of PFOS, PFOA and PFHxS in soil - plant systems	2021	J Hazard Mater. 2021 Feb 15;404(Pt B):124065. doi: 10.1016/j.jhazmat.2020.124065. Epub 2020 Oct 1.	This study investigated the potential aging and plant bioaccumulation of three perfluoroalkyl acids (PFAAs), perfluorosulphonic acid (PFOS), perfluoroctanoic acid (PFOA) and perfluorohexanesulphonic acid (PFHxS) in 20 soils over a six-month period. Sorption coefficients (Log K(d)) ranged from 0.13-1.28 for PFHxS, 0.17-1.06 for PFOA and 0.98-2.03 for PFOS, respectively, and bioaccumulation factors (Log BAFs) ranged from 0.29-1.24, 0.22-1.46 and 0.05-0.65 for PFHxS, PFOA and PFOS, respectively. Over the six-month period, K(d) values significantly increased for PFHxS and PFOA but the magnitude of the increase was very small and did not translate into differences in plant PFAA-concentrations between aged and freshly spiked treatments. The K(d) and BAF values were modelled by multiple linear regression (MLR) to soil physico-chemical properties and by partial least squares regression to soil spectra acquired by mid-infrared spectroscopy (DRIFT-PLSR). Modelling of each PFAA was influenced by different soil properties, including organic carbon, pH, CEC, exchangeable cations (Ca(2+), Mg(2+), Na(+) and K(+)) and oxalate extractable AI. BAF values were not strongly correlated to any soil property but were inversely correlated to K(d) values. Our results indicate that limited aging occurred in these soils over the six-month period.			с
D520	蓄積性	Flynn, R Wesley; Hoskins, Tyler D; lacchetta, Michael; de Perre, Chloe; Lee, Linda S; Hoverman, Jason T; Sepulveda, Maria S	Dietary exposure and accumulation of per- and polyfluoroalkyl substances alters growth and reduces body condition of post-metamorphic salamanders	2021	Sci Total Environ. 2021 Apr 15;765:142730. doi: 10.1016/j.scitotenv.2020.142730. Epub 2020 Oct 6.	Per- and polyfluoroalkyl substances (PFAS) are contaminants of concern due to their persistence, potential to bioaccumulate, and toxicity. While dietary exposure is the primary route of exposure for terrestrial species, data on dietary PFAS uptake and adverse effects are largely restricted to mammals. As such, substantial data gaps exist that hinder ecological risk assessment, including environmentally relevant exposure levels and taxa. Using a 30-d laboratory experiment, we examined the effects of dietary PFAS-exposure on post-metamorphic tiger salamanders (Ambystoma tigrinum). We fed salamanders crickets exposed to perfluorooctanoic acid (PFOA), perfluorooctane sulfonate (PFOS), perfluorohexane sulfonate (PFHxS), or 6:2 fluorotelomer sulfonate (6:2 FTS) at low (<1.0), medium (2-5), or high (16-62) ng PFAS/g/d (wet weight) dose rates. We found that only PFOS resulted in substantial biomagnification. Despite limited evidence for biomagnification, PFAS altered growth and generally reduced body condition. Salamanders with the highest burdens of PFOS grew less and had lower body conditions, while burdens of PFHxS and PFOA were only associated with reduced growth. There was no evidence that environmentally relevant doses of PFAS increase liver size in salamanders. Our results demonstrate that dietary exposure and accumulation of PFAS can impact fitness-related traits in amphibians and contribute to trophic transfer in terrestrial food webs.			В

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン 文 ン 文 ク 献 ク 献 ① ラ ② ラ
D521	蓄積性	Chen, Meng; Zhu, Lingyan; Wang, Qiang; Shan, Guoqiang	Tissue distribution and bioaccumulation of legacy and emerging per-and polyfluoroalkyl substances (PFASs) in edible fishes from Taihu Lake, China	2021	Environ Pollut. 2021 Jan 1;268(Pt A):115887. doi: 10.1016/j.envpol.2020.115887. Epub 2020 Oct 17.	Tissue distribution of legacy and emerging per-and polyfluoroalkyl substances (PFASs) in several kinds of edible fishes collected from Meiliang bay of Taihu Lake, China were investigated and the related human health risks were assessed. Perfluorooctanesulfonate (PFOS), perfluorooctanesulfonamide (PFOSA) and 6:2 fluorotelomer phosphate diester (6:2 diPAP) were the most abundant legacy perfluoroalkyl acid (PFAA), PFOS related precursor (PreFOS), and the emerging PFASs in all fish tissues, respectively. Similar to the legacy PFAAs, 6:2 diPAP and 6:6 perfluorophosphinate (6:6 PFPiA) had the highest levels in the fish liver, whereas the highest level of PFOSA was in kidney, which might be due to its intensive transformation in fish liver. The concentrations of PFASs were generally positively correlated with the trophic levels. The profiles of PFASs were significantly different among bitterling, crucian and other fish, which might be related to their different metabolic capacities. Bioaccumulation factors (BAFs) of PreFOSs, 6:2 diPAP, and 6:6 PFPiA were lower than those of PFAAs with the same number of perfluorinated carbons. The calculated hazard ratios (HR) of PFOS (Range: 0.0100-0.655) and perfluoroctanoic acid (PFOA) (<0.00200) in all fish muscles were less than 1.0. However, the HR of the Σ PFASs in crucian muscle was 1.04, which implied that frequent consumption of crucian collected from Meiliang Bay might pose potential risks to human health.			В
D522	蓄積性	Zhu, Jiawen; Wallis, Ilka; Guan, Huade; Ross, Kirstin; Whiley, Harriet; Fallowfield, Howard	Juncus sarophorus, a native Australian species, tolerates and accumulates PFOS, PFOA and PFHxS in a glasshouse experiment	2022	Sci Total Environ. 2022 Jun 20;826:154184. doi: 10.1016/j.scitotenv.2022.154184. Epub 2022 Feb 26.	Perfluoroalkyl and polyfluoroalkyl substances (PFAS) have been identified as emerging contaminants of public health concern. With PFAS now detected globally in a wide range of environments, there is an urgent need for effective remedial treatment solutions at the field scale. Phytoremediation presents a potential remediation strategy for PFAS that would allow efficient and cost-effective remediation at large scales. This study examined the potential for the Australian native wetland plant Juncus sarophorus to tolerate, take up, and accumulate PFOS, PFOA and PFHxS. A 190-day glasshouse experiment was conducted, in which 0, 10 and 100 μ g/L each of PFOS, PFOA and PFHxS were used to irrigate J. sarophorus in potted soil. The results suggest that J. sarophorus has a high tolerance to PFAS and is effective at accumulating and transferring PFHxS and PFOA from soils to above ground biomass. Together with its high growth rate, J. sarophorus appears to be, in principle, a suitable candidate for phytoextraction of short-chained PFAS compounds. It is, however, less efficient at uptake of PFOS, owing to the long chain-lengths of this compound and PFOSs' ability to sorb effectively to soils. The total accumulated PFAS mass at the end of the experiment was ~2000 μ g/kg biota((wet weight)) and ~170 μ g/kg biota((wet weight)) for soils irrigated with 100 μ g/L and 10 μ g/L for each PFAS compound, translating into overall PFAS removal rates of 11% and 9%.			В
D523	蓄積性	Lasters, Robin; Groffen, Thimo; Bervoets, Lieven; Eens, Marcel	Perfluoroalkyl acid (PFAA) profile and concentrations in two co-occurring tit species: distinct differences indicate non-generalizable results across passerines	2021	Sci Total Environ. 2021 Mar 20;761:143301. doi: 10.1016/j.scitotenv.2020.143301. Epub 2020 Nov 4.	Eggs of terrestrial bird species have often been used to biomonitor both legacy and emerging anthropogenic contaminants, such as perfluoroalkyl acids (PFAAs). However, few, if any, studies have examined whether results obtained in a given model species can be generalized across bird species. Therefore, we compared potential differences in egg PFAA profile and concentrations between two widely studied passerine species, great tit (Parus major) and blue tit (Cyanistes caeruleus), which are similar in many aspects of their ecology and life history. Whole clutches of both species were collected from the same breeding season and at the same place (Antwerp, Belgium), enabling us to study laying order effects. Additionally, we evaluated how egg PFAA concentrations for both species changed along a distance gradient from a PFAA point source. Although the sum PFAA concentrations did not significantly differ between great tits and blue tits, large differences in PFAA profile and laying order effects were observed. Great tits showed a more diverse PFAA detection profile, including perfluorooctane sulfonic acid (PFOS) and various long-chain perfluorocarboxylic acids (PFCAs) but no short-chain compounds. Contrarily, short-chain PFCAs (perfluorobutanoic acid (PFDA) and perfluorohexanoic acid (PFHxA)) were only detected in blue tit eggs. The variation of perfluoroctanoic acid (PFOA) concentrations within clutches was large in both species decreased similarly from the fluorochemical point source onwards, more variation in egg PFOA concentrations could be explained by distance from the fluorochemical plant in great tits (60%) than in blue tits (15%). Results showed that both species markedly differed in terms of egg PFAA profile and concentrations, most likely reflecting differences in diet, foraging habits and egg protein composition. Finally, biomonitoring results of PFAAs in eggs are likely not generalizable across bird species.			В
D524	蓄積性	Pan, Chang-Gui; Xiao, Shao-Ke; Yu, Ke-Fu; Wu, Qi; Wang, Ying- Hui	Legacy and alternative per- and polyfluoroalkyl substances in a subtropical marine food web from the Beibu Gulf, South China: Fate, trophic transfer and health risk assessment	2021	J Hazard Mater. 2021 Feb 5;403:123618. doi: 10.1016/j.jhazmat.2020.123618. Epub 2020 Aug 9.	The usage of alternative per- and polyfluoroalkyl substances (PFASs) has been increasing due to the restriction and elimination of legacy PFASs. However, there is limited knowledge on bioaccumulation and trophic magnification of alternative PFASs, especially in subtropical ecosystems. In the present study, we performed a comprehensive survey to investigate the occurrence, bioaccumulation and trophic magnification of legacy and alternative PFASs in subtropical marine food webs in the Beibu Gulf, South China. Results showed that perfluorobutanoic acid (PFBA) and perfluorooctanoic acid (PFOA) were the predominant PFASs in water phase, while perfluoroctane sufonate (PFOS) contributed most to the sum of target PFASs in sediments and marine organisms. Of the investigated PFASs, PFOS and 6:2 chlorinated polyfluoroalkyl ether sulfonic acids (F-53B) exhibited the highest bioaccumulation factor with values > 5000, qualifying as very bioaccumulative chemicals. There was a significant positive correlation between log BSAF and the carbon chain length of perfluoroalkyl carboxylic acids (PFCAs). Trophic magnification (TMF) was observed for PFOS and F-53B, while the remaining PFASs were biodiluted through the present food web. The hazard ratios for PFOS and PFOA in all organisms were far less than unity, suggesting overall low PFAS risks for humans through consumption of marine organisms.			в

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D525	蓄積性	Ali, Aasim M; Sanden, Monica; Higgins, Christopher P; Hale, Sarah E; Alarif, Walied M; Al-Lihaibi, Sultan S; Ræder, Erik Magnus; Langberg, Håkon Austad; Kallenborn, Roland	Legacy and emerging per- and polyfluorinated alkyl substances (PFASs) in sediment and edible fish from the Eastern Red Sea	2021	Environ Pollut. 2021 Jul 1;280:116935. doi: 10.1016/j.envpol.2021.116935. Epub 2021 Mar 12.	POLY: and perfluorinated alkyl substances (PFASs) are ubiquitously detected all around the world. Herein, for the first time, concentrations of 16 selected legacy and emerging PFASs are reported for sediment and edible fish collected from the Saudi Arabian Red Sea. Mean concentrations varied from 0.57 to 2.6 μ g kg(-1) dry weight (dw) in sediment, 3.89-7.63 μ g kg(-1) dw in fish muscle, and 17.9-58.5 μ g kg(-1) dw in fish liver. Wastewater treatment plant effluents represented the main source of these compounds and contributed to the exposure of PFAS to biota. Perfluoroctane sulfonate (PFOS) was the most abundant compound in sediment and fish tissues analysed, comprising between 42 and 99% of the Σ (16)PFAS. The short chain perfluorobutanoate (PFBA) was the second most dominant compound in sediment and was detected at a maximum concentration of 0.64 μ g kg(-1) dw. PFAS levels and patterns differed between tissues of investigated fish species. Across all fish species and size. The PFOS replacements fluorotelomer sulfonate (6:2 FTS) and perfluorobutane sulfonate (PFBS) exhibited a bioaccumulation potential in several fish species and 6:2 FTS, was detected at a maximum concentration of 2.65 μ g kg(-1) dw in a doublespotted queenfish (Scomberoides Iysan) liver. PFBS was detected at a maximum concentration of 2.65 μ g kg(-1) dw in strong spine silver-biddy (Gerres longirostris) liver. The calculated dietary intake of PFOS, perfluoroctanoic acid (PFOA), perfluorononanoic acid (PFNA) and perfluorobexane sulfonic acid (PFHxS) exceeded the safety threshold established by the European Food Safety Authority (EFSA) in 2020 in doublespotted queenfish muscle, indicating a potential health risk to humans consuming this fish in Jeddah, Saudi Arabia.		В
D526	蓄積性	Parolini, Marco; Cappelli, Francesca; De Felice, Beatrice; Possenti, Cristina Daniela; Rubolini, Diego; Valsecchi, Sara; Polesello, Stefano	Within- and Among-Clutch Variation of Yolk Perfluoroalkyl Acids in a Seabird from the Northern Adriatic Sea	2021	Environ Toxicol Chem. 2021 Mar;40(3):744-753. doi: 10.1002/etc.4833. Epub 2020 Sep 8.	Perfluoroalkyl substances (PFAS) are surface-active agents used in diverse industrial and commercial applications. They contaminate both freshwater and marine ecosystems, are highly persistent, and accumulate through trophic transfer. Seabirds are exposed to environmental contaminants due to their high trophic position in food webs and relatively long lifespan. We measured levels of 10 perfluoroalkyl acids (PFAAs) in egg yolks of yellow-legged gulls (Larus michahellis) breeding in the northern Adriatic Sea (Northeast Italy). We examined variations in PFAAs within clutches (between eggs of different laying order) and among clutches. Perfluoroactane sulfonate (PFOS) was the most abundant yolk PFAA (mean = 42.0 ng/g wet wt), followed by perfluoroactaneic acid (PFOA; 3.8 ng/g wet wt) and perfluorododecanoic acid (PFDoDa; 2.8 ng/g wet wt). The ΣPFAAs averaged 57.4 ng/g wet weight, ranging between 26.5 and 115.0 ng/g wet weight. The PFAA levels varied substantially among clutches (0.29-0.79 of the total variation), whereas the effects of laying order were considerably weaker (0.01-0.13). Egg-laying order effects were detected for ΣPFAAs, PFOS, perfluorononanoic acid (PFNA), perfluorodecanoic acid (PFDA), and PFDoDa, whereby the last-laid eggs exhibited lower PFAA concentrations than early-laid eggs. Our results indicate that seagulls from the northern Adriatic basin deposit measurable amounts of PFAAs in their eggs. The large among-clutches differences in PFAAs suggest that exposure of yellow-legged gull females to these compounds is highly variable. Environ Toxicol Chem 2021;40:744-753. © 2020 SETAC.		в
D527	蓄積性	Xiao, Yipo; Deng, Jiewei; Fang, Ling; Tu, Lanyin; Luan, Tiangang	Mapping the distribution of perfluoroalkyl substances in zebrafishes by liquid extraction surface analysis mass spectrometry	2021	Talanta. 2021 Aug 15;231:122377. doi: 10.1016/j.talanta.2021.122377. Epub 2021 Apr 6.	Investigation on the distribution of persistent organic pollutants (POPs) in aquatic organisms is of great importance for exploring the biological toxicity and health risks of environmental pollutants. In this study, a liquid extraction surface analysis mass spectrometry (LESA-MS) method was developed for rapid and in situ analysis of the spatial distribution of perfluoroalkyl substances (PFASs) in zebrafish. By combining the high-precision automated moving platform of LESA device and the high-resolution MS, quantitative analysis of perfluoroactanoic acid (PFOA) and perfluoroactanesulfonic acid (PFOS) in zebrafish tissue section were easily achieved. A tissue-specific ionization efficiency factor (TSF) strategy was also proposed to correct the matrix effect in different parts of zebrafish tissue. By using the developed method, high sensitive and efficient imaging of PFOA and PFOS in zebrafish tissue was achieved, and the distributions of PFOA and PFOS in descending order were gills, organs, roes, pelvic fin, muscle, and brain. The experimental results demonstrated that the coupling of LESA-MS method with TFS strategy is an efficient and reliable approach for monitoring the content distribution of environmental pollutants in biological tissues.		В

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D528	蓄積性	Zhang, Bo; He, Yuan; Yang, Guang; Chen, Bingyao; Yao, Yiming; Sun, Hongwen; Kannan, Kurunthachalam; Zhang, Tao	Legacy and Emerging Poly- and Perfluoroalkyl Substances in Finless Porpoises from East China Sea: Temporal Trends and Tissue-Specific Accumulation	2022	Environ Sci Technol. 2022 May 17;56(10):6113-6122. doi: 10.1021/acs.est.1c00062. Epub 2021 Apr 14.	Perfluoroalkyl sulfonates (PFSAs), perfluoroalkyl carboxylates (PFCAs), and emerging alternatives and precursors of these compounds were determined in tissues of finless porpoise (Neophocaena asiaeorientalis sunameri) collected from East China Sea in 2009-2010 and 2018-2019. The median hepatic concentrations of emerging poly- and perfluoroalkyl substances (PFASs), including 6:2 chlorinated polyfluorinated ether sulfonate (6:2 CI-PFESA), 8:2 chlorinated polyfluorinated ether sulfonate (8:2 CI-PFESA), 2,3,3,3-tetrafluoro-2-propanoate (HFPO-DA), and 4.8-dioxa-3H-perfluorononanoate (ADONA) were 16.2, 2.16, < LOQ (limit of quantification) and < LOQ ng/g ww (wet weight), respectively. The concentrations of legacy substances, perfluoroctanesulfonate (PFOS), and perfluoroctanoate (PFOA), were 86.9 and 1.95 ng/g ww, respectively. The liver concentrations of 6:2 CI-PFESA, HFPO-DA, and perfluorohexanesulfonate (PFHxS) increased with time between 2009-2010 and 2018-2019. Further, concentrations of PFOA showed a declining trend in finless porpoise, whereas PFOS and its precursor (i.e., perfluorooctane sulfonamide [FOSA]) showed an increasing trend with time between 2009-2010 and 2018-2019. Analysis of PFASs in nine different tissues/organs of finless porpoise (i.e., liver, heart, intestine, spleen, kidney, stomach, lung, muscle, and skin) revealed a similar distribution pattern between 6:2 CI-PFESA ≈ PFOS; hWever, the tissue distribution patterns differed between HFPO-DA and PFOA. The concentrations of PFAS alternatives in kidney were similar or lower than the prototype compounds PFOS and PFOA (i.e., 8:2 CI-PFESA < 6:2 CI-PFESA ≈ PFOS; HFPO-DA < PFOA), implying slow renal excretion of PFAS alternatives as that of legacy PFASs. The estimates of body burdens of PFASs in porpoises suggested comparable accumulation of PFAS alternatives and legacy PFSAs and PFCAs. This study provides novel information on temporal trends and tissue distribution of emerging PFASs in marine mammals in China.		в
D529	蓄積性	Munoz, Gabriel; Mercier, Laurie; Duy, Sung Vo; Liu, Jinxia; Sauv é, Sébastien; Houde, Magali	Bioaccumulation and trophic magnification of emerging and legacy per- and polyfluoroalkyl substances (PFAS) in a St. Lawrence River food web	2022	, Environ Pollut. 2022 Sep 15;309:119739. doi: 10.1016/j.envpol.2022.119739. Epub 2022 Jul 8.	Research on per- and polyfluoroalkyl substances (PFAS) in freshwater ecosystems has focused primarily on legacy compounds and little is still known on the presence of emerging PFAS. Here, we investigated the occurrence of 60 anionic, zwitterionic, and cationic PFAS in a food web of the St. Lawrence River (Quebec, Canada) near a major metropolitan area. Water, sediments, aquatic vegetation, invertebrates, and 14 fish species were targeted for analysis. Levels of perfluorobutanoic acid (PFBA) in river water exceeded those of perfluoroctanoic acid (PFOA) or perfluoroctane sulfonate (PFOS), and a zwitterionic betaine was observed for the first time in the St. Lawrence River. The highest mean PFAS concentrations were observed for the benthopelagic top predator Smallmouth bass (Micropterus dolomieu, Σ (60)PFAS ~ 92 ± 34 ng/g wet weight whole-body) and the lowest for aquatic plants (0.52-2.3 ng/g). Up to 33 PFAS were detected in biotic samples, with frequent occurrences of emerging PFAS such as perfluorobutane sulfonamide (FBSA) and perfluoroethyl cyclohexane sulfonate (PFECHS), while targeted ether-PFAS all remained undetected. PFOS and long-chain perfluorocarboxylates (C10-C13 PFCAs) dominated the contamination profiles in biota except for insects where PFBA was predominant. Gammarids, molluscs, and insects also had frequent detections of PFOA and fluorotelomer sulfonates, an important distinction with fish and presumably due to different metabolism. Based on bioaccumulation factors >5000 and trophic magnification factors >1, long-chain (C10-C13) PFCAs, PFOS, perfluorodecane sulfonate, and perfluorocatene sulfonamide qualified as very bioaccumulative and biomagnifying. Newly monitored PFAS such as FBSA and PFECHS were biomagnified but moderately bioaccumulative, while PFOA was biodiluted.		В
D530	蓄積性	Kowalczyk, Janine; Gö ckener, Bernd; Eichhorn, Maria; Kotthoff, Matthias; Bü cking, Mark; Schafft, Helmut; Lahrssen- Wiederholt, Monika; Numata, Jorge	Transfer of Per- and Polyfluoroalkyl Substances (PFAS) from Feed into the Eggs of Laying Hens. Part 2: Toxicokinetic Results Including the Role of Precursors	2020	J Agric Food Chem. 2020 Nov 11;68(45):12539-12548. doi: 10.1021/acs.jafc.0c04485. Epub 2020 Oct 29.	A feeding study was performed to examine the bioaccumulation of per- and polyfluoroalkyl substances (PFAS) in laying hens' tissues and plasma and feed-to-egg transfer rates and half-lives. A 25 day exposure was followed by a 42 day depuration period. A target analysis revealed substantial amounts of the precursors N-methyl and N-ethyl perfluorooctane sulfonamidoacetic acid (Me- and EtFOSAA), perfluorooctane sulfonamidoacetic acid (FOSAA), and perfluorooctane sulfonamide (FOSA). In tissues and eggs, the highest bioaccumulation was found for PFHxS, PFHpS, PFOS, and PFOA. Low levels of PFHxS (all samples), PFOS, and FOSAA (in yolk) were measurable even after the depuration period. The egg elimination half-lives of PFOS and aforementioned precursors were estimated to be 4.3 days, while the transfer rates of PFOS and all precursors taken together were 0.99. The transfer rate of PFOA was around 0.49. PFHxS and PFHpS showed apparent transfer rates of >100%, which is hypothesized to indicate the presence of precursors.		В

別添-2 ゞ	と献データ	タベース	文献リ	スト
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No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン 文 ン 文 ク 献 ク 献 ① ラ ② ラ
D531	蓄積性	Wilson, Timothy B; Stevenson, Gavin; Crough, Robert; de Araujo, Jesuina; Fernando, Nilhan; Anwar, Arif; Scott, Tyrone; Quinteros, José A; Scott, Peter C; Archer, Michael J G	Evaluation of Residues in Hen Eggs After Exposure of Laying Hens to Water Containing Per- and Polyfluoroalkyl Substances	2021 Environ Toxicol Chem. 2021 Mar;40(3):735-743. doi: 10.1002/etc.4723. Epub 2020 Jun 8.		Per- and polyfluoroalkyl substances (PFAS) have been used in aqueous film-forming foams used in firefighting, resulting in soil and groundwater contamination and leading to human exposure via animal products grown in contaminated areas. The present study reports the relationship between PFAS intake by hens and the PFAS concentrations in the edible parts of eggs. Laying hens were exposed via drinking water to different concentrations of 4 PFAS compounds (perfluorooctane sulfonate [PFOS], perfluorohexane sulfonate [PFHxS], perfluorooctanoic acid [PFOA], and perfluorohexanoic acid) over 61 d. Egg PFAS residues were assessed for a further 30 d after exposure ceased. The target concentrations of PFAS were 0, 0.3, 3, 30, and 300 µg/L for the treatment groups T1-T5, respectively; and PFAS residues were determined from the eggs collected every second day. There was a linear correlation between the PFAS concentrations in the drinking water of hens and those detected in the egg, which could be useful in estimating PFAS concentrations in the egg by measuring water concentrations. Exposure of hens to drinking water with PFAS concentrations below the Australian Government Department of Health limits (PFOS and PFHxS, 0.07 µg/L; PFOA, 0.56 µg/L), and with no other sources of PFAS exposure, is unlikely to result in egg PFAS concentrations that would exceed the 10% limit set by Food Standards Australia New Zealand for human consumption. Environ Toxicol Chem 2021;40:735-743. © 2020 SETAC.			В
D532	蓄積性	Ren, Junda; Point, Adam D; Baygi, Sadjad Fakouri; Fernando, Sujan; Hopke, Philip K; Holsen, Thomas M; Crimmins, Bernard S	Bioaccumulation of polyfluoroalkyl substances in the Lake Huron aquatic food web	2022	Sci Total Environ. 2022 May 1;819:152974. doi: 10.1016/j.scitotenv.2022.152974. Epub 2022 Jan 8.	Polyfluoroalkyl substances (PFAS) are a group of fluorinated organic chemicals that have been produced for industrial and commercial application since the 1950s. PFAS are highly persistent and ubiquitous in water, sediment, and biota. Toxic effects of PFAS on humans and the ecosystem have increased scientific and public concern. To better understand the distribution of PFAS in the Laurentian Great Lakes, carbon ((12)C and (13)C) and nitrogen ((14)N and (15)N) stable isotope enrichment, fatty acid profiles, and PFAS were measured in the Lake Huron (LH) aquatic food web. The trophic level of the organisms was estimated using δ (15)N and found to be a determinant of PFAS biomagnification. The δ (13)C and fatty acid profiles were used to assess the carbon/energy flow pathway and predator-prey relationships, respectively. The δ (13)C, δ (15)N, and fatty acids were used to elucidate the trophodynamics and understand the PFAS trophic transfer in the LH aquatic food web. Perfluorooctanesulfonic acid (PFOS) was the dominant PFAS observed, followed by C9 - C11 perfluorinated carboxylic acids (PFCA). The highest PFOS concentrations (45 ± 11 ng/g, wet weight (wwt)) were detected in lake trout (Salvelinus namaycush), while the highest total PFCA concentrations (sum of C4 - C16 PFCAs) were detected in deepwater sculpin (Myoxocephalus thompsonii). With the exception of perfluorooctanoic acid (PFOA), C8-C14 PFAS biomagnification factors (BMFs) were found to be generally greater than 1, suggesting PFAS biomagnification from prey to predator. Trophic magnification factors (TMFs) of C8-C14 PFCA were found to be independent of compound hydrophobicity.			В
D533	蓄積性	Liu, Zhaoyang; Xu, Chang; Johnson, Andrew C; Sun, Xiaoyan; Ding, Xiaoyan; Ding, Da; Liu, Sitao; Liang, Xiaoyu	Source apportionment and crop bioaccumulation of perfluoroalkyl acids and novel alternatives in an industrial-intensive region with fluorochemical production, China: Health implications for human exposure	2022	J Hazard Mater. 2022 Feb 5;423(Pt A):127019. doi: 10.1016/j.jhazmat.2021.127019. Epub 2021 Aug 24.	Due to their great environmental hazards, the widely used legacy perfluoroalkyl acids (PFAAs) are gradually restricted, and novel alternatives are being developed and applied. For efficient control of emerging environmental risks in agricultural production, we systematically studied the source apportionment in field soils and bioaccumulation characteristics in multiple crops of 12 PFAAs and five novel alternatives in an industrial-intensive region of China, followed by human exposure estimation and health risk assessment. Compared with perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS), shorter-chained PFAAs and novel alternatives have become the dominant components in local soils and crops, indicating their wide application. A positive matrix factorization (PMF) model coupled with multivariate analysis identified fluoropolymer manufacturing and textile treatment as the principal sources. The bioaccumulation factors (BAFs) of individual PFAAs and alternatives in crops decreased with increasing carbon chain lengths. As a novel alternative of PFOA, hexafluoropropylene oxide dimer acid (GenX) exhibited much higher BAFs; for the alternative of PFOS, 6:2 chlorinated polyfluorinated ether sulfonic acid (6:2 Cl-PFESA) showed lower BAFs. The bioaccumulation capacities of PFAAs and alternatives were also associated with soil organic matter and crop species. Through crop consumption, short-chained PFAAs and novel alternatives might pose emerging human health threats.			В
D534	蓄積性	Huang, Jing; Liu, Yu; Wang, Qiyu; Yi, Jianfeng; Lai, Hong; Sun, Liwei; Mennigen, Jan Alexander; Tu, Wenqing	Concentration-dependent toxicokinetics of novel PFOS alternatives and their chronic combined toxicity in adult zebrafish	2022	Sci Total Environ. 2022 Sep 15;839:156388. doi: 10.1016/j.scitotenv.2022.156388. Epub 2022 May 30.	The increasing use of perfluorooctanesultonate (PFOS) alternatives has led to their release into the aquatic environment. This study sought to determine the effects of exposure concentration on the toxicokinetics of PFOS and its alternatives, including perfluorobutanesulfonic acid (PFBS), perfluorohexanesulfonic acid (PFHxS), chlorinated polyfluorinated ether sulfonate (F-53B) and sodium p-perfluorous nonenoxybenzenesulfonate (OBS) in adult zebrafish by exposure to mixtures of the five per- and polyfluoroalkyl substances (PFAS) at 1, 10, and 100 ng/mL for 28-day, followed by a 14-day depuration. PFAS predominantly accumulated in the blood and liver, and the bioconcentration factor (BCF) decreased in the order of F-53B > PFOS > OBS \gg PFHxS > PFBS in whole-fish homogenates. The uptake rate constants and BCF of the short-chain PFAS (\leq C6) positively correlated with increasing exposure concentration, while the long-chain PFAS (\geq C8) exhibited a pattern of first increasing and then decreasing. A consistent increase in the elimination rate constants of short- and long-chain PFAS was observed with increasing exposure concentration. All PFAS form tight conformations with ZSA and ZL-FABP via hydrogen bonding as revealed by molecular docking analysis. Furthermore, chronic combined exposure to PFAS induced the occurrence of vacuolation and oxidative stress in the zebrafish liver. Our findings uniquely inform the concentration-dependent bioconcentration potential and health risks to aquatic organisms of these PFOS alternatives in the environment.			В

別添-2	文献データベース文献リスト	

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン文ン文 ク献 ク献 ① ラ ② ラ
D535	蓄積性	Colomer-Vidal, Pere; Bertolero, Albert; Alcaraz, Carles; Garreta- Lara, Elba; Santos, Francisco Javier; Lacorte, Silvia	Distribution and ten-year temporal trends (2009-2018) of perfluoroalkyl substances in gull eggs from Spanish breeding colonies	2022	2 2 10.1016/j.envpol.2021.118555. Epub 2021 Nov 19.	Gull eggs are excellent bioindicators of environmental pollution as reflect the contamination levels of coastal areas, especially of persistent and bioacumulative compounds such as perfluoroalkyl substances (PFAS). This study aims to evaluate the geographical distribution and 10-year temporal trends (2009-2018) of 17 PFAS in eggs of two gull species (Larus michahellis and Larus audouinii) from 5 main Spanish colonies. Σ PFAS ranged from 13.7 \pm 5.9 to 164 \pm 17 ng g(-1) wet weight and higher concentrations were observed in L. audouinii than in L. michahellis. Perfluorooctane sulfonate (PFOS) was the predominant compound in all samples, followed by perfluoroundecanoic acid (PFUnA) and perfluorotridecanoic acid (PFTriDA). Perfluorododecanoic acid (PFDA), perfluorodecanoic acid (PFDA) and perfluoroctanoic acid (PFNA) were also found in all studied areas but at lower concentrations, while perfluoroctancic acid (PFOA) was only detected in the Medes Islands. Principal Component Analysis revealed the co-occurrence of the 6 detected PFAS, and differentiated samples from Ebro Delta and Medes Islands, both located in the North-Eastern Mediterranean Sea, with high contribution of all PFAS, from Chafarinas and Atlantic Islands with lower concentration levels and variability. Also, different patterns were observed among colonies, suggesting the fishbased diet plays an important role in PFAS bioaccumulation. In all colonies, except for the Medes Islands, Σ PFAS decreased through the 10-year study period, with PFOS, PFUnA, and PFTriDA showing a significant concentration reduction in a colony-specific manner. This study demonstrates the usefulness and importance of continuous systematic long-term monitoring to determine the geographical distribution and temporal variations of PFAS in marine protected areas using gull eggs as bioindicators of environmental pollution.			В
D536	蓄積性	Liu, Siqian; Zhou, Jian; Guo, Jia; Gao, Zhuo; Jia, Yibo; Li, Shunli; Wang, Tiecheng; Zhu, Lingyan	Insights into the impacts of dissolved organic matter of different origins on bioaccumulation and translocation of per- and polyfluoroalkyl substances (PFASs) in wheat	2022	2 2 10.1016/j.envpol.2021.118604. Epub 2021 Nov 30.	Per- and polyfluoroalkyl substances (PFASs) have been found to be widely present in soil. Dissolved organic matter (DOM) in soil are supposed to greatly affect the bioavailability of PFASs in soil. Herein, hydroponic experiments were conducted to understand the impacts of two kinds of typical DOM, bovine serum albumin (BSA) and humic acid (HA), on the uptake and translocation of legacy PFASs and their emerging alternatives, perfluorooctane sulfonic acid (PFOS), perfluorooctane acid (PFOA), perfluorohexane sulfonic (PFHxS) and 6:2 chlorinated polyfluoroalkyl ether sulfonate (6:2 CI-PFESA) in wheat (Triticum aestivum L.). The results indicated that both HA and BSA significantly inhibited the bioaccumulation and translocation of PFASs in the roots and shoots of wheat, and the impacts of BSA were greater than HA. This difference was explained by the greater binding affinities of the four PFASs with BSA than with HA, as evidenced by the equilibrium dialysis and isothermal titration calorimetry (ITC) analyses. It was noting that inhibition impacts of the BSA-HA mixture (1:1) were lower than BSA alone. The results of Fourier transform infrared (FT-IR) spectroscopy and excitation-emission matrix (EEM) fluorescence spectroscopy suggested that HA could bind with the fluorescent tryptophan residues in BSA greatly, competing the binding sites with PFASs and forming a cover on the surface of BSA. As a result, the binding of PFASs with BSA-HA complex was much lower than that with BSA, but close to HA. The results of this study shed light on the impacts of DOM in soil on the bioaccumulation and translocation of PFASs in plants.			В
D537	蓄積性	Gallocchio, Federica; Mancin, Marzia; Belluco, Simone; Moressa, Alessandra; Angeletti, Roberto; Lorenzetto, Monica; Arcangeli, Giuseppe; Ferrè, Nicola; Ricci, Antonia; Russo, Francesca	Investigation of levels of perfluoroalkyl substances in freshwater fishes collected in a contaminated area of Veneto Region, Italy	2022	2 Environ Sci Pollut Res Int. 2022 Mar;29(14):20996-21011. doi: 10.1007/s11356-021-17236-5. Epub 2021 Nov 8.	The bioaccumulation of 12 perfluoroalkyl substances (PFASs) in 107 freshwater fishes collected during 2017 in waterbodies of a contaminated area in Veneto Region (Italy) was evaluated. The contamination had been previously ascribed to a fluorochemical manufacturing plant that discharged mainly perfluorooctanoic acid (PFOA), among other PFASs, into the surrounding environment. Perfluorooctane sulfonate (PFOS) was the most abundant compound, detected in almost 99% of the fish with an average concentration of 9.23 µg/kg wet weight (w/w). Other detected compounds were perfluoroundecanoic acid (PFUnA) (98%, 0.55 µ g/kg w/w), perfluorodecanoic acid (PFDA) (98%, 2.87 µg/kg w/w), perfluorododecanoic acid (PFDA) (93%, 1.51 µg/kg w/w), and PFOA (79%, 0.33 µg/kg w/w). Bioaccumulation of PFASs was species related, with Italian barbel being the most contaminated, followed by chub, wels catfish, and carp, reflecting animals' habitat use and feeding behavior. A significant negative linear relation between PFAS concentration and fish weight was observed no matter the considered species, with smaller fish having proportionally higher bioaccumulation. PFOS concentrations were strongly correlated with the concentrations of other PFASs, suggesting a similar source of contamination or a contamination from ubiquitous sources. Correlation analysis showed PFOA likely originated from a separated source, unlinked to other PFASs. Although the fishes studied are not usually consumed by local people, with the likely exception of freshwater anglers (and relatives), their consumption has been banned by Veneto Authority since the time this study was conducted. In fact, the study suggests that a medium/high consumption frequency (superior to 1 portion per month) of fish from the investigated area might result in a high exposure to PFASs.			в

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D538	蓄積性	Bustnes, Jan Ove; Bårdsen, Bå rd-Jørgen; Herzke, Dorte; Bangjord, Georg; Bourgeon, Sophie; Fritsch, Clementine; Eulaers, Igor	Temporal Trends of Organochlorine and Perfluorinated Contaminants in a Terrestrial Raptor in Northern Europe Over 34 years (1986-2019)	2022	Environ Toxicol Chem. 2022 Jun;41(6):1508-1519. doi: 10.1002/etc.5331. Epub 2022 May 17.	Fourteen legacy organochlorine (OC) contaminants and 12 perfluoroalkyl substances (PFASs) were measured in eggs of tawny owls (Strix alueco) in central Norway (1986-2019). We expected OCs to have reached stable equilibrium levels due to bans, and that recent phase-out of some PFASs would have slowed the increase of these compounds. Σ OC comprised on average approximately 92% of the measured compounds, whereas Σ PFAS accounted for approximately 8%. However, whereas the Σ OC to Σ PFAS ratio was approximately 60 in the first 5 years of the study, it was only approximately 11 in the last 5 years. Both OC pesticides and polychlorinated biphenyls (PCBs) showed substantial declines over the study period (~85%-98%): hexachlorocyclohexanes and chlordanes seemed to be levelling off, whereas p,p'-dichlorodiphenyldichloroethylene (p,p'-DDE) and hexachlororbenzene (HCB), and most PCB congeners still seemed to decline at a more or less constant rate. While the concentration of perfluoroctane sulfonic acid (PFOS), the dominating PFAS, was reduced by approximately 43%, other perfluorinated sulfonates (PFSAs) increased approximately five-fold over the study period. Perfluorododecanoic acid, perfluorodidecanoic acid, and perfluorotetradecanoic acid seemed to increase more or less linearily. Finally, perfluoroctane is caid (PFOA) was increasingly likely to be detected over the study period. Hence, most legacy OCs and PFOS have not reached a lower threshold with stable background levels, and voluntary elimination of perfluoroalkyl carboxylates still has not resulted in declining levels in tawny owls in central Norway. Environ Toxicol Chem 2022;41:1508-1519. © 2022 The Authors. Environmental Toxicology and Chemistry published by Wiley Periodicals LLC on behalf of SETAC.		в
D539	蓄積性	Judy, Jonathan D; Gravesen, Caleb; Christopher Wilson, P; Lee, Linda; Sarchapone, Jennifer; Hinz, Francisca; Broadbent, Emma	Trophic transfer of PFAS from tomato (Solanum lycopersicum) to tobacco hornworm (Manduca sexta) caterpillars	2022	Environ Pollut. 2022 Oct 1;310:119814. doi: 10.1016/j.envpol.2022.119814. Epub 2022 Aug 1.	 PFASs are highly persistent in the environment and the potential exists for terrestrial biota to accumulate PFAS, which may result in exposure of higher trophic level organisms to these compounds through consumption. However, trophic transfer of proteinophilic compounds such as PFAS has not been extensively studied and the degree to which plant-accumulated PFAS will be transferred to herbivorous consumers is unclear. Here, we exposed Solanum lycopersicum (tomato) plants to a suite of 7 different PFAS, including 4 carboxylic acids (PFOA, PFHxA, PFHpA and PFDA) and 3 sulfonates (PFBS, PFHxS and PFOS). Exposed leaf tissues were subsequently fed to Manduca sexta (tobacco hornworm) caterpillars. Biomagnification factors (BMFs) were all below 1 and patterns of uptake and elimination were similar between the different PFAS. However, PFOS bioaccumulated in the hornworms to a much higher concentration, with approximately 5-fold higher BMFs and assimilation efficiencies (AEs) than other PFAS tested. AE and BMF, as well as PFAS uptake by the plants, were positively correlated with PFAS carbon chain length for both sulfonates and carboxylic acids, providing evidence that longer chain PFAS may be more efficiently accumulated (or less efficiently eliminated) than shorter-chain PFAS in some contexts. 		В
D540	蓄積性	Wu, Yan-Qi; Song, Shuai; Shi, Ya-Juan; Liu, Ying; Yang, Sheng-Jie	[Screening and Control Measures for New Priority Pollutants in Surface Water of Tianjin]	2022	Huan Jing Ke Xue. 2022 Aug 8;43(8):4074-4086. doi: 10.13227/j.hjkx.202111166.	Emerging pollutants are frequently detected in surface water, threatening the regional aquatic ecosystem and human health. Due to their complex types and large differences in risk and toxicity, research based on the comprehensive assessment of the pollution characteristics to determine the new priority pollutants remains incomplete. This study established a multi-criterion scoring method targeting 41 emerging pollutants with the goal of protecting aquatic organisms and human health, using five key indicators including environmental exposure level, persistence, bioaccumulation, ecological risk, and health risk of pollutants. The emerging pollutants were screened and identified in the surface water of Tianjin. The priority levels of different congeners were divided, and the ecological and health risks of pollutants in the priority control list were evaluated. The results showed that 41 emerging pollutants were generally detected in the study area. The average concentration of sulfonamide antibiotics (SAs) and other drugs (Others) were the largest, with 200.04 ng-L(-1) and 176.30 ng-L(-1), respectively, followed by perfluorinated compounds (PFASs, 57.98 ng-L(-1)). In terms of pollutant categories, high-priority emerging pollutants were dominated by PFASs, accounting for 50%. Medium-priority emerging pollutants were still dominated by PFASs (26.32%), but the proportion was lower. Low-priority emerging pollutants were dominated by SAs, accounting for 31.25%. Perfluorooctane sulforic acid (PFOS), perfluoroctancia cid (PFOA), carbamazepine (CBZ), caffeine (CAF), perfluorohexyl sulfonic acid (PFHxA), and clarithromycin (CLA) were defined as a priority control list. Compared with other pollutants, PFOS and PFOA had higher scores in persistence, bioaccumulation, and health risk, whereas CBZ and CAF had higher scores in cological risk. The average risk quotient (RQ) of CAF was 4.8, which indicated a relatively high ecological risk. Health risk indicated that the potential risk caused by PFOA (average hazard quotient was 0		В

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン文ン文 ク献ク献 ① ラ ② ラ
D541	蓄積性	Chu, Kejian; Lu, Ying; Hua, Zulin; Liu, Yuanyuan; Ma, Yixin; Gu, Li; Gao, Chang; Yu, Liang; Wang, Yifan	Perfluoroalkyl acids (PFAAs) in the aquatic food web of a temperate urban lake in East China: Bioaccumulation, biomagnification, and probabilistic human health risk	2022	Environ Pollut. 2022 Mar 1;296:118748. doi: 10.1016/j.envpol.2021.118748. Epub 2021 Dec 24.	The bioaccumulation and biomagnification of perfluoroalkyl acids (PFAAs) in temperate urban lacustrine ecosystems is poorly understood. We investigated the occurrence and trophic transfer of and probabilistic health risk from 15 PFAAs in the food web of Luoma Lake, a temperate urban lake in East China. The target PFAAs were widely distributed in the water (Σ PFAA: 77.09 \pm 9.07 ng/L), suspended particulate matter (SPM) (Σ PFAA: 284.07 \pm 118.05 ng/g dw), and sediment samples (Σ PFAA: 67.77 \pm 17.96 ng/g dw) and occurred in all biotic samples (Σ PFAA: 443.27 \pm 124.89 ng/g dw for aquatic plants; 294.99 \pm 90.82 for aquatic animals). PFBA was predominant in water and SPM, with 40.11% and 21.35% of the total PFAAs, respectively, while PFOS was the most abundant in sediments (14.11% of the total PFAAs) and organisms (14.33% of the total PFAAs). Sediment exposure may be the major route of biological uptake of PFAAs. The PFAA accumulation capacity was the highest in submerged plants, followed by emergent plants > bivalves > crustaceans > fish > floating plants. Long-chain PFAAs were biomagnification potential among the target PFAAs. However, biomagnification of short-chain PFAAs was also observed within the low trophic-level part of the food web. Human health risk assessment indicated that perfluorooctanesulfonate (PFOS) and perfluorooctanoic acid (PFOA) posed health risks to all age groups, while the other PFAAs were unlikely to cause immediate harm to consumers in the region. This study fills a gap in the knowledge of the transfer of PFAAs in the food webs of temperate urban lacustrine food web. PFAAs are perfluence of the food web. Back the age of the transfer of PFAAs are perfluence of the food web. Human health risk assessment indicated that perfluorooctanesulfonate (PFOS) and perfluorooctanoic acid (PFOA) posed health risks to all age groups, while the other PFAAs were unlikely to cause immediate harm to consumers in the region. This study fills a gap in the knowledge of the transfer of PFAAs in t			В
D542	蓄積性	Sun, Qiongping; Bi, Ran; Wang, Tieyu; Su, Chuanghong; Chen, Zhenwei; Diao, Jieyi; Zheng, Zhao; Liu, Wenhua	Are there risks induced by novel and legacy poly- and perfluoroalkyl substances in coastal aquaculture base in South China?	2021	Sci Total Environ. 2021 Jul 20;779:146539. doi: 10.1016/j.scitotenv.2021.146539. Epub 2021 Mar 18.	Perfluoroalkyl substances (PFASs) have raised great attention as emerging contaminants due to their persistent and bioaccumulative characteristics. Following the global actions to limit perfluoroctanesulfonic acid (PFOS) and its salts, chlorinated polyfluorinated ether sulfonate (F-53B), as an alternative perfluorochemical, has been a focus during this period. In this study, PFASs in coastal seawater, sediment, and seaweed from the significant aquaculture bases of Porphyra haitanensis in the southeast of China were investigated. Their bioaccumulation and ecological risk were elucidated and associated human exposures to PFASs with consumption of aquatic products for rural and urban groups were calculated. The total PFASs levels in seawater and sediment were 21.52-241.86 ng/L and 4.55-26.54 ng/g·dw, respectively. F-53B was found frequently and has relative high concentration in seawater (ND-2.13 ng/L). The Porphyra haitanensis and Siganus fuscescens were also analyzed, with PFASs concentrations ranging from 10.45 to 29.98 ng/g·dw and 7.17 to 25.43 ng/g·dw, respectively. The total logarithm BAF of F-53B and PFOS in two kinds of detected seafoods were within 0-2.94 and 2.01-3.25, these values did not vary in different sites. The estimated daily intake (EDI) of PFASs through aquatic products consumption in rural and urban residents were 0.03-26.50 ng/kg bw/day and 0.17-37.01 ng/kg bw/day, respectively, based on the Dietary Guidelines for Chinese residents. The total EDI of PFASs via Porphyra haitanensis and Siganus fuscescens in different groups were significantly lower than the suggested tolerable daily intake (PFOS, 150 ng/kg bw/day; PFOA, 1500 ng/kg bw/day), which indicates that PFASs did not induce health risks to the residents living around these aquaculture bases.			В
D543	蓄積性	Drew, Roger; Hagen, Tarah G; Champness, David	Accumulation of PFAS by livestock - determination of transfer factors from water to serum for cattle and sheep in Australia	2021	Food Addit Contam Part A Chem Anal Control Expo Risk Assess. 2021 Nov;38(11):1897-1913. doi: 10.1080/19440049.2021.1942562. Epub 2021 Jul 29.	In this study accumulation has been determined of several per- and polyfluoroalkyl substances (PFAS) from ingested water to steady state serum concentration for adult beef cattle and sheep raised on a hobby farm impacted by PFAS contamination. PFAS concentrations in stock water were stable for more than a year, they were non-measurable in grass but present at very low levels in soil which equated to just 1% of the intake from water. Prior to quantifying PFAS in cattle serum there had been no breeding for 18 months. Although there were high concentrations of several PFAS in the water, only perfluorooctane sulphonate (PFOS) and perfluorohexane sulphonate (PFHxS) were in cattle serum in appreciable amounts; perfluoroheptane sulphonate (PFHpS), perfluorononanoic acid (PFNA) and perfluorodecanoic acid (PFDA) were much lower. Transfer factors (TFs) for cattle were calculated by dividing steady state serum concentration (ng PFAS/mL) by water concentration (µg PFAS/L). Average and upper estimate TF values for cattle were calculated; the former were 140 (total PFOS, i.e. tPFOS), 130 (PFHpS), 65 (PFHxS), 170 (PFNA), and 120 (PFDA). Previous investigation campaigns at the farm provided relative steady state serum PFAS concentrations for sheep and cattle that allowed adjustment of the cattle TFs. The resulting average estimate TFs for ewes (non-pregnant and not lactating) were 20 (tPFOS) and 30 (PFHxS), other PFAS were not measurable in sheep serum. Discussion on using these TFs in human health risk assessments is provided. With certain assumptions/caveats the TFs allow estimations of PFAS steady state serum concentrations for use in preliminary human health risk assessments (HHRAs) when only PFAS in stock water is known.			В

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨 (原文)	備考	出 村 報 新	ン文 ン文 ク献 ① ラ ② ラ
D544	蓄積性	Chen, Ruya; Zhuang, Yuan; Yu, Ying; Shi, Baoyou	Enhanced perfluorooctanoic acid (PFOA) accumulation by combination with in-situ formed Mn oxides under drinking water conditions	2021	Water Res. 2021 Feb 15;190:116660. doi: 10.1016/j.watres.2020.116660. Epub 2020 Nov 20.	Particulate manganese oxide (MnOx) deposition in drinking water distribution systems (DWDS) gives rise to the risk of water discoloration at the consumers' tap; however, its role in the fate and transport of trace organic pollutants in DWDS is not clear. Perfluorooctanoic acid (PFOA), a persistent organic pollutant frequently detected in natural water, was selected to investigate the potential effect of MnOx on its transportation behavior under DWDS conditions through laboratory batch experiments. The results show that PFOA can be greatly combined with MnOx formed in-situ through a Mn(II) oxidation process by free chlorine. However, the accumulation of PFOA by preformed MnOx was negligible. It was found that 1 mg/L Mn captured over 50% of PFOA with an initial concentration of 50 ng/L during oxidation. The water compositions of actual water could contribute to the effect of PFOA accumulation to a certain extent. Characterization of the solid products revealed that PFOA is homogenously embedded into MnOx. The combination of PFOA with MnOx occurs through a bridging effect of Mn(II) between the surface hydroxyls of MnOx and the -COOH group of PFOA. The resulting MnOx-PFOA particles were more inclined to agglomerate, enabling possibly easy deposition onto the pipe wall than ordinary MnOx particles. This study provides insights into the co-occurrence of metal deposits with PFOA and the potential risks posed by PFOA accumulation to consumers through the water distribution process.			В
D545	蓄積性	Zhuang, Yuan; Qin, Xinyi; Shi, Baoyou	Interface hydrogen bonding dominated perfluorooctanoic acid (PFOA) accumulation by iron particles in drinking water pipes	2022	Chemosphere. 2022 Nov 8;312(Pt 1):137211. doi: 10.1016/j.chemosphere.2022.137211. Online ahead of print.	Iron particle is one of the key factors inducing discoloration in drinking water distribution system (DWDS), but the mechanism of iron particles on the accumulation of trace organic pollutants in DWDS is not clear. Here, iron-based pipes from real DWDS were used to investigate the perfluorooctanoic acid (PFOA) accumulation mechanisms in DWDS. Results showed that old unlined pipes had a much higher accumulation capacity for PFOA than new pipes. Among the corrosion products in old pipes, Fe(2)O(3) and Fe(3)O(4) did not have obvious accumulation for PFOA, while FeOOH exhibited a strong accumulation effect for PFOA. Furthermore, the in-situ formed iron particles contributed more to PFOA accumulation than pre-formed iron particles. Interestingly, PFOA caused an increase in turbidity and particle size of in-situ formed iron particles. Mulliken charge of F-bonded Fe increased from +1.28 e to +1.30 e, which indicated that the oxidation state of Fe-center was strengthened by PFOA. When dissolved oxygen existed, a PFOA-FeOOH-O(2) linkage could form through COO-Fe coordination and O(2) interface adsorption, which enhanced cytotoxicity due to the generation of •OH radicals. These findings implied that interface hydrogen bonding dominated PFOA accumulation by iron particles in DWDS, which would increase the risks of discoloration.			В
D546	蓄積性	Bian, Yu; He, Mu-Yi; Ling, Yun; Wang, Xiu-Juan; Zhang, Feng; Feng, Xue-Song; Zhang, Yuan; Xing, Shi-Ge; Li, Jie; Qiu, Xin; Li, Yu-Rui	Tissue distribution study of perfluorooctanoic acid in exposed zebrafish using MALDI mass spectrometry imaging	2022	Environ Pollut. 2022 Jan 15;293:118505. doi: 10.1016/j.envpol.2021.118505. Epub 2021 Nov 13.	Perfluorooctanoic acid (PFOA) as an emerging environmental contaminant, has become ubiquitous in the environment. It is of significance to study bioconcentration and tissue distribution of aquatic organisms for predicting the persistence of PFOA and its adverse effects on the environment and human body. However, the distribution of PFOA in different tissues is a complex physiological process affected by many factors. It is difficult to be accurately described by a simple kinetic model. In present study, a new strategy was introduced to research the PFOA distribution in tissues and estimate the exposure stages. Zebrafish were continuously exposed to 25 mg/L PFOA for 30 days to simulate environmental process. Matrix-assisted laser desorption ionization mass spectrometry imaging (MALDI-MSI) method was used to monitor the spatio-temporal distribution of PFOA in zebrafish tissues. By analyzing the law of change obtained from the high spatial resolution MSI data, two different enrichment trends in ten tissues were summarized by performing curve fitting. Analyzing the ratio of two types of curves, a new "exposure curve" was defined to evaluate the exposure stages. With this model, three levels (mild, moderate, and deep pollution stage) of PFOA pollution in zebrafish can be simply evaluated.			В
D547	蓄積性	Sciancalepore, Giuseppe; Pietroluongo, Guido; Centelleghe, Cinzia; Milan, Massimo; Bonato, Marco; Corazzola, Giorgia; Mazzariol, Sandro	Evaluation of per- and poly-fluorinated alkyl substances (PFAS) in livers of bottlenose dolphins (Tursiops truncatus) found stranded along the northern Adriatic Sea	2021	Environ Pollut. 2021 Dec 15;291:118186. doi: 10.1016/j.envpol.2021.118186. Epub 2021 Sep 18.	Per-and poly-fluorinated alkyl substances (PFAS) are a group of chemicals used in a wide variety of commercial products and industrial applications. These chemicals are persistent, can accumulate in humans' and animals' tissues and in the environment, representing an increasing concern due to their moderate to highly toxicity. Their global distribution, persistence and toxicity led to an urgent need to investigate bioaccumulation also in marine species. In 2013 PFAS contamination was detected in a vast area in Veneto region, mainly in Adige and Brenta rivers. In order to investigate any relevant presence of these substances in marine vertebrates constantly living in the area, PFAS were measured in hepatic tissue samples of 20 bottlenose dolphins (Tursiops truncatus) stranded along the northern Adriatic Sea coastline between 2008 and 2020. Using high performance liquid chromatography-mass spectrometry, 17 target PFAS (PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFDA, PF			В

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン文ン文 ク献 ① ラ ② ラ
D548	蓄積性	Pan, Ying; Wen, Bei; Zhang, Hongna; Zhang, Shuzhen	Comparison of 6:2 chlorinated polyfluorinated ether sulfonate (6:2 CI-PFESA) and perfluorooctane sulfonate (PFOS) accumulation and toxicity in mung bean	2021	Environ Pollut. 2021 Oct 15;287:117332. doi: 10.1016/j.envpol.2021.117332. Epub 2021 May 10.	With the regulation of perfluorooctanesulfonate (PFOS), 6:2 chlorinated polyfluoroalkyl ether sulfonate (6:2 CI-PFESA) has been used as a potential PFOS alternative in electroplating. In this study, the uptake, translocation and phytotoxicity of PFOS and 6:2 CI-PFESA in mung bean (Vigna radiata (Linn.) Wilczek.) were investigated. The uptake kinetics of PFOS and 6:2 CI-PFESA fit the Michaelis-Menten equation well, suggesting that the uptake is a carrier-mediated process. The root concentration factor (RCF) of 6:2 CI-PFESA (34.55 mL g(-1) dw) was 1.27 times that of PFOS (27.11 mL g(-1) dw), and the translocation factor (TF) of 6:2 CI- PFESA (0.177) was 1.07 times that of PFOS (0.165). Exposure to 6:2 CI-PFESA and PFOS both resulted in the inhibition of mung bean seedling development. Treatment with 6:2 CI-PFESA and PFOS led to the concentration-dependent elevation of malondialdehyde (MDA), carbonyl groups, and phosphorylated histone H2AX (γ -H2AX) levels in mung bean roots. The MDA and carbonyl group contents induced by 6:2 CI-PFESA were 1.10-1.35 and 1.03-1.14 times, respectively, those of PFOS. The hydroxyl free radical (·OH) levels in mung bean roots after exposure to PFOS and 6:2 CI-PFESA were elevated significantly, and the ·OH levels induced by 6:2 CI-PFESA were higher than those induced by PFOS. Hydroxyl free radical levels were positively correlated with the MDA and carbonyl group contents in mung bean roots ($p < 0.05$). The dynamic changes in some antioxidative enzyme activities in mung bean seedlings were determined, including peroxidase (POD), superoxide dismutase (SOD), and catalase (CAT). The results demonstrated the phytotoxicities of 6:2 CI-PFESA and PFOS to mung bean in the early developmental stage. 6:2 CI- PFESA is more harmful to mung beans than PFOS. The production of hydroxyl radical is the mechanism that causes the toxicity of PFOS and 6:2 CI-PFESA toward plants.			В
D549	蓄積性	Savoca, Dario; Pace, Andrea; Arizza, Vincenzo; Arculeo, Marco; Melfi, Raffaella	Controlled uptake of PFOA in adult specimens of Paracentrotus lividus and evaluation of gene expression in their gonads and embryos	2022	Environ Sci Pollut Res Int. 2022 Nov 9. doi: 10.1007/s11356- 022-23940-7. Online ahead of print.	Perfluorooctanoic acid (PFOA) has been largely used in the manufacturing industry but a few years ago it turned out to be a dangerous pollutant which is now of concern for terrestrial and aquatic environments. Here, we investigated the bioaccumulation of PFOA in the sea urchin Paracentrotus lividus after exposure to different concentrations of the pollutant for 28 days. We observed rapid uptake of PFOA in the coelomic fluid collected weekly during the exposure period and high bioaccumulation in gonads at the end of the experiment. Interestingly, animals were also able to fast depurate when relocated to a clean environment. In addition, to assess the effect of PFOA on sea urchins' physiological pathways, we analysed the expression profile of some marker genes both in the gonads and in the embryos obtained from parents exposed to PFOA. Our results suggest that PFOA is a persistent, bioaccumulative compound that adversely affects the health of the exposed organisms and their offspring by causing significant changes in the expression of some key target genes and the occurrence of developmental anomalies in the embryos.			В
D550	蓄積性	Satbhai, Kruuttika; Vogs, Carolina; Crago, Jordan	Comparative toxicokinetics and toxicity of PFOA and its replacement GenX in the early stages of zebrafish	2022	Chemosphere. 2022 Dec;308(Pt 1):136131. doi: 10.1016/j.chemosphere.2022.136131. Epub 2022 Aug 22.	PER: and poly-fluoroalkyl substances (PFAS) are receiving attention due to their persistence, and potential adverse effects on environmental and human health. Efforts to reduce long-chained PFAS (\geq C8) compounds were implemented in 2006 as a part of "PFOA Stewardship Program Initiative" (PFOA-perfluorooctanoic acid). Short-chained PFAS (<c8) as<br="" introduced="" were="">replacements, which were believed to have lower potential for environmental persistence and bioaccumulation. Little is known about the uptake and elimination, and potential toxic effects of these replacement compounds. Hence, it is important to compare toxicokinetics and toxicity of long-chain PFAS to their replacement compounds. To this end, zebrafish (ZF), Danio rerio, embryos were exposed to PFOA and its short-chain replacement perfluoro (2-methyl-3-oxahexanoic) acid (GenX) with the aim to assess uptake and elimination kinetics, hatching success, morphology, startle response, and survival. At 24 hpf, LC50 was 82 μ M for PFOA and 170 μ M for GenX. At 54 hpf, GenX but not PFOA showed an increase in hatching success. At 120 hpf, no statistically significant differences were seen in white light startle response below the LC50. PFAS internal concentrations were measured at 72 and 120 hpf during exposure phase, and at 168 hpf during depuration phase. GenX and PFOA internal concentrations in 120 hpf larvae exposed to highest concentration (20 μ M) were 35.02 and 44.51 μ M, respectively. Concentrations were eliminated almost completely at 168 hpf for GenX up to 95%, while for PFOA up to 50%. As steady-state was not reached, we estimated kinetic bioconcentration factors (BCFkin). BCFkin for GenX was lower than PFOA at equimolar concentrations. However, bioconcentration factors were higher at the lower exposure concentrations for both chemicals, suggesting a concentration dependent uptake of PFASs. The predicted internal effect concentrations, accounting for the differences in bioconcentration factors, were 229 μ M for GenX and 226 μ M for PFOA, su</c8)>			В

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D551	蓄積性	Coy, Carrie O; Steele, Alexandra N; Abdulelah, Sara A; Belanger, Rachelle M; Crile, Karen G; Stevenson, Louise M; Moore, Paul A	Differing behavioral changes in crayfish and bluegill under short- and long-chain PFAS exposures: Field study in Northern Michigan, USA	2022	Ecotoxicol Environ Saf. 2022 Dec 1;247:114212. doi: 10.1016/j.ecoenv.2022.114212. Epub 2022 Oct 20.	The emergent contaminant family, per- and poly-fluorinated alkyl substances (PFAS) has gained research attention due to their widespread detection and stability within the environment. Despite the growing amount of research on perfluoroctanesulfonic acid (PFOS) and perfluoro-n-octanoic acid (PFOA) in aquatic organisms, investigations detailing behavioral and physiological effects of aquatic organisms exposed to a mixture of PFAS analytes in the wild have been limited. The objective of this study was to evaluate the potential behavioral and histological effects of environmental exposure to PFAS compounds within multiple trophic levels of aquatic ecosystems. The current study investigates effects of environmentally relevant PFAS concentration exposures in crayfish (Faxonius immunis, F. rusticus, F. virilis) and bluegill (Lepomis macrochirus) sourced from four water bodies in Northern Michigan. Antipredator response and foraging behavioral assays were used to investigate potential effects on fish. Linear mixed model and multiple regression analyses resulted in significant relationships between tissue accumulation levels of long chain PFAS compounds and crayfish foraging and fish critical swimming speed responses. Crayfish foraging decreased and fish critical swim speeds increased with PFAS exposure which may lead to energetic and population concerns. Antipredator response in crayfish and liver and gill histology for seearch regarding the differential toxicity of short-chain and long-chain PFAS compounds. The sensitivity of some aquatic organism behaviors to PFAS accumulated in tissue may have implications for PFAS transfer and alterations to ecosystem functioning; based on the results of this field study, further laboratory research is recommended to further evaluate these relationships.		C
D552	蓄積性	Zou, Yilong; Wu, Yongming; Wang, Qiyu; Wan, Jinbao; Deng, Mi; Tu, Wenqing	Comparison of toxicokinetics and toxic effects of PFOS and its novel alternative OBS in zebrafish larvae	2021	Chemosphere. 2021 Feb;265:129116. doi: 10.1016/j.chemosphere.2020.129116. Epub 2020 Nov 26.	Sodium p-perfluorous nonenoxybenzene sulfonate (OBS), a novel alternative to perfluorooctanesulfonate (PFOS), is widely used in industry as a surfactant, firefighting foam and photographic material. The occurrence of OBS in the aquatic environment has been recently reported, but little information is available on its accumulation and toxic effects in aquatic organisms. In this study, zebrafish larvae (3 d post-fertilization) were subjected to OBS (10, 100 μ g/L) and PFOS (10 μ g/L) for a period of 48 h, followed by a 24 h of depuration period. The bioconcentration and depuration kinetics, oxidative stress and possible molecular mechanisms of OBS and PFOS were investigated in zebrafish larvae. Our results showed that the uptake and depuration of both OBS and PFOS fitted well with a first-order kinetic model. The uptake rate constant of OBS was similar to that of PFOS, but the depuration rate constant was much higher than PFOS with a half-life of 69.7-85 h for OBS and 222.2 h for PFOS. The calculated BCFs of OBS and PFOS were 238.0-242.5 and 644.2, respectively. In our acute toxicity assay, the enhanced expression of Nrf2 protein accompanied by the upregulation of CAT and SOD protein expressions indicated OBS and PFOS induced oxidative stress in zebrafish larvae, and the Nrf2-ARE signaling pathway was involved in this process. Collectively, OBS has a lower bioconcentration potential than PFOS, but its toxic effect on oxidative stress was comparable to PFOS in zebrafish larvae.		В
D553	蓄積性	Park, Kiwan; Barghi, Mandana; Lim, Jae-Eun; Ko, Hye-Mee; Nam, Hyun-Young; Lee, Sang-Im; Moon, Hyo-Bang	Assessment of regional and temporal trends in per- and polyfluoroalkyl substances using the Oriental Magpie (Pica serica) in Korea	2021	Sci Total Environ. 2021 Nov 1;793:148513. doi: 10.1016/j.scitotenv.2021.148513. Epub 2021 Jun 17.	Per- and polyfluoroalkyl substances (PFASs) are used in industrial and commercial products due to their amphiphilic properties. Birds have been utilized as biomonitoring species due to their environmental pollutant vulnerability and wide distribution. The Oriental Magpie (Pica serica) is a representative residential species inhabiting terrestrial environments. In this study, we measured PFAS concentrations in Magpie liver tissue (n = 253) collected from 12 Korean regions in 2004 and 2017. The predominant compounds were perfluorooctanesulfonic acid (PFOS; mean: 23.8 ng/g wet weight), perfluorotridecanoic acid (PFTrDA; 2.79 ng/g), and perfluoroundecanoic acid (PFUnDA: 2.11 ng/g). We observed significant correlations between Magpie PFAS measurements, indicating similar sources and bioaccumulation processes. Adult females showed significantly lower PFOS concentrations than adult males and young males and females, indicating that avian sex is a crucial physiological factor of PFAS accumulation. PFOS, perfluorodecanoic acid (PFDA), and perfluorotetradecanoic acid (PFTeDA) concentrations in urban regions were significantly higher than rural regions. PFOS concentrations in Magpie livers increased significantly between sampling years, whereas C11-C13 carboxylic acids (PFCAs) decreased. This suggests that urbanization and population are major factors in Magpie PFAS accumulation. Almost all hepatic PFOS concentrations were below the threshold values proposed by previous studies, implying limited risks. Our findings suggest that the Oriental Magpies are PFAS sentinel in residential environments. This is the first comprehensive report on biomonitoring of PFASs using the Oriental Magpie.		В

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文ン文 対報 象抽 ① ラ ② ラ
D554	蓄積性	Jarjour, Julie; Yan, Bei; Munoz, Gabriel; Desrosiers, Mé Ianie; Sauvé, Sé bastien; Liu, Jinxia	Reduced bioaccumulation of fluorotelomer sulfonates and perfluoroalkyl acids in earthworms (Eisenia fetida) from soils amended with modified clays	2022	J Hazard Mater. 2022 Feb 5;423(Pt A):126999. doi: 10.1016/j.jhazmat.2021.126999. Epub 2021 Aug 21.	Soils contaminated by per- and polyfluoroalkyl substances (PFAS) pose long-term sources to adjacent water bodies and soil invertebrates. The study investigated the stabilization using a modified clay adsorbent (FLUORO-SORB100®) in reducing the bioaccumulation of 13 anionic PFAS by earthworms (Eisenia fetida), as compared to coal-based granular activated carbon. The target PFAS included four perfluoroalkyl sulfonates such as perfluorooctane sulfonate (PFOS), six perfluoroalkyl carboxylates (e.g., perfluorooctanoate PFOA), and three (X:2) fluorotelomer sulfonates. Laboratory-spiked surface soil and the soil collected from a site contaminated by aqueous film-forming foams were examined. Both adsorbents resulted in reduced earthworm PFAS body burdens at the end of the 28-day uptake phase. The highest adsorbent amendment concentration (4 w/w%) was most effective, achieving >95% reduction of PFAS body burden. Soil leaching tests indicated better immobilization performance by the clay adsorbent for most analytes; in comparison, the activated carbon performed better at reducing total PFAS body burdens, possibly owing to the avoidance of larger-sized particles by earthworms. Strong positive logarithm relationships were observed between leachate concentrations and earthworm body burdens for most PFAS in the spiked soil. The study demonstrated that stabilization of PFAS using modified clay adsorbents can achieve concurrent benefits of lowering leachability and reducing bioaccumulation.		С
D555	蓄積性	Savoca, Dario; Melfi, Raffaella; Palumbo Piccionello, Antonio; Barreca, Salvatore; Buscemi, Silvestre; Arizza, Vincenzo; Arculeo, Marco; Pace, Andrea	Presence and biodistribution of perfluorooctanoic acid (PFOA) in Paracentrotus lividus highlight its potential application for environmental biomonitoring	2021	Sci Rep. 2021 Sep 21;11(1):18763. doi: 10.1038/s41598-021- 98284-2.	The first determination of presence and biodistribution of PFOA in ninety specimens of sea urchin Paracentrotus lividus from two differently contaminated sites along Palermo's coastline (Sicily) is reported. Analyses were performed on the sea urchins' coelomic fluids, coelomocytes, gonads or mixed organs, as well as on seawater and Posidonia oceanica leaves samples from the collection sites. PFOA concentration ranged between 1 and 13 ng/L in seawater and between 0 and 794 ng/g in P. oceanica. The analyses carried out on individuals of P. lividus from the least polluted site (A) showed PFOA median values equal to 0 in all the matrices (coelomic fluid, coelomocytes and gonads). Conversely, individuals collected from the most polluted site (B) showed median PFOA concentrations of 21 ng/g in coelomic fluid, 153 ng/g in coelomocytes, and 195 ng/g in gonads. Calculated bioconcentration factors of log(10)BCF > 3.7 confirmed the very bioaccumulative nature of PFOA. Significant correlations were found between the PFOA concentration of the coelomic fluid versus the total PFOA concentration of the entire sea urchin. PERMANOVA (p = 0.001) end Welch's t-test (p < 0.001) analyses showed a difference between specimens collected from the two sites highlighting the potential application of P. lividus as sentinel species for PFOA biomonitoring.		В
D556	蓄積性	Death, Clare; Bell, Cameron; Champness, David; Milne, Charles; Reichman, Suzie; Hagen, Tarah	Per- and polyfluoroalkyl substances (PFAS) in livestock and game species: A review	2021	Sci Total Environ. 2021 Jun 20;774:144795. doi: 10.1016/j.scitotenv.2020.144795. Epub 2021 Jan 26.	Per- and polyfluoroalkyl substances (PFAS) are synthetic, organic chemicals that resist environmental breakdown. The properties that made PFAS into an industrial success also led to their persistence and bioaccumulation. As PFAS were widely used for many decades their presence is evident globally, and their persistence and potential for toxicity create concern for human, animal and environmental health. Following the precautionary principle, a reduction in human exposure is generally recommended. The most significant source of human exposure to PFAS is dietary intake (food and water) with additional exposure via dust. As PFAS concentrations have been more frequently studied in aquatic food sources, there is less understanding of exposure via terrestrial animals. To further define human exposure via animal products, it is necessary to determine PFAS concentrations and persistence in terrestrial livestock and game species. Studies assessing ambient concentrations of PFAS have noted that, aside from point sources of contamination, there is generally low input of PFAS into terrestrial agricultural food chains. However, livestock and game species may be exposed to PFAS via contaminated water, soil, substrate, air or food, and the contribution of these exposures to PFAS concentrations in food products is less well studied. This review focuses on perfluoroalkyl substances (PFAAs) and compiles information from terrestrial livestock and game species as a source of dietary exposure in humans, and discusses toxicokinetics and health effects in animals, while identifying future focus areas. Publications describing the transfer of PFAAs to farmed and hunted animals are scarce, and demonstrate large variability in distribution and elimination. We outline several relatively small, short-term studies in cattle, sheep, pigs and poultry. While negative effects have not been noted, the poultry investigations were the only studies to explicitly assess health effects. Comparative information is presented on PFAA concentrations in l		В
D557	蓄積性	Geng, Qianqian; Guo, Mengmeng; Wu, Haiyan; Peng, Jixing; Zheng, Guanchao; Liu, Xiaoyu; Zhai, Yuxiu; Tan, Zhijun	Effects of single and combined exposure to BDE-47 and PFOA on distribution, bioaccumulation, and toxicity in blue mussel (Mytilus galloprovincialis)	2021	Ecotoxicol Environ Saf. 2021 Nov 24;228:113014. doi: 10.1016/j.ecoenv.2021.113014. Online ahead of print.	The contamination of 2,2',4,4'-Tetrabrmodiphenyl ether (BDE-47) and perfluorooctanoic acid (PFOA) has drawn a worldwide attention over the risks in ecological and food safety. In this work, blue mussel (Mytilus galloprpvincialis) was employed to investigate the combined effects of BDE-47 (10 ng mL(-1)) and PFOA (100 ng mL(-1)) on tissue distribution, accumulation, elimination, and toxicity. Results suggested that BDE-47 and PFOA accumulated mostly in digestive gland, followed by gills and gonad, and M. galloprovincialis displayed higher accumulation capacity to BDE-47 than PFOA. Co-exposure treatment reduced the accumulation of BDE-47, and enhanced the accumulation of PFOA. Furthermore, biochemical and histopathological tests revealed that the aggravated toxicity in co-exposure groups was mainly attributed to the oxidative stress and damage of tissue structure. This work could be helpful to get a better understanding of the combined behaviors and cumulative risks of BDE-47 and PFOA in marine ecosystem.		В

No.	分野 (参考)	著者	タイトル	発行年書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン 文 ク 献 ① ラ ② ラ
D558	蓄積性	Du, Di; Lu, Yonglong; Zhou, Yunqiao; Li, Qifeng; Zhang, Meng; Han, Guoxiang; Cui, Haotian; Jeppesen, Erik	Bioaccumulation, trophic transfer and biomagnification of perfluoroalkyl acids (PFAAs) in the marine food web of the South China Sea	J Hazard Mater. 2021 Mar 5;405:124681. doi: 2021 10.1016/j.jhazmat.2020.124681. Epub 2020 Nov 27.	Knowledge about bioaccumulation and trophic transfer in food webs is of tremendous importance in contaminant hazards evaluation. Perfluoroalkyl acids (PFAAs) are widely distributed, and its emissions to coastal areas have posed a threat to the health of marine organisms and consumers. In this study, 15 species were sampled from Qinzhou Bay of the South China Sea. The concentrations of PFAAs in organisms were detected by liquid chromatography-mass spectrometry, and the trophic positions of organisms were constructed based on nitrogen isotope analysis. PFAAs were found in all organisms. The contents of PFOS in all organisms were higher than of PFOA, and the proportions of short-chain PFAAs were higher in the low trophic positioned organisms, while long-chain PFAAs were higher in the high trophic positioned organisms. Moreover, the bioaccumulation factors (BAFs) increased with the increasing number of fluorocarbon atoms. The trophic magnification factor (TMF) and the biomagnification factors (BMFs), calculated from the constructed food webs, together suggested potential biomagnification effects of PFOS, while less clear results were found for PFOA. Our results further indicate that previously banned long-chain PFAAs had persistent residuals in this coastal marine ecosystem, and that emerging short-chain PFAAs had high concentrations in some species but showed no biomagnification.			В
D559	蓄積性	Stockin, K A; Yi, S; Northcott, G L; Betty, E L; Machovsky- Capuska, G E; Jones, B; Perrott, M R; Law, R J; Rumsby, A; Thelen, M A; Graham, L; Palmer, E I; Tremblay, L A	Per- and polyfluoroalkyl substances (PFAS), trace elements and life history parameters of mass- stranded common dolphins (Delphinus delphis) in New Zealand	2021 Mar Pollut Bull. 2021 Dec;173(Pt A):112896. doi: 10.1016/j.marpolbul.2021.112896. Epub 2021 Sep 30.	Profiles of 33 PFAS analytes and 12 essential and non-essential trace elements were measured in livers of stranded common dolphins (Delphinus delphis) from New Zealand. PFAS concentrations reported were largely comparable to those measured in other marine mammal species globally and composed mostly of long-chain compounds including perfluorooctanesulfonic acid (PFOS), perfluorododecanoic acid (PFDoDA), perfluorotridecanoic acid (PFTrDA) and perfluorooctanesulfonamide (FOSA). PFAS profiles did not vary significantly by location, body condition, or life history. Notably, significant positive correlations were observed within respective PFAS and trace elements. However, only negative correlations were evident between these two contaminant types, suggesting different exposure and metabolic pathways. Age-associated concentrations were found for PFTrDA and four trace elements, i.e. silver, mercury, cadmium, selenium, indicating differences in the bioaccumulation biomagnification mechanisms. Overall, our results contribute to global understanding of accumulation of PFAS by offering first insights of PFAS exposure in cetaceans living within South Pacific Australasian waters.			В
D560	蓄積性	Groffen, Thimo; Prinsen, Els; Devos Stoffels, Ona-Abeni; Maas, Layla; Vincke, Pieter; Lasters, Robin; Eens, Marcel; Bervoets, Lieven	PFAS accumulation in several terrestrial plant and invertebrate species reveals species-specific differences	2022 Environ Sci Pollut Res Int. 2022 Nov 4. doi: 10.1007/s11356- 022-23799-8. Online ahead of print.	regarding their bioavailability in the terrestrial environment. Therefore, this study investigated the influence of soil characteristics and PFAS concentrations on the adsorption of PFAS to soil and their influence on the PFAS bioavailability to terrestrial plants and invertebrates. PFAS concentrations and profile were compared among different invertebrate and plant species and differences between leaves and fruits/nuts of the plant species were assessed. Soil concentrations were primarily affected by organic carbon content. The PFAS accumulation in biota was, except for PFOA concentrations in nettles, unrelated to the soil concentrations, as well as to the soil characteristics. The PFAS profiles in soil and invertebrates were mainly dominated by PFOA and PFOS, whereas short-chained PFAS were more abundant in plant tissues. Our results show that different invertebrate taxa accumulate different PFAS, likely due to dietary differences. Both long-chained and, to lesser extent, short-chained PFAS were observed in herbivorous invertebrate taxa, whereas the carnivorous invertebrates only accumulated long-chained PFAS. Correlations were observed between PFOA concentrations in herbivorous invertebrates and in the leaves of some plant species, whereas such relationships were absent for the carnivorous spiders. It is essential to continuously monitor PFAS exposure in terrestrial organisms, taking into account differences in bioaccumulation, and subsequent potential toxicity, among taxa, in order to protect the terrestrial ecosystem.			В
D561	蓄積性	Brase, Richard A; Schwab, Holly E; Li, Lingyun; Spink, David C	Elevated levels of per- and polyfluoroalkyl substances (PFAS) in freshwater benthic macroinvertebrates from the Hudson River Watershed	2022 ^{Chemosphere.} 2022 Mar;291(Pt 2):132830. doi: 10.1016/j.chemosphere.2021.132830. Epub 2021 Nov 8.	Per- and polyfluoroalkyl substances (PFAS) are contaminants of global concern due to their persistence and associated negative health effects. Considerable attention has been given to monitoring PFAS in the aquatic environment, however, few investigations have done so using freshwater benthic macroinvertebrates (BMIs). As these bottom-dwelling animals are known to bioconcentrate exogenous pollutants to a high degree, studying their PFAS levels may provide a more integrated view of PFAS contamination in the aquatic environment. In this study, BMIs, sediment, and surface water were collected from two streams in the Hudson River Watershed (one historically-impacted by PFAS) and analyzed for 44 PFAS using liquid chromatography-tandem mass spectrometry (LC-MS/MS). Orbitrap high-resolution mass spectrometry (HRMS) was used to confirm the identities of quantitated analytes. Across all matrices, 17 analytes were detected with PFOA dominating in surface water and PFOS in sediment/BMIs. PFOS bioaccumulation factors (BAFs) were approximately one order of magnitude higher than those of PFOA and ranged from 857 to 5151 L kg(-1) across different BMI taxa. While PFAS concentrations in surface water and sediment were not excessively high, elevated levels were still measured in most BMI taxa. This observation suggests that the extent of PFAS contamination in a local system may be severely underestimated if only surface water and sediment are used for monitoring. Moreover, these findings have relevance for human exposure assessment considering BMIs are the primary food source of many fish.			в

別添−Z 乂厭テーダペース乂厭リスト	献データベース文献リスト
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No.	分野 (参考)	著者	タイトル	発行年書誌情報	要旨 (原文)	備考	出 対 報 掛	ン文 ン文 ク献 ① ラ ② ラ	
D562	蓄積性	Rijnders, Jet; Bervoets, Lieven; Prinsen, Els; Eens, Marcel; Beemster, Gerrit T S; AbdElgawad, Hamada; Groffen, Thimo	Perfluoroalkylated acids (PFAAs) accumulate in field- exposed snails (Cepaea sp.) and affect their oxidative status	2021 Sci Total Environ. 2021 Oct 10;790:148059. doi: 10.1016/j.scitotenv.2021.148059. Epub 2021 May 27.	Perfluoroalkyl acids (PFAAs) are a group of synthetic persistent chemicals with distinctive properties, such as a high thermal and chemical stability, that make them suitable for a wide range of applications. They have been produced since the 1950s, resulting in a global contamination of the environment and wildlife. They are resistant to biodegradation and have the tendency to bio-accumulate in organisms and bio-magnify in the food chain. However, little is known about the bioaccumulation of PFAAs in terrestrial invertebrates, including how they affect the physiology and particularly oxidative status. Therefore, we studied the bioaccumulation of PFAAs in snails that were exposed for 3 and 6 weeks along a distance gradient radiating from a well-known fluorochemical hotspot (3M). In addition, we examined the potential effects of PFAAs on the oxidative status of these snails. Finally, we tested for relationships between the concentrations of PFAAs in snails with those in soil and nettles they were feeding on and the influence of soil physicochemical properties on these relationships. Our results showed higher concentrations of PFOA and/or PFOS in almost every matrix at the 3M site, but no concentration gradient along the distance gradient. The PFOS concentrations in snails were related to those in the nettles and soil, and were affected by multiple soil properties. For PFOA, we observed no relationships between soil and biota concentrations. Short-chained PFAAs were dominant in nettles, whereas in soil and snails long-chained PFAAs were dominant. We found a significant positive correlation between peroxidase, catalase and peroxiredoxins and PFAA concentrations, suggesting that snails, in terms of oxidative stress (OS) response, are possibly susceptible to PFAAs pollution. CAPSULE: We observed a positive correlation between the levels of PFAAs and the antioxidants peroxidase, catalase and peroxiredoxins in snails, exposed on nettles grown at contaminated sites.			В	
D563	蓄積性	Jang, Mi; Shim, Won Joon; Han, Gi Myung; Ha, Sung Yong; Cho, Youna; Kim, Miran; Hong, Sang Hee	Spatial distribution and temporal trends of classical and emerging persistent organic pollutants (POPs) in black-tailed gull (Larus crassirostris) eggs from Korea	2022 Sci Total Environ. 2022 Nov 1;845:157244. doi: 10.1016/j.scitotenv.2022.157244. Epub 2022 Jul 9.	This study monitored the spatiotemporal trends of persistent organic pollutants (POPs) contamination along the Korean coasts using eggs of the black-tailed gull, a resident bird that occupies a high trophic position in the marine food web. Black-tailed gull eggs were collected from three breeding islands located in the western (Seoman-do), southern (Hong-do), and eastern (Dok-do) seas of Korea during 2015-2019, and egg contents were analyzed for classical and emerging POPs. Among the target analytes, levels of emerging POPs such as brominated flame retardants (BFRs) and perfluoroalkyl acids (PFAAs) were significantly higher in eggs from Seoman-do than other islands. Global positioning system tracking data show that seagulls from Seoman-do traveled frequently to two neighboring major cities (Incheon and Seoul), indicating that the accumulation of BFRs and PFAAs in bird eggs is directly affected by the pollution characteristics of urban areas. Overall, the ratios of PFAA and BFR to the total POPs in eggs from the islands increased over time, while the proportion of classical POPs decreased. A shift from classical POPs to BFRs and PFAAs in seagull eggs was identified. Interestingly, perfluorooctanoic acid (PFOA), which exhibits limited bioaccumulation, was detected at higher levels in eggs from Seoman-do, indicating widespread use of PFOA and maternal transfer to seabird eggs. Continuous monitoring of PFAAs in marine environments of Korea is needed. This study demonstrates that monitoring of seabird eggs is effective for detecting spatial and temporal trends of POPs in the marine environment, and provides insights into emerging POPs such as PFAAs.			В	
D564	蓄積性	Lv, Guochun; Sun, Xiaomin	The molecular-level understanding of the uptake of PFOS and its alternatives (6:2 CI-PFESA and OBS) into phospholipid bilayers	2021 J Hazard Mater. 2021 Sep 5;417:125991. doi: 10.1016/j.jhazmat.2021.125991. Epub 2021 May 4.	Bioaccumulation of perfluoroalkyl and polyfluoroalkyl substances (PFASs) is an important indicator of their hazard. Partitioning to membrane phospholipids is one of the pathways for their bioaccumulation. However, the molecular mechanism on PFASs uptake into membrane phospholipids is not yet to be fully understood. In this work, we used molecular dynamics (MD) simulations to study the uptake processes of PFOS and its alternatives (6:2 CI-PFESA and OBS) into DPPC bilayers, and to evaluate their interaction with DPPC bilayers and their effect on properties of DPPC bilayers. The result of free energy changes shows that a barrier of 2-3 kcal mol(-1) exists when these adsorbed PFASs on the surface are absorbed into DPPC bilayers. After incorporating into DPPC bilayers, three DPPC molecules interact with and thus stabilize a PFOS (or 6:2 CI-PFESA or OBS) molecule. And another role of the three DPPC molecules is to shield these PFASs from exposure to water environment. These PFASs have the similar condensing effect on the model membrane. The molecular-level study is beneficial for understanding the bioaccumulation and toxicity of PFOS and its alternatives.			В	
D565	蓄積性	Álvarez-Ruiz, Rodrigo; Picó, Yolanda; Campo, Julián	Bioaccumulation of emerging contaminants in mussel (Mytilus galloprovincialis): Influence of microplastics	2021 Sci Total Environ. 2021 Nov 20;796:149006. doi: 10.1016/j.scitotenv.2021.149006. Epub 2021 Jul 13.	Coastal environments are heavily influenced by human activities. Chemical substances considered as emerging contaminants (ECs) are one of the most important indicators of the anthropic influence on the environment, and they have recently shown to interact with microplastics (MPs). Mussels are suitable for in-lab bioacumulation studies providing insight about the occurrence and fate of contaminants in the organisms. In this study, bioacummulation of 20 chemical substances catalogued as ECs, including pharmaceuticals and personal care products (PPCPs), pesticides, and perfluoroalkyl substances (PFASs) in Mytilus galloprovincialis was assessed, with or without the influence of the presence of MPs. Mussels were distributed in three groups: control (B), exposed to ECs (C) and exposed to ECs and polyethylene MPs (C+M). The study was carried out for 58 days separated in two stages (i) exposure during days 0-28, and (ii) depuration during days 29-58. Visceral mass and haemolymph of the mussels were extracted separately, using QuEChERS and solid phase extraction (SPE), respectively. Then, extracts were analysed via UHPLC-MS/MS. Results showed that 3 PPCPs, 4 pesticides and 3 PFASs accumulated in visceral mass with bioconcentration factors (BCFs) ranging 6.7-15000 L/kg/d. In addition, 2 PPCPs, 2 pesticides and PFPeA were detected in haemolymph showing BCFs ranging 0.9-3.3 L/kg/d. When comparing C and C+M, MPs worked as a vector for the accumulation of the PFASs: PFOA, PFOS, PFDA and PFPeA; showing higher BCFs in the presence of MPs. Furthermore, the elimination of PFDA and PFOS was slower in the mussels exposed to MPs. On the other hand, the pesticides terbuthylazine and chlorpyrifos showed lower BCFs and more rapid elimination in the mussels exposed to MPs.			В	
No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン文 ン文 ク献 ① ラ ② ラ
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D566	蓄積性	Glaser, David; Lamoureux, Elizabeth; Opdyke, Dan; LaRoe, Sarah; Reidy, Deirdre; Connolly, John	The impact of precursors on aquatic exposure assessment for PFAS: Insights from bioaccumulation modeling	2021	Integr Environ Assess Manag. 2021 Jul;17(4):705-715. doi: 10.1002/ieam.4414. Epub 2021 May 13.	Risk assessment for per- and polyfluoroalkyl substances (PFAS) is complicated by the fact that PFAS include several thousand compounds. Although new analytical methods have increased the number that can be identified in environmental samples, a significant fraction of them remain uncharacterized. Perfluorooctane sulfonate (PFOS) is the PFAS compound of primary interest when evaluating risks to humans and wildlife owing to the consumption of aquatic organisms. The exposure assessment for PFOS is complicated by the presence of PFOS precursors and their transformation, which can occur both in the environment and within organisms. Thus, the PFOS to which wildlife or people are exposed may consist of PFOS that was discharged directly into the environment and/or other PFOS precursors that were transformed into PFOS. This means that exposure assessment and the development of remedial strategies may depend on the relative concentrations and properties not only of PFOS but also of other PFAS that are transformed into PFOS. A bioaccumulation model was developed to explore these issues. The model embeds toxicokinetic and bioenergetic components within a larger food web calculation that accounts for uptake from both food and water, as well as predator-prey interactions. Multiple chemicals are modeled, including parent-daughter reactions. A series of illustrative simulations explores how chemical properties can influence exposure assessment and remedial decision making. Integr			С
D567	蓄積性	Robuck, Anna R; Cantwell, Mark G; McCord, James P; Addison, Lindsay M; Pfohl, Marisa; Strynar, Mark J; McKinney, Richard; Katz, David R; Wiley, David N; Lohmann, Rainer	Legacy and Novel Per- and Polyfluoroalkyl Substances in Juvenile Seabirds from the U.S. Atlantic Coast	2020	Environ Sci Technol. 2020 Oct 20;54(20):12938-12948. doi: 10.1021/acs.est.0c01951. Epub 2020 Oct 7.	Per- and polyfluoroalkyl substances (PFAS) are anthropogenic, globally distributed chemicals. Legacy PFAS, including perfluorooctane sulfonate (PFOS), have been regularly detected in marine fauna but little is known about their current levels or the presence of novel PFAS in seabirds. We measured 36 emerging and legacy PFAS in livers from 31 juvenile seabirds from Massachusetts Bay, Narragansett Bay, and the Cape Fear River Estuary (CFRE), United States. PFOS was the major legacy perfluoroalkyl acid present, making up 58% of concentrations observed across all habitats (range: 11-280 ng/g). Novel PFAS were confirmed in chicks hatched downstream of a fluoropolymer production site in the CFRE: a perfluorinated ether sulfonic acid (Nafion byproduct 2; range: 1-110 ng/g) and two perfluorinated ether carboxylic acids (PFO(4)DA and PFO(5)DoDA; PFO(5)DoDA range: 5-30 ng/g). PFOS was inversely associated with phospholipid content in livers from CFRE and Massachusetts Bay individuals, while δ (13)C, an indicator of marine versus terrestrial foraging, was positively correlated with some long-chain PFAS in CFRE chick livers. There is also an indication that seabird phospholipid dynamics are negatively impacted by PFAS, which should be further explored given the importance of lipids for seabirds.			В
D568	蓄積性	Di Nisio, Andrea; Pannella, Micaela; Vogiatzis, Stefania; Sut, Stefania; Dall'Acqua, Stefano; Rocca, Maria Santa; Antonini, Angelo; Porzionato, Andrea; De Caro, Raffaele; Bortolozzi, Mario; Toni, Luca De; Foresta, Carlo	Impairment of human dopaminergic neurons at different developmental stages by perfluoro-octanoic acid (PFOA) and differential human brain areas accumulation of perfluoroalkyl chemicals	2022	Environ Int. 2022 Jan;158:106982. doi: 10.1016/j.envint.2021.106982. Epub 2021 Nov 12.	Perfluoroalkyl substances (PFASs) are synthetic chemicals widely used in industrial and consumer products. The environmental spreading of PFASs raises concerns for their impact on human health. In particular, the bioaccumulation in humans due to environmental exposure has been reported also in total brain samples and PFAS exposure has been associated with neurodevelopmental disorders. In this study we aimed to investigate the specific PFAS bioaccumulation in different brain areas. Our data reported major accumulation in the brainstem region, which is richly populated by dopaminergic neurons (DNs), in brain autopsy samples from people resident in a PFAS-polluted area of Italy. Since DNs are the main source of dopamine (DA) in the mammalian central nervous system (CNS), we evaluated the possible functional consequences of perfluoro-octanoic acid (PFOA) exposure in a human model of DNs obtained by differentiation of human induced pluripotent stem cells (hiPSCs). Particularly, we analyzed the specific effect of the exposure to PFOA for 24 h, at the concentration of 10 ng/ml, at 3 different steps of dopaminergic differentiation phase (DP3). Interestingly, compared to untreated cells, exposure to PFOA was associated with a reduced expression of Tyrosine Hydroxylase (TH) and Neurofilament Heavy (NFH), both markers of dopaminergic maturation at DP2 phase. In addition, cells at DP3 phase exposed to PFOA showed a severe reduction in the expression of the Dopamine Transporter (DAT), functionally involved in pre-synaptic dopamine reuptake. In this proof-of-concept study we show a significant impact of PFOA exposure, mainly on the most sensitive stage of neural dopaminergic differentiation, prompting the way for further investigations more directly relevant to risk assessment of these chemicals.			В

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン文ン文 ク献ク献 ① ラ ② ラ
D569	蓄積性	Burkhard, Lawrence P; Votava, Lauren K	Biota-Sediment Accumulation Factors (BSAFs) for Per- and Polyfluorinated Substances (PFAS)	2022	Environ Toxicol Chem. 2022 Nov 18. doi: 10.1002/etc.5526. Online ahead of print.	Per- and polyfluoroalkyl substances (PFAS) are widely used in commercial products such textiles, firefighting foams, and surface coatings across the globe and some PFAS are known to be bioaccumulative in aquatic species. The ultimate sink for numerous anthropogenic chemicals is the sediments in the lakes, rivers, and oceans. To understand the relationship between sediment and aquatic species, a literature search was performed and biota-sediment accumulation factors (BSAFs) data for 17 taxonomic classes were assembled. The carbonyl and sulfonyl PFAS classes were relatively data rich while phosphate (no measurements), ether (one chemical), and fluorotelomer (limited number of chemicals) PFAS classes are data poor. Taxonomic classes of Teleostei and Clitellata had the largest BSAFs while Magnoliopsida and Bivalvia had smallest BSAFs and BSAFs (kg-OC/kg-ww) values greater than 1 were very rare. Across all studies, median (\pm standard deviation) whole body Teleostei BSAFs for PFOS and PFOA (kg-OC/kg-ww) were 0.0580 (\pm 0.445, n=60) and 0.00283 (\pm 0.103,24), respectively. Laboratory measured BSAFs were consistently larger than field measured BSAFs, i.e., 53 of 67 comparing BSAFs within a taxonomic class, BSAFs were significantly different ($\alpha = 0.05$). Comparing BSAFs within a taxonomic class, BSAFs were significantly different for 63% of the taxonomic classes. Elimination kinetics for benthic invertebrates suggests steady-state conditions might be reached in the 28-day uptake portion of a laboratory bioaccumulation test for some test species. The largest data gaps, beyond limited measurements, are understanding the effects of concentration and mixtures upon bioaccumulation from sediments, quantifying the difference if any in BSAFs between freshwater and brackish/marine ecosystems, and models for predicting BSAFs based upon concentrations in sediment. This article is protected by copyright. All rights reserved. Environ Toxicol Chem 2022;00:0-0. © 2022 SETAC.			В
D570	蓄積性	Groffen, Thimo; Bervoets, Lieven; Eens, Marcel	Temporal trends in PFAS concentrations in livers of a terrestrial raptor (common buzzard; Buteo buteo) collected in Belgium during the period 2000-2005 and in 2021	2022	Environ Res. 2022 Oct 25;216(Pt 2):114644. doi: 10.1016/j.envres.2022.114644. Online ahead of print.	Per- and polyfluoroalkyl substances (PFAS) are anthropogenic chemicals that have been globally distributed. Biological time series data suggest variation in temporal PFAS concentrations due to regulations and the phase-out of multiple PFAS analytes. Nonetheless, biomonitoring temporal trends of PFAS concentrations in raptors has only been done sporadically in Europe at a national scale. In the present study, we examined the concentrations of 28 PFAS in livers of common buzzard (Buteo buteo) collected in Belgium in the period 2000-2005 and in 2021. Despite the regulations and phase-out, the Σ PFAS concentrations remained similar in the livers over the past 20 years. However, over time the abundance of perfluoroctane sulfonate (PFOS), dominant in livers collected in 2000-2005, to the Σ PFAS concentration decreased from 46% to 27%, whereas the abundance of perfluorotetradecanoic acid (PFTeDA), dominant in 2021, increased from 19% to 43%. The PFOS concentrations in the present study did not exceed the Toxicity Reference Values (TRVs), which were determined in liver on the characteristics of an avian top predator. The absence of temporal changes in PFAS concentrations is hypothesized to be due to a lagged response in environmental concentrations compared to atmospheric concentrations.			В
D571	蓄積性	Cheng, Haixiang; Lv, Chenhan; Li, Jianhui; Wu, Dexin; Zhan, Xugang; Song, Ying; Zhao, Nan; Jin, Hangbiao	Bioaccumulation and biomagnification of emerging poly- and perfluoroalkyl substances in marine organisms	2022	Sci Total Environ. 2022 Dec 10;851(Pt 2):158117. doi: 10.1016/j.scitotenv.2022.158117. Epub 2022 Aug 17.	Accumulating evidence has demonstrated the wide environmental presence of 6:2 chlorinated polyfluoroalkyl ether sulfonates (6:2 CI-PFAES) and p-perfluorous nonenoxybenzene sulfonate (PFNOBS). However, data on the bioaccumulation and trophic magnification of these emerging poly- and perfluoroalkyl substances (PFASs) in subtropical marine environment is still limited. In this study, seawater (n = 17), sediment (n = 14), and marine organism (27 species; n = 177) samples were collected from East China Sea, and analyzed them for legacy and emerging PFASs. Besides perfluoroalkyl carboxylates and perfluoroactane sulfonate (PFOS), 6:2 CI-PFAES was always among the predominant PFASs detected in seawater, sediment, and marine organism. For emerging PFASs, 6:2 CI-PFAES (mean \pm SD, 3.1 \pm 0.17), 8:2 CI-PFAES (3.3 \pm 0.35), and PFNOBS (3.3 \pm 0.19) had lower bioaccumulation factors (BAF) than PFOS (3.4 \pm 0.22) in marine fish. In crab, PFNOBS (3.7 \pm 0.33) had a lower biota-sediment accumulation factor (BSAF) than PFOS (3.9 \pm 0.45). In snail, among all detected PFASs, PFNOBS (4.0 \pm 0.42) had the highest mean log BSAF value. 8:2 CI-PFAES consistently had a higher log BSAF value than 6:2 CI-PFAES in snail and crab. Notably, these differences in BAF and BSAF are not significant. Among PFASs, 6:2 CI-PFAES (2.3; 95 % confidence interval, CI: 1.9-2.6) displayed the highest trophic magnification factor (TMF). PFNOBS had the lowest TMF value (1.8, 95 % CI: 1.4-2.1), but which still indicates its weak biomagnification through the current marine food web. This is the first study reporting the bioaccumulation and biomagnification of PFNOBS in marine organisms, which deepens the understanding of its environmental behavior in the marine ecosystem.			В
D572	蓄積性	Szabo, Drew; Moodie, Damien; Green, Mark P; Mulder, Raoul A; Clarke, Bradley O	Field-Based Distribution and Bioaccumulation Factors for Cyclic and Aliphatic Per- and Polyfluoroalkyl Substances (PFASs) in an Urban Sedentary Waterbird Population	2022	Environ Sci Technol. 2022 Jun 21;56(12):8231-8244. doi: 10.1021/acs.est.2c01965. Epub 2022 Jun 9.	The field-based distribution and bioaccumulation factor (BAF) for per- and polyfluoroalkyl substances (PFASs) were determined in residential Black Swans (Cygnus atratus) from an urban lake (Melbourne, Australia). The concentrations of 46 aliphatic and cyclic PFASs were determined by HPLC-MS/MS in serum and excrement from swans, and water, sediment, aquatic macrophytes, soil, and grass samples in and around the lake. Elevated concentrations of Σ (46)PFASs were detected in serum (120 ng mL(-1)) and excrement (110 ng g(-1) dw) were strongly related indicating a potential noninvasive sampling methodology. Environmental concentrations of PFASs were consistent with a highly impacted ecosystem and notably high concentrations of perfluoro-4- ethylcyclohexanesulfonate (PFECHS, 67584-42-3; C(8)HF(15)SO(3)) were detected in water (27 ng L(-1)) and swan serum (16 ng mL(-1)). In the absence of credible putative alternative sources of PFECHS input to the lake, we propose that the use of high- performance motorsport vehicles is a likely source of contamination to this ecosystem. The BAF of perfluorocarboxylic acids increased with each additional CF(2) moiety from PFOA (15.7 L kg(-1) ww) to PFDoDA (3615 L kg(-1) ww). The BAF of PFECHS was estimated as 593 L kg(-1) ww, which is lower compared with that of PFOS (1097 L kg(-1) ww).			В

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン 文 ク 献 ① ラ ② ラ
D573	蓄積性	Miranda, Daniele A; Benskin, Jonathan P; Awad, Raed; Lepoint, Gilles; Leonel, Juliana; Hatje, Vanessa	Bioaccumulation of Per- and polyfluoroalkyl substances (PFASs) in a tropical estuarine food web	2021	Sci Total Environ. 2021 Feb 1;754:142146. doi: 10.1016/j.scitotenv.2020.142146. Epub 2020 Sep 2.	The biomagnification of per- and polyfluoroalkyl substances (PFASs) was investigated in a tropical mangrove food web from an estuary in Bahia, Brazil. Samples of 44 organisms (21 taxa), along with biofilm, leaves, sediment and suspended particulate matter were analyzed. Sum (Σ) PFAS concentrations in biota samples were dominated by perfluoroctane sulfonate (PFOS, 93% detection frequency in tissues; 0.05 to 1.97 ng g(-1) ww whole-body (wb)), followed by perfluorotridecanoate (PFTrDA, 57%; 0.01 to 0.28 ng g(-1) ww wb). PFOS precursors such as perfluoroctane sulfonamide (FOSA, 54%; 0.01 to 0.32 ng g(-1) ww wb) and N-ethyl perfluoroctane sulfonamide (EtFOSA; 30%; 0.01 to 0.21 ng g(-1) ww wb) were also detected. PFAS accumulation profiles revealed different routes of exposure among bivalve, crustacean and fish groups. Statistics for left-censored data were used in order to minimize bias on trophic magnification factors (TMFs) calculations. TMFs >1 were observed for PFOS (linear + branched isomers), and perfluorononanoate (PFNA), and in all cases, dissimilar accumulation patterns were observed among different trophic positions. The apparent biodilution of some long-chain PFCAs through the food chain (TMF < 1) may be due to exposure from multiple PFAS sources. This is the first study investigating bioaccumulation of PFASs in a tropical food web and provides new insight on the behavior of this ubiquitous class of contaminants.			В
D574	蓄積性	Joerss, Hanna; Schramm, Thekla-Regine; Sun, Linting; Guo, Chao; Tang, Jianhui; Ebinghaus, Ralf	Per- and polyfluoroalkyl substances in Chinese and German river water - Point source- and country- specific fingerprints including unknown precursors	2020	Environ Pollut. 2020 Dec;267:115567. doi: 10.1016/j.envpol.2020.115567. Epub 2020 Aug 31.	This study aimed at comparing source-specific fingerprints of per- and polyfluoroalkyl substances (PFASs) in river water from China and Germany, selected as countries with different histories of PFAS production. Samples were collected from up- and downstream of seven suspected point sources in autumn 2018. Amongst the 29 analyzed legacy and emerging PFASs, 24 were detected, with a sum ranging from 2.7 ng/L (Alz River) to 420,000 ng/L (Xiaoqing River). While mass flow estimates for the Xiaoqing River and Yangtze River (mean: 20 and 43 t/y, respectively) indicated ongoing high emissions of the legacy compound PFOA in China, its ether-based replacements HFPO-DA and DONA showed the highest contribution downstream of a German fluoropolymer manufacturing site (50% and 40% of Σ PFASs measured, respectively). In river water impacted by manufacturing sites for pharmaceutical and pesticide intermediates, the short-chain compound PFBS was the most prevalent substance in both countries. The German Ruhr River, receiving discharges from the electroplating industry, was characterized by the PFOS replacement 6:2 FTSA. Isomer profiling revealed a higher proportion of branched isomers in the Chinese Xi River and Xiaoqing River than in other rivers. This points to different synthesis routes and underlines the importance of differentiating between linear and branched isomers in risks assessments. Upon oxidative conversion in the total oxidizable precursor (TOP) assay, the increase of the short-chain compound PFBA was higher in German samples than in Chinese samples (88 \pm 30% versus 12 \pm 14%), suggesting the presence of a higher proportion of unknown precursors to PFBA in the German environment. Amongst the ether- based replacements, DONA and 6:2 CI-PFESA were fully or partially degraded to non-targeted oxidation products, whereas HFPO- DA showed no degradation. This indicates that the inclusion of ether-based PFASs and their oxidation products in the TOP assay can help in capturing a larger amount of the unknown PFAS fracti			В
D575	蓄積性	Beale, David J; Nilsson, Sandra; Bose, Utpal; Bourne, Nicholas; Stockwell, Sally; Broadbent, James A; Gonzalez- Astudillo, Viviana; Braun, Christoph; Baddiley, Brenda; Limpus, Duncan; Walsh, Tom; Vardy, Suzanne	Bioaccumulation and impact of maternal PFAS offloading on egg biochemistry from wild-caught freshwater turtles (Emydura macquarii macquarii)	2022	Sci Total Environ. 2022 Apr 15;817:153019. doi: 10.1016/j.scitotenv.2022.153019. Epub 2022 Jan 11.	Per- and polyfluoroalkyl substances (PFAS) are persistent synthetic contaminants that are pervasive in the environment. Toxicity resulting from elevated PFAS concentrations in wildlife has been studied, yet evidence of their accumulation, developmental toxicity and maternal offloading in egg-laying species is limited. Here we show the maternal offloading of PFAS in freshwater short-necked turtles (Emydura macquarii macquarii) exposed to elevated PFAS and the resulting biological impact on oviducal eggs. Total PFAS concentrations were determined in serum from adult females and harvested oviducal eggs collected from euthanised turtles exposed to low and high levels of PFAS and compared against turtle serum and eggs collected from a suitable reference site. Multi-omics assays were utilised to explore the biochemical impact of elevated PFAS on egg albumen, yolk and eggshell using a range of metabolomics, lipidomics, and proteomics techniques. Eggshells were also screened for metals by Inductively Coupled Plasma Mass Spectrometry (ICP-MS). Analysis of the serum collected from adult female turtles and their oviducal eggs demonstrated PFAS offloading and transference that is 1.6 and 5.3 times higher in the low and high PFAS impacted eggs, respectively, compared to maternal serum concentrations. Oviducal egg success resignificantly elevated in purine metabolism metabolites, which are tied to potential biological dysfunctional processes. The yolks were significantly depleted in lipids and lipid quality tied to growth and development. The high PFAS impacted oviducal eggshells were lower in calcium, important developmental and immune response proteins, and higher in glycerophosphoethanolamines (PE) lipids and histidine metabolism metabolites that are tied to a weakened physical structure. Further investigation is needed to establish the rate of PFAS offloading and quantify the developmental impact on hatchling and hatchling success to fully demonstrate PFAS-developmental toxicity linkages.			В

分野 タイトル 発行年 書誌情報 要旨 (原文) No. 著者 (参考) Previous studies have shown that accumulation of perfluoroalkyl acids (PFAAs) in the tissue Movement and migration patterns in these species represent an important consideration wh Taylor, Matthew accumulation in exposed biota, and may have a large influence on the risk profiles for migrat D; Gillanders, relationships between PFAA concentrations in muscle and liver tissue, and recent fish migra Bronwyn M; profiles in fish otoliths, otherwise known as otolith chemistry) were evaluated in Sea Mullet Migration histories and perfluoroalkyl acid (PFAA) Environ Pollut. 2021 May 1;276:116686. doi: Nilsson. Sandra PFAAs, and higher concentrations, were found in liver compared to muscle tissue. Perfluoro 2021 10.1016/j.envpol.2021.116686. Epub 2021 Feb 7. 蓄積性 D576 loads in an estuarine fish: A novel union of analyses to Bräunig, Jennifer in highest concentrations in both muscle and liver tissues, and there was strong correlation inderstand variation in contaminant concentrations Barnes, Thomas tissues. PFOS was found to decrease and increase alongside recent strontium and barium o C: Mueller. otolith, suggesting higher concentrations of PFAAs in fish recently exposed to comparatively Jochen F study highlights how otolith chemistry can be employed to examine links between contamina recent migration history. This approach shows promise for studying contaminant residues in natural environment Pickard, Heidi M; Per- and polyfluoroalkyl substances (PFAS) are a diverse class of fluorinated anthropogenic Ruyle, Bridger J acids (PFAA), which are widely used in modern commerce. Many products and environmenta precursors that can degrade into terminal PFAA associated with adverse health effects. Fish Thackray, Colin P; Chovancova, exposure source for PFAS that bioaccumulate in food webs. However, little is known about t Adela; Here, we identify and quantify PFAS in recreational fish species collected from surface wate Dassuncao toolbox of analytical methods. Targeted analysis of paired water and tissue samples suggest Environ Sci Technol. 2022 Nov 15;56(22):15573-15583. doi: PFAS and Precursor Bioaccumulation in Freshwater D577 蓄積性 Clifton 2022 detection in water have a higher bioaccumulation potential than their terminal PFAA. Perfluc 10.1021/acs.est.2c03734. Epub 2022 Oct 24. Recreational Fish: Implications for Fish Advisories Becanova, Jitka; short-chain precursor produced by electrochemical fluorination, was detected in all fish sam Vojta, Simon; total oxidizable precursor assay interpreted using Bayesian inference revealed fish muscle ti Lohmann, chain precursors in high concentration samples. Suspect screening analysis indicated these precursors with three and five perfluorinated carbons. Fish consumption advisories are prime Rainer: Sunderland, Elsie perfluorooctane sulfonate (PFOS), but this work reinforces the need for risk evaluations to c NЛ PFAS, including perfluoroalkyl sulfonamide precursors. Although poly- and perfluorinated alkyl substances (PFAS) are ubiquitous in the Arctic, their environments remain unclear. Herein, abiotic media (water, snow, and sediment) and biotic Ali, Aasim M; fish, crab, and glaucous gull) were sampled to study PFAS uptake and fate in the marine foo Langberg, Håkon of Longvearbyen (Svalbard, Norwegian Arctic), Samples were collected from locations impact A; Hale, Sarah E (FFTS) and a landfill as well as from a reference site. Mean concentration in the landfill lead Kallenborn, was 365 ± 8.0 ng L(-1) in a freshwater pond and 57 ± 4.0 ng L(-1) in a creek in the vicinity Roland; Hartz, order of magnitude higher than in coastal seawater of the nearby fjord (maximum level, at t William F; the most predominant compound in all seawater samples and in freshly fallen snow (63-93% The fate of poly- and perfluoroalkyl substances in a Mortensen, Åse Environ Sci Process Impacts. 2021 Apr 1;23(4):588-604. doi: Longyear river and the reference site, PFCA \leq C(9) were the predominant PFAS (37-59%), ir 2021 10.1039/d0em00510j. Epub 2021 Mar 11. 蓄積性 D578 narine food web influenced by land-based sources in Karen: Ciesielsk and diffuse sources contributed to the exposure of the marine food web in the fjord. concent the Norwegian Arctic Tomasz Maciei: $(1.1 \pm 0.32 \ \mu \,\text{g kg}(-1) \ \text{ww})$ to polychaete $(2.8 \pm 0.80 \ \mu \,\text{g kg}(-1) \ \text{ww})$, crab $(2.9 \pm 0.70 \ \mu \,\text{g kg})$ McDonough, 0.87 μ g kg(-1) ww), and gull liver (62.2 ± 11.2 μ g kg(-1)). PFAS profiles changed with increases Carrie A: contribution of 6:2 FTS, FOSA and long-chained PFCA in zooplankton and polychaetes to bei Jenssen, Bjørn and gull liver. The PFOS isomer profile (branched versus linear) in the active FFTS and land Munro; A similar isomer profile was observed in seawater, indicating major contribution from local s Breedveld, Gijs D profile enriched by the linear isomer was observed in other media (sediment and biota). Sub PFBS, showed bioaccumulation potential in marine invertebrates. However, these compound higher trophic levels Perfluorooctane sulfonate (PFOS) is a legacy contaminant that has been detected globally w numerous species, including humans. Despite an international ban on its use, this unique co Aquilina-Beck organisms and their surroundings due to PFOS's inability to breakdown into nontoxic forms Allisan A; Reiner study, we analyzed the effects of a technical mixture of PFOS (linear and branched isomers) Jessica L; Chung Crassostrea virginica, at 2 days and 7 days exposure. Biomarker analysis (lysosomal destabi Uptake and Biological Effects of Perfluorooctane Katy W: DeLise. Arch Environ Contam Toxicol. 2020 Oct;79(3):333-342. doi: glutathione assays) in ovster tissue along with chemical analysis (liquid chromatography tan D579 蓄積性 2020 Sulfonate Exposure in the Adult Eastern Oyster 10.1007/s00244-020-00765-4. Epub 2020 Oct 15. Meaghan J; Key, oyster tissue and water samples revealed the oysters' ability to overcome exposures without Crassostrea virginica Peter B; membranes or the glutathione phase II enzyme system; however, significant cellular lysosom DeLorenzo, were able to eliminate up to 96% of PFOS at 0.3 mg/L and 3 mg/L exposures when allowed Marie E seawater. Chemical analysis showed the linear isomer to be the prevailing fraction of the res tissue. Results provide insight into possible detrimental cellular effects of PFOS exposure in contaminant persistence in ovster tissue.

	備考	出 対 象 抽	ン 文 ク 献 ① ラ	ン 文 ク 献 ② ラ
es of aquatic species is highly variable. ten evaluating contaminant tory seafood species. In this study, ation history (inferred from metals (Mugil cephalus). A greater number of octane sulfonate (PFOS) was present in concentrations between these two oncentrations (respectively) in the r lower salinity environments. This ant concentrations in fish, and their mobile seafood species within the			В	
chemicals that include perfluoroalkyl al samples contain abundant o consumption is an important dietary pioaccumulation of PFAA precursors. ers across New Hampshire, US, using a ts that many precursors below probutane sulfonamide (FBSA), a uples analyzed for this compound. The issue contained additional, short- were perfluoroalkyl sulfonamide arily being developed for consider additional bioaccumulative			В	
sources and fate in Arctic marine media (plankton, benthic organisms, ad web of an Arctic Fjord in the vicinity cted by a firefighting training site chate was 643 ± 84 ng L(-1), while it of the FFTS. These levels were an he FFTS impacted site). PFOS was 6 of). In freshwater samples from the ndicating that both local point sources trations increased from zooplankton rg(-1) ww whole-body), fish liver (5.4 \pm easing trophic level from a large ing dominated by linear PFOS in fish fill was similar to historical ECF PFOS. ources. However, a PFOS isomer estitutes for PFOS, namely 6:2 FTS and ds were not found in organisms at			В	
vithin the environment and throughout ontaminant continues to persist in resulting in bioaccumulation. In this 0 in the adult Eastern oyster, lization, lipid peroxidation, and odem mass spectrometry) of PFOS in t significant damage to lipid nal damage was observed. The oysters to depurate for 2 days in clean sidual PFOS contained in oyster addition to offering insight into			В	

No.	分野 (参考)	著者	タイトル	発行年書誌情報	要旨 (原文)	備考	出 対 象 抽	ン文 ン文 ク献 ク献 ① ラ ② ラ
D580	蓄積性	Ren, Junda; Point, Adam D; Baygi, Sadjad Fakouri; Fernando, Sujan; Hopke, Philip K; Holsen, Thomas M; Crimmins, Bernard S	Bioaccumulation of perfluoroalkyl substances in the lake Erie food web	2022 2022 Environ Pollut. 2022 Nov 15:120677. doi: 10.1016/j.envpol.2022.120677. Online ahead of print.	The bioaccumulation and biomagnification of perfluoroalkyl substances (PFAS) in the Lake Erie food web was investigated by analyzing surface water and biological samples including 10 taxa of fish species, 2 taxa of benthos and zooplankton. The carbon (δ (13)C) and nitrogen (δ (15)N) isotopic composition and fatty acids profiles of biological samples were used to evaluate the food web structure and assess the biomagnification of PFAS. Perfluorooctane sulfonate (PFOS) dominated the total PFAS (Σ PFAS) concentration (50-90% of Σ PFAS concentration), followed by C9-C11 perfluorinated carboxylic acids (PFCAs). The highest PFOS concentrations (79 ± 4.8 ng/g, wet weight (wwt)) and Σ PFAS (88 ± 5.2 ng/g, wwt) were detected in yellow perch (Perca flavescens). The C8-C14 PFAS biomagnification factors (BMFs) between apex piscivorous fish and prey fish were found to be generally greater than 1, indicative of PFAS biomagnification, while biodilution (BMF<1) was observed between planktivorous fish and zooplankton. Trophic magnification factors (TMFs) of C8-C14 PFCA were not correlated with perfluoroalkyl chain length. The C4-C9 PFAS were detected in the surface water of Lake Erie, and PFBA was found to have the highest concentrations (2.1-2.8 ng/L) among all PFAS detected. The log of bioaccumulation factor (BAF) was found to generally increase with increasing log K(ow) for C6, 8, and 9 PFAS in all selected species from three tropic levels.			В
D581	蓄積性	Bangma, Jacqueline; Guillette, Theresa C; Strynar, Mark; Lindstrom, Andrew; McCord, James; Hill, Donna; Lau, Christopher; Chernoff, Neil; Lang, Johnsie R	A rapid assessment bioaccumulation screening (RABS) study design for emerging per-and polyfluoroalkyl substances in mice exposed to industrially impacted surface water	2022 Chemosphere. 2022 Dec;308(Pt 1):136159. doi: 10.1016/j.chemosphere.2022.136159. Epub 2022 Sep 2.	The shift away from PFOS and PFOA production in the past 20 years towards shorter chain and replacement PFAS has led to the environmental release of complex mixtures of emerging PFAS for which bioaccumulation potential and toxicology are largely unknown. The rate at which emerging PFAS can be prioritized for research in these complex mixtures is often limited by the lack of available chemical standards. We developed a study design that rapidly assesses which emerging PFAS in an environmentally derived mixture have the potential for mammalian bioaccumulation and thus prioritize these emerging chemicals for standard synthesis and toxicity testing. Surface water was collected at an impacted site downstream of an industrial fluorochemical manufacturing outfall and concentrated 100-fold via weak anion exchange, solid-phase extraction. The concentrated extract contained 13 previously identified emerging PFAS, including hexafluoropropylene oxide-dimer acid (HFPO-DA). BALB/c mice were orally dosed with surface water concentrate once a day for seven days. Twenty-four hours after the last dose, liver, serum, urine, and feces were collected and the emerging PFAS were semi-quantified based on peak area counts. Of the 13 emerging PFAS, Nafion byproduct-2 (Nafion BP2), Hydro-EVE, PFO(4)DA, and PFO(5)DoA had the largest increases in percent composition when comparing serum and liver to the dosing solution, suggesting that these PFAS may have the highest bioaccumulation potential. This finding supports other studies that detected bioaccumulation of the same four PFAS in human serum collected from communities with contaminated drinking water. In the future, the Rapid Assessment Bioaccumulation Screening (RABS) study design can be extended to other complex industrial chemical mixtures impacting surface water in order to better inform chemical prioritization for acquisition and in vitro/in vivo toxicity testing of the potential pollutants.			с
D582	蓄積性	Xu, Lijia; Chen, Hui; Han, Xu; Yu, Kefu; Wang, Yongzhi; Du, Bibai; Zeng, Lixi	First report on per- and polyfluoroalkyl substances (PFASs) in coral communities from the Northern South China sea: Occurrence, seasonal variation, and interspecies differences	Environ Pollut. 2022 Dec 1;314:120214. doi: 10.1016/j.envpol.2022.120214. Epub 2022 Sep 20.	In this study, the contamination levels and seasonal variation of 22 PFASs were investigated in coastal reef-building corals (n = 68) from the northern South China Sea (SCS) during wet and dry seasons. Perfluorohexane sulfonate (PFHxS) was the predominant PFASs in all coral samples, representing 43% of the total PFAS. Long-chain PFASs, as well as PFAS alternatives, were frequently detected above the MQL (>88%) but showed relatively low concentrations compared to short-chain PFASs in most species and seasons. Seasonal variation of PFAS concentrations were observed in branching corals, indicating that the accumulation of PFASs may be associated with coral morphological structures. Interspecies differences in PFAS levels agree well with different bioaccumulation potentials among coral species. Redundancy analysis (RDA) showed that seasonal factor and coral genus could partly influence PFAS concentrations in coral tissues. In summary, our study firstly reported the occurrence of PFASs in coral communities from the SCS and highlights the necessity for future investigations on more toxicity data for coral communities.			В
D583	蓄積性	Bi, Chunqing; Junaid, Muhammad; Liu, Yan; Guo, Wenjing; Jiang, Xilin; Pan, Baozhu; Li, Zhengguoshen; Xu, Nan	Graphene oxide chronic exposure enhanced perfluorooctane sulfonate mediated toxicity through oxidative stress generation in freshwater clam Corbicula fluminea	2022 Chemosphere. 2022 Jun;297:134242. doi: 10.1016/j.chemosphere.2022.134242. Epub 2022 Mar 5.	Graphene oxide (GO), a frequently utilized graphene family nanomaterial, is inevitably released into the aquatic environment and interacts with organic pollutants, including perfluorooctane sulfonate (PFOS), a well-known persistent organic pollutant. To determine the adverse effects of GO chronic exposure on PFOS bioaccumulation and toxicity, adult freshwater bivalves, namely Asian clams (Corbicula fluminea) were treated for 28 days with PFOS (500 ng/L) and different concentrations of GO (0.2, 1, 5 mg/L) as PFOS single and GO single exposure groups, as well as PFOS-GO mixture exposure groups. Our results demonstrated that the bioaccumulation of PFOS was significantly enhanced by co-exposure in gills and visceral masses, which was 1.64-2.91 times higher in gills than in visceral masses. Both single, as well as co-exposure, caused a significant reduction in clams' siphoning behavior, compared to the controls. Further, the co-exposure significantly increased the production of reactive oxygen species (ROS), exacerbating malondialdehyde (MDA) content, enhancing superoxide dismutase (SOD) and catalase (CAT), while decreasing glutathione reductase (GR) and glutathione S-transferase (GST) enzymatic activities in clam tissues. And co-exposure significantly altered the expressions of se-gpx, sod, cyp30, hsp40, and hsp22 genes (associated with oxidative stress and xenobiotic metabolism) both in gills and visceral masses. Moreover, co-exposure caused significant histopathological changes such as cilia degradation in the gills, expansion of tubule lumens in digestive glands, and oocyte shrinkage in gonads. Finally, the enhanced biomarker response (EIBR) index revealed that to-exposure to 500 ng/L PFOS + 1 mg/L/5 mg/L GO was the most stressful circumstance. Overall, our findings suggested that the presence of GO increased PFOS bioaccumulation in tissues, inducing multifaceted negative implications at molecular and behavioral levels through oxidative stress generation in Asian clams.			С

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 タ献 の す で 、 の で
D584	蓄積性	Islam, Naimul; Garcia da Fonseca, Tainá; Vilke, Juliano; Gonçalves, Joanna M; Pedro, Paulo; Keiter, Steffen; Cunha, Sara C; Fernandes, José O; Bebianno, M J	Perfluorooctane sulfonic acid (PFOS) adsorbed to polyethylene microplastics: Accumulation and ecotoxicological effects in the clam Scrobicularia plana	2021	Mar Environ Res. 2021 Feb;164:105249. doi: 10.1016/j.marenvres.2020.105249. Epub 2021 Jan 4.	Microplastics are widespread in the marine environment, whereby the uptake of these tiny particles by organisms, can cause adverse biological responses. Plastic debris also act as a vector of many contaminants, herein depending on type, size, shape and chemical properties, possibly intensifying their effects on marine organisms. This study aimed to assess the accumulation and potential toxicity of different sizes of microplastics with and without adsorbed perfluorooctane sulfonic acid (PFOS) in the clam Scrobicularia plana. Clams were exposed to low-density polyethylene microplastics (1 mg L(-1)) of two different sizes (4-6 and 20-25 μ m) virgin and contaminated with PFOS (55.7 ± 5.3 and 46.1 ± 2.9 μ g g(-1) respectively) over 14 days. Microplastic ingestion, PFOS accumulation and filtration rate were determined along with a multi biomarker approach to assess the biological effects of microplastics ingestion. Biomarkers include oxidative stress (superoxide dismutase, catalase, glutathione peroxidases), biotransformation enzymes (glutathione-S-transferases activity), neurotoxicity (acetylcholinesterase activity), oxidative damage and apoptosis. Microplastics ingestion and PFOS accumulation was microplastic size dependent but not PFOS dependent and filtration rate was reduced at the end of the exposure. Reactive oxygen species in gills and digestive gland were generated as a result of exposure to both types of microplastics, confirming the disturbance of the antioxidant system. Larger virgin microparticles lead to stronger impacts, when compared to smaller ones which was also supported by the Integrated Biomarker Responses index calculated for both tissues. An anti-apoptotic response was detected in digestive glands under exposure to any of the MPs treatments.		С
D585	蓄積性	Wang, Cong; Lu, Yonglong; Sun, Bin; Zhang, Meng; Mao, Ruoyu; Li, Xiaoqian; Song, Shuai; Zhao, Jixin; Yu, Mingzhao; Shi, Yajuan; Wang, Pei	Biomanipulation impacts on per-and polyfluoroalkyl substances accumulation and trophic transfer in an eutrophic lake	2022	Environ Int. 2022 Feb;160:107057. doi: 10.1016/j.envint.2021.107057. Epub 2021 Dec 23.	Manipulation of freshwater food web through species introduction has been used to control the increasing algae in the Wuliangsuhai Lake, which affects not only the pathways of carbon source and energy transfer, but also the transfer of contaminants through food web. Food web relationships between biomanipulation area (BMA) and non-biological manipulation area (NBMA) were investigated using stable carbon (δ (13)C) and nitrogen (δ (15)N) isotope analysis. In BMA, the δ (13)C values in fish species were enriched while δ (15)N depleted due to the increased inter-species competition. Among the same fish species between BMA and NBMA, lower trophic levels were observed in BMA. Concentrations of target PFASs (Σ PFAS) in fish from BMA were significantly (p < 0.05) lower than those from NBMA. Whilst elevated trophic magnification factors (TMFs) of PFASs, especially for perfluoroalkyl carboxylic acids (PFCAs) with long carbon chain length (C9-10), perfluoroctane sulfonate (PFOS), and 6:2 chlorinated polyfluorinated ether sulfonate (F-53B) were exhibited in BMA. We found that biomanipulation through species introduction played an important role in control over lake eutrophication and trophic transfer patterns of PFASs in biota from the altered aquatic ecosystem.		В
D586	蓄積性	Semerád, Jaroslav; Horká, Petra; Filipová, Alena; Kukla, Jaroslav; Holubov á, Kateřina; Musilová, Zuzana; Jandová, Kateřina; Frouz, Jan; Cajthaml, Tomáš	The driving factors of per- and polyfluorinated alkyl substance (PFAS) accumulation in selected fish species: The influence of position in river continuum, fish feed composition, and pollutant properties	2022	Sci Total Environ. 2022 Apr 10;816:151662. doi: 10.1016/j.scitotenv.2021.151662. Epub 2021 Nov 13.	Per- and polyfluorinated alkyl substances (PFASs) represent a group of highly recalcitrant micropollutants, that continuously endanger the environment. The present work describes the geographical trends of fish contamination by individual PFASs (including new compounds, e.g., Gen-X) assessed by analyzing the muscle tissues of 5 separate freshwater fish species from 10 locations on the Czech section of the Elbe River and its largest tributary, the Vltava River. The data of this study also showed that the majority of the detected PFASs consisted of long-chain representatives (perfluorooctane sulfonate (PFOS), perfluorononanoic acid, perfluorodecanoic acid, and perfluoroundecanoic acid), whereas short-chain PFASs as well as other compounds such as Gen-X were detected in relatively small quantities. The maximum concentrations of the targeted 32 PFASs in fish were detected in the lower stretches of the Vltava and Elbe Rivers, reaching 289.9 ng/g dw, 140.5 ng/g dw, and 162.7 ng/g dw for chub, roach, and nase, respectively. Moreover, the relationships between the PFAS (PFOS) concentrations in fish muscle tissue and isotopic ratios (δ (15)N and δ (13)C) were studied to understand the effect of feed composition and position in the river continuum as a proxy for anthropogenic activity. Redundancy analysis and variation partitioning showed that the largest part of the data variability was explained by the interaction of position in the river continuum and δ (15)N (δ (13)C) of the fish. The PFAS concentrations increased downstream and were positively correlated with δ (15)N and negatively correlated with δ (13)C. A detailed study at one location also demonstrated the significant relationship between δ (15)N (estimated trophic position) and PFASs (PFOS) concentrations. From the tested physicochemical properties, the molecular mass and number of fluorine substituents seem to play crucial roles in PFAS bioaccumulation.		В

ウリ尛ーZ 又獣ナータヘース又獣リスト	
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No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D587	蓄積性	Cara, Byns; Lies, Teunen; Thimo, Groffen; Robin, Lasters; Lieven, Bervoets	Bioaccumulation and trophic transfer of perfluorinated alkyl substances (PFAS) in marine biota from the Belgian North Sea: Distribution and human health risk implications	2022	Environ Pollut. 2022 Oct 15;311:119907. doi: 10.1016/j.envpol.2022.119907. Epub 2022 Aug 16.	Per- and polyfluorinated alkyl substances (PFAS) are highly persistent chemicals, which pose a potential risk for aquatic wildlife due to their bioaccumulative behaviour and toxicological effects. Although the distribution of PFAS in marine environments has been studied worldwide, little is known on the contamination of PFAS in the southern North Sea. In the present study, the bioaccumulation and trophic transfer of Perfluoroalkyl acids (PFAAs) was studied in liver and muscle tissue of seven fish species and in whole-body tissue of two crustacean species, collected at 10 sites in the Belgian North Sea. Furthermore, the human and ecological health risks were examined. Overall, perfluoroctane sulfonate (PFOS) was predominant in all matrices and other long-chain PFAS were frequently detected. Mean PFOS concentrations ranged from <loq (<loq-116="" (crangon="" (merlangus="" (pftrda)="" (pleuronecta="" (solea="" (ww)="" 0.29="" 107="" 17="" 18="" 24="" 26="" 28%="" 33="" 43="" 43%="" 5.6="" 9.1="" <loq="" a="" abiotic="" acid="" analysis,="" and="" as="" based="" be="" benchmark="" bioconcentration="" biomagnification="" biota.="" brown="" coastal="" commercially="" compound.="" concentrations="" consumption="" could="" crangon),="" crustaceans.="" day="" day,="" detected="" did="" distinctive="" dominating="" elevated="" environment="" estuarine="" exceed="" exceeded="" exceeds="" fish="" for="" from="" g="" health="" however,="" identified="" if="" implies="" important="" in="" indicating="" is="" isotope="" it="" likely="" liver="" liver,="" measurements="" merlangus)="" might="" most="" muscle="" ng="" no="" not="" of="" on="" over="" patterns="" perfluorotridecanoic="" pfas="" pfos="" plaice="" platessa),="" point="" poisoning="" pose="" potential="" protection="" qs(biota,hh)="" region="" respectively.="" risks="" samples="" secondary="" shrimp="" sole="" sole<="" solea)="" source="" species="" specific="" stable="" studied="" such="" surrounding="" targeting="" td="" that="" the="" this="" to="" transfer="" trophic="" was="" were="" which="" whiting="" wildlife="" ww="" ww),="" ww,=""><td></td><td>в</td></loq>		в
D588	蓄積性	Vi, Phung Thi; Ngoc, Nguyen Thuy; Quang, Phan Dinh; Dam, Nguyen Thanh; Tue, Nguyen Minh; Tuyen, Le Huu; Viet, Pham Hung; Anh, Duong Hong	Perfluoroalkyl substances in freshwater and marine fish from northern Vietnam: Accumulation levels, profiles, and implications for human consumption	2022	Mar Pollut Bull. 2022 Sep;182:113995. doi: 10.1016/j.marpolbul.2022.113995. Epub 2022 Aug 5.	The accumulation profiles of nine perfluoroalkyl substances (PFASs) were determined in 95 muscle samples of seven freshwater (n = 65) and seven marine (n = 30) fish species collected in Northern Vietnam. In both groups of fish, perfluoroactane sulfonic acid (PFOS) was the most prevalent component, accounting for roughly 29 % of total PFASs. The total PFASs in freshwater fish species ranged from 0.08 to 8.06 ng/g wet weight (w.w), with the highest concentration found in topmouth culter (7.01 \pm 1.23 ng/g w.w). In marine fish, the highest mean concentration of PFASs was detected in Asian sea bass (2.75 \pm 0.54 ng/g, w.w). Estimation on the human dietary intake of PFASs from fish consumption resulted in hazard ratios (HR) ranging from 0.019 to 0.238 for freshwater fish and from 0.016 to 0.074 for marine fish, indicating low exposure risks associated with PFASs.		В
D589	蓄積性	Garnett, Jack; Halsall, Crispin; Winton, Holly; Joerss, Hanna; Mulvaney, Robert; Ebinghaus, Ralf; Frey, Markus; Jones, Anna; Leeson, Amber; Wynn, Peter	Increasing Accumulation of Perfluorocarboxylate Contaminants Revealed in an Antarctic Firn Core (1958-2017)	2022	Environ Sci Technol. 2022 Aug 16;56(16):11246-11255. doi: 10.1021/acs.est.2c02592. Epub 2022 Jul 26.	Perfluoroalkyl acids (PFAAs) are synthetic chemicals with a variety of industrial and consumer applications that are now widely distributed in the global environment. Here, we report the measurement of six perfluorocarboxylates (PFCA, C(4)-C(9)) in a firn (granular compressed snow) core collected from a non-coastal, high-altitude site in Dronning Maud Land in Eastern Antarctica. Snow accumulation of the extracted core dated from 1958 to 2017, a period coinciding with the advent, use, and geographical shift in the global industrial production of poly/perfluoroalkylated substances, including PFAA. We observed increasing PFCA accumulation in snow over this time period, with chemical fluxes peaking in 2009-2013 for perfluorocatoate (PFOA, C(8)) and nonanoate (PFNA, C(9)) with little evidence of a decline in these chemicals despite supposed recent global curtailments in their production. In contrast, the levels of perfluorobutanoate (PFBA, C(4)) increased markedly since 2000, with the highest fluxes in the uppermost snow layers. These findings are consistent with those previously made in the Arctic and can be attributed to chlorofluorocarbon replacements (e.g., hydrofluoroethers) as an inadvertent consequence of global regulation.		В

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン 文 ク 献 ① ラ ② ラ
D590	蓄積性	Teunen, Lies; De Jonge, Maarten; Malarvannan, Govindan; Covaci, Adrian; Belpaire, Claude; Focant, Jean- François; Blust, Ronny; Bervoets, Lieven	Effect of abiotic factors and environmental concentrations on the bioaccumulation of persistent organic and inorganic compounds to freshwater fish and mussels	2021	Sci Total Environ. 2021 Dec 10;799:149448. doi: 10.1016/j.scitotenv.2021.149448. Epub 2021 Aug 4.	Many aquatic ecosystems are under persistent stress due to influxes of anthropogenic chemical pollutants. High concentrations can harm entire ecosystems and be toxic to humans. However, in case of highly hydrophobic compounds, their low water solubility precludes direct measurement in water, and thus alternative monitoring strategies are needed. In the present study, we investigated the extent to which bioaccumulated concentrations of persistent compounds can be predicted by concentrations in environmental compartments (water and sediment). Due to their high biomagnification potential, Hg and PFOS were included in this analysis as well. At 44 field locations in Flanders (Belgium), we monitored the concentrations of 11 priority compounds and their derivatives, included in the Water Framework Directive, in both sediment and water (where feasible) and biota (European perch, European eel and freshwater mussels). Besides, some sediment (i.e. total organic carbon (TOC) and clay content) and water characteristics were measured (i.e. pH, oxygen level, conductivity, nitrate, nitrite and dissolved organic carbon (DOC)). Measurements of HCB, HCBD, cis-heptachlorepoxide, HBCD and PFOS in sediment and Σ PCB in water showed a lower detection frequency than in fish samples. While PCB profiles were comparable between all matrices, for PBDE clear differences were detected between sediment and fish profiles, with BDE99 contributing the most for sediment (34%) and BDE47 for fish (\geq 44%), followed by BDE99 for perch (28%) and BDE100 for eel (25%). Water concentrations in fish were dependent on sediment concentrations and negatively related to organic compound levels ($p < 0.05$). Furthermore, pH and nitrite were negatively associated with accumulated concentrations in eel for HCB and PFOS, respectively ($p < 0.05$). Strong relationships between bioaccumulation and sediment and/or water concentrations strengthened the basis for surrogate monitoring methods. Finally, the extrapolation potential of Hg, Σ PBDE, PFOS, HBCD and Σ			В
D591	蓄積性	Keilen, Ellen Kristine; Borgå, Katrine; Thorstensen, Helene Skjeie; Hylland, Ketil; Helberg, Morten; Warner, Nicholas; Baek, Kine; Reiertsen, Tone Kristin; Ruus, Anders	Differences in Trophic Level, Contaminant Load, and DNA Damage in an Urban and a Remote Herring Gull (Larus argentatus) Breeding Colony in Coastal Norway	2022	Environ Toxicol Chem. 2022 Oct;41(10):2466-2478. doi: 10.1002/etc.5441. Epub 2022 Sep 13.	Herring gulls (Larus argentatus) are opportunistic feeders, resulting in contaminant exposure depending on area and habitat. We compared contaminant concentrations and dietary markers between two herring gull breeding colonies with different distances to extensive human activity and presumed contaminant exposure from the local marine diet. Furthermore, we investigated the integrity of DNA in white blood cells and sensitivity to oxidative stress. We analyzed blood from 15 herring gulls from each colony-the urban Oslofjord near the Norwegian capital Oslo in the temperate region and the remote Hornøya island in northern Norway, on the Barents Sea coast. Based on d(13) C and d(34) S, the dietary sources of urban gulls differed, with some individuals having a marine and others a more terrestrial dietary signal. All remote gulls had a marine dietary signal and higher relative trophic level than the urban marine feeding gulls. Concentrations (mean \pm standard deviation [SD]) of most persistent organic pollutants, such as polychlorinated biphenyl ethers (PCBs) and perfluorooctane sulfonic acid (PFOS), were higher in urban marine (PCB153 $17 \pm 17 \text{ ng/g}$ wet weight, PFOS $25 \pm 21 \text{ ng/g}$ wet wt) than urban terrestrial feeders (PCB153 $3.7 \pm 2.4 \text{ ng/g}$ wet wt, PFOS $6.7 \pm 10 \text{ ng/g}$ wet wt). Despite feeding at a higher trophic level (d(15) N), the remote gulls (PCB153 $17 \pm 1221 \text{ ng/g}$ wet wt, PFOS $19 \pm 1421 \text{ ng/g}$ wet wt) were similar to the urban marine feeders. Cyclic volatile methyl siloxanes were detected in only a few gulls, except for decamethylcyclopentasiloxane in the urban colony, which was found in 12 of 13 gulls. Only hexachlorobenzene was present in higher concentrations in the remote ($2.6 \pm 0.42 \text{ ng/g}$ wet wt) compared with the urban colony ($0.34 \pm 0.33 \text{ ng/g}$ wet wt). Baseline and induced DNA damage (doublestreak breaks) was higher in urban than in remote gulls for both terrestrial and marine feeders. Environ Toxicol Chem 2022;41:2466-2478. © 2022 The Authors. Environmental Toxico			в
D592	蓄積性	Miranda, Daniele de A; Peaslee, Graham F; Zachritz, Alison M; Lamberti, Gary A	A worldwide evaluation of trophic magnification of per- and polyfluoroalkyl substances in aquatic ecosystems	2022	, Integr Environ Assess Manag. 2022 Nov;18(6):1500-1512. doi: 10.1002/ieam.4579. Epub 2022 Feb 7.	A review of the published literature on the trophic magnification factor (TMF) for per- and polyfluoroalkyl substances (PFAS) was conducted to assess how biomagnification varies across aquatic systems worldwide. Although the TMF has been recognized as the most reliable tool for assessing the biomagnification of organic contaminants, peer-reviewed studies reporting TMFs for PFAS are few and with limited geographical distribution. We found 25 published studies of the biomagnification of 35 specific PFAS, for which the TMF was generated through linear regression of individual log-PFAS concentration and the δ (15) N-based trophic position of each organism in the food webs. Studies were concentrated mainly in China, North America, and Europe, and the most investigated compound was perfluorooctane sulfonate (PFOS), which was frequently shown to be biomagnification. Observed differences in the TMF were associated with length of the food web, geographic location, sampling methodologies, tissue analyzed, and distance from known direct PFAS inputs. In addition to biomagnification of legacy PFAS, precursor substances were observed to bioaccumulate in the food web, which suggests they may biotransform to more persistent PFAS compounds in upper trophic levels. This review discusses the variability of environmental characteristics driving PFAS biomagnification in natural ecosystems and highlights the different approaches used by each study, which can make comparisons among studies challenging. Suggestions on how to standardize TMFs for PFAS are also provided in this review. Integr Environ Assess Manag 2022;18:1500- 1512. © 2022 SETAC.			В

分野 著者 タイトル 発行年 書誌情報 要旨 (原文) No. (参考) Perfluoroalkyl substances (PFASs) are a class of organohalogenated compounds of environr characteristics as the well-studied legacy persistent organic pollutants (POPs) that typically biomagnification and toxicity. Nevertheless, PFAS are still poorly regulated internationally an Here, we studied liver and muscle concentrations in five cetacean species stranded at the so 2009-2018. Twelve of the fifteen targeted compounds were detected in >50% of the liver sar Lópezsignificantly higher than those in muscle reflecting the particular toxicokinetics of these com Berenguer, G; truncatus showed the highest hepatic Σ PFAS (n = 5; 796.8 ± 709.0 ng g(-1) ww) concentra Bossi, R: Eulaers Environ Pollut. 2020 Dec;267:115367. doi: Stenella coeruleoalba (n = 29; 259.5 \pm 136.2 ng g(-1) ww), sperm whale Physeter macrocep l; Dietz, R; Peñ Stranded cetaceans warn of high perfluoroalkyl 蓄積性 D593 short-beaked common dolphin Delphinus delphis (n = 2; 240.3 \pm 218.6 ng g(-1) ww) and Ris 10.1016/j.envpol.2020.115367. Epub 2020 Aug 20. alver, J; Schulz, substance pollution in the western Mediterranean Sea 78.7 ng g(-1) ww). These interspecies differences could be partially explained by habitat pre R: Zubrod, J: generally not be related to trophic position or food chain proxied by stable N (δ (15)N) and C Sonne, C; Martí respectively. PFAS profiles in all species showed a similar pattern of concentration prevalen nez-López, E PFFUnA>PFDA. The higher number of samples available for striped dolphin allowed for eval in relation to the stranding year, stable isotope values, and biological variables including sex find links between $\,\delta\,(15)$ N and PFAS burdens in muscle tissue, and between stranding year Despite reductions in the manufacturing industry, these compounds still appear in high conc two decades ago in the Mediterranean Sea and PFOS remains the dominating compound. For many years, eggs of diverse bird species have been used as monitoring tools in studies i (PFAS) contamination, especially in marine and remote areas. Avian eggs are a suitable mor Morganti, relatively easy to collect and their yolks store diverse maternally transferred PFAS. Moreover Michelangelo; detected in the eggs are a good proxy for maternal exposure and allow the assessment of the Polesello, features support the use of avian eggs as a key monitoring tool in exposure assessment of P Stefano: Exposure assessment of PEAS-contaminated sites review the recent application of avian eggs in PFAS monitoring in environmental risk assess Pascariello, using avian eggs as a biomonitoring tool: A frame of Integr Environ Assess Manag. 2021 Jul;17(4):733-745. doi: 2021 10.1002/ieam.4417. Epub 2021 May 3. D594 蓄積性 and limitations and suggesting which criteria should be considered when selecting a proper Simona; Ferrario, reference and a case study in the Po River valley sampling and analytical protocol. Eventually, we report findings from a field study realized in Claudia; Rubolini, (Northern Italy) site in the upper Po plain (Northern Italy), revealing an unprecedented contamination level o Diego; Valsecchi, wild passerines. In future, long-term monitoring of PFAS contamination using avian eggs sho Sara; Parolini, information on the temporal trend of fluorochemical production and waste disposal, while fa Marco emerging PFAS as well as the quantification of their biomagnification across the trophic web 2021;17:733-745. © 2021 SETAC. PFAS mixtures in the environment are common and identifying PFAS constituents, bioaccum mixtures remains a challenge. Here, an omics-based ecosurveillance approach was taken to pollution in freshwater turtles (Emydura macquariimacquarii). Four turtles were collected fro from an industrial source of PFAS contamination in Queensland, Australia and analysed for 4 collected from a suitable control site. PFAS concentrations were quantified in turtle serum u Beale, David J; methodology. The serum PFAS concentration was ten-fold greater at the impacted site (Σ 4 Hillyer, Katie; the control sample (Σ 49 PFAS 140 ng/mL). Perfluorooctane sulfonate (PFOS; 889 ± 56 ng/ serum than in the water that they were collected from (Σ PFAS 32.0 μ g/L). Perfluorobutane Nilsson, Sandra: Bioaccumulation and metabolic response of PEAS Sci Total Environ. 2022 Feb 1;806(Pt 3):151264. doi: Limpus, Duncan mixtures in wild-caught freshwater turtles (Emydura ng/mL) and perfluorohexane sulfonamide (FHxSA; 550 ± 330 ng/mL) were also reported at D595 蓄積性 10.1016/j.scitotenv.2021.151264. Epub 2021 Oct 29. Bose, Utpal; macquariimacquarii) using omics-based serum of impacted turtles. Biochemical profiles were analysed using a mixture of liquid chroi Broadbent, ecosurveillance techniques and quadrupole time-of-flight (QToF) mass spectrometry methodologies. These profiles dem James A; Vardy, impacted turtles exposed to elevated PFAS with an enhanced purine metabolism, glyceroph Suzanne response, which suggest an inflammation response, metabolic preservation and re-routing o Conversely, lipid transport and binding activity were negatively correlated. Using these prelir demonstrate the negative metabolic impact from PFAS mixtures on turtle metabolic health. cohort, omics-based data will contribute towards linking adverse outcome pathways for turtl mixtures. Moreover, expanding the use of ecosurveillance tools will inform mechanistic toxic regulatory applications

	備考	出 情 対 報 象 抽	ン 文 ク 献 ① ラ	ン 文 ク 献 ② ラ
mental concern due to similar show environmental persistence, and in many aspects poorly understood. butheastern coast of Spain during mples. Hepatic concentrations were appounds. Bottlenose dolphins Tursiops attions, followed by striped dolphin obalus (n = 1; 252.8 ng g(-1) ww), sso's dolphin Grampus griseus (n = 1; afferences, although they could C (δ (13)C) isotope values, ce in the order PFOS>PFOSA>PFNA \approx luating their PFAS burden and profile and length. However, we could only and PFAS profile composition. centrations compared to more than			В	
nvestigating perfluoroalkyl substances nitoring matrix because they are r, the concentrations of PFAS e potential risk for birds. These PFAS-contaminated sites. We first ment schemes, highlighting strengths study species and structuring the 2020 near a perfluoropolymer factory of PFOA and C6O4 in three species of buld be maintained, to provide crucial cilitating early identification of b. Integr Environ Assess Manag			В	
nulation, and biological impacts of investigate the impacts of PFAS om an impacted waterway downstream 49 different PFAS. One turtle was using an established targeted 9 PFAS 1933 \pm 481 ng/mL) relative to 47 mL) was 235 times higher in turtle a sulfonamide (FBSA; 403 \pm 83 substantial concentrations in the matography triple quadrupole (QqQ) nonstrated a positive correlation in the osphocholines and an innate immune of central carbon metabolites. minary data, we were able to With further research on a larger turtle le populations exposed to PFAS sological data for risk assessment and			В	

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン文 ン文 ク献 ① ラ ② ラ
D596	蓄積性	Burkhard, Lawrence P	Evaluation of Published Bioconcentration Factor (BCF) and Bioaccumulation Factor (BAF) Data for Per- and Polyfluoroalkyl Substances Across Aquatic Species	2021	Environ Toxicol Chem. 2021 Jun;40(6):1530-1543. doi: 10.1002/etc.5010. Epub 2021 May 13.	Per- and polyfluoroalkyl substances (PFAS) are a group of man-made chemicals of concern across the globe, and some of the PFAS chemicals are known to be bioaccumulative in aquatic species. A literature search for bioconcentration factors (BCFs) and bioaccumulation factors (BAFs) for PFAS has been done, and data for 22 taxonomic classes were assembled. The assembled data were evaluated for quality, and for gaps and limitations in bioaccumulation information for the PFAS universe of chemicals. In general, carbonyl and sulfonyl PFAS classes are relatively data rich, whereas phosphate, fluorotelomer, and ether PFAS classes are data limited for fish and nonexistent for most other taxonomic classes. Taxonomic classes with the most measurements were, in descending order, Teleostei (fish), Bivalvia, and Malacostraca. For fish, median whole-body log BAFs (L/kg wet wt) for perfluorooctane sulfonic acid and perfluorooctanoic acid were 3.55 (standard deviation [SD] = 0.83, n = 84) and 2.16 (SD = 0.85, n = 48) using all measurements, respectively. In comparison with freshwater species, data are limited for marine species, and further research is needed to determine whether the BAFs for freshwater and marine species should be the same or different. The BAFs for some PFAS appear to be consistent with the BCFs developed with laboratory experiments, in which values decline with increasing concentrations in water. Environ Toxicol Chem 2021;40:1530-1543. Published 2021. This article is a U.S. Government work and is in the public domain in the USA.			В
D597	蓄積性	Giffard, Nathan G; Gitlin, Saige A; Rardin, Marta; Petali, Jonathan M; Chen, Celia Y; Romano, Megan E	Occurrence and Risks of Per- and Polyfluoroalkyl Substances in Shellfish	2022	Curr Environ Health Rep. 2022 Oct 18. doi: 10.1007/s40572- 022-00379-z. Online ahead of print.	PURPOSE OF REVIEW: Per- and polyfluoroalkyl substances (PFAS) are a diverse class of persistent, fluorinated surfactants used widely in industrial and commercial applications with known adverse health effects. Seafood consumption is thought to be an underappreciated source of PFAS exposure in the general population. This review synthesizes the current understanding of PFAS occurrence in shellfish, a term used to describe animals such as mollusk bivalves, certain gastropods (snails), cephalopods (e.g., octopuses and squid), and crustaceans, and highlights scientific gaps relative to bioaccumulation and the protection of shellfish consumers. RECENT FINDINGS: A range of sampling methodologies are used across studies, and the suite of PFAS surveyed across studies is highly variable. Concentrations of PFAS observed in shellfish vary by geographic location, shellfish species, habitat, and across PFAS compounds, and studies informing estimates of bioaccumulation of PFAS in shellfish are extremely limited at this time. This review identifies several important opportunities for researchers to standardize PFAS sampling techniques, sample preparation, and analytical methodologies to allow for better comparison of PFAS analytes both within and across future studies. Increasing the range of geographic locations where samples are collected is also a critical priority to support a greater knowledge of worldwide PFAS contamination. When put into the context of risk to consumer, concentrations of PFAS, especially PFOS, found in shellfish collected from sites containing aqueous film-forming foam (AFFF) and industrial contamination may present risks to frequent consumers. Further research is needed to protect shellfish consumers and to inform shellfich advisories and health protective policies.			В
D598	蓄積性	Hong, Sang Hee; Reiner, Jessica L; Jang, Mi; Schuur, Stacy S; Han, Gi Myung; Kucklick, John R; Shim, Won Joon	Levels and profiles of perfluorinated alkyl acids in liver tissues of birds with different habitat types and trophic levels from an urbanized coastal region of South Korea	2022	Sci Total Environ. 2022 Feb 1;806(Pt 3):151263. doi: 10.1016/j.scitotenv.2021.151263. Epub 2021 Oct 26.	Contamination status and characteristics of perfluorinated alkyl acids (PFAAs) including perfluorinated carboxylic acids (PFCAs) and perfluorinated sulfonic acids (PFSAs) was examined using liver tissue of birds - black-tailed gulls (Larus crassirostris), domestic pigeons (Columba livia var. domestica), pacific loons (Gavia pacifica), herons (Ardea cinerea), and egrets (Egretta garzetta and Ardea alba) - with different trophic levels, habitat types and migratory behaviors from an industrialized coastal region of South Korea. A wide range of PFAAs (1.09 ng/g to 1060 ng/g; median = 52.6 ng/g) were detected in bird livers from the Korean coasts with high detection frequency. Accumulation features of PFAAs in birds indicated that primarily trophic position and secondly habitat type influence the levels and composition of PFAAs, e.g., relatively high PFAA levels and high composition of odd-numbered long carbon chain PFCAs (perfluoroundecanoic acid (PFUnDA) and perfluorotridecanoic acid (PFTriDA)) and PFOS in higher trophic and marine birds. The prevalence of long carbon chain (\geq 14) PFCAs likely implies a wide use of fluorotelomer-based substances in Korea. Interspecies comparison in the accumulation profile of persistent organic pollutants (including polychlorinated biphenyls (PCBs), organochlorine pesticides, polybrominated diphenylethers (PBDEs), and PFAAs) reveals relatively high load of PFAAs in inland (pigeons) and estuarine (egrets/herons) species compared to marine bird species, indicating wide use of PFAAs in the terrestrial environment.			В

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D599	蓄積性	Bustnes, Jan Ove; Bårdsen, Bå rd-Jørgen; Herzke, Dorte; Bangjord, Georg; Bourgeon, Sophie; Fritsch, Clementine; Eulaers, Igor	Ecosystem specific accumulation of organohalogenated compounds: A comparison between adjacent freshwater and terrestrial avian predators	2022	Environ Res. 2022 Sep;212(Pt D):113455. doi: 10.1016/j.envres.2022.113455. Epub 2022 May 14.	Insight into processes determining the exposure of organohalogenated contaminants (OHCs) in wildlife might be gained from comparing predators in different ecosystems. This study compared two avian predator species with similar food chain lengths: the goldeneye duck (Bucephala clangula) and the tawny owl (Strix aluco) breeding in adjacent freshwater- and terrestrial ecosystems in central Norway. We measured lipophilic organochlorines (OCs) and protein-bound perfluorinated substances (PFASs) in eggs of the two species over 21 years (1999-2019). Across years, the proportional distribution of OCs (~90% of the Σ OHC load) relative to PFASs (~10%) was similar in the two species. Moreover, Σ OC concentrations were similar between the species, but PFAS compounds were 2-12 times higher in the goldeneyes than in tawny owls. OC-pesticides dominated in tawny owls (~60% of Σ OC), whereas persistent polychlorinated biphenyl (PCBs) congeners were the main OC components in goldeneyes (~70% of Σ OC). The lipid-normalized concentrations of most OC-pesticides and the less persistent PCB101 declined significantly in both species. Hexachlorobenzene (HCB), p,p'-dichlorodiphenyldichloroethylene (p,p'-DDE), and more persistent PCBs decreased in tawny owls, while they tended to increase in goldeneyes. The increase in HCB was particulary robust. Among the PFASs, contrasted temporal trends were found across the species for four out of 11 compounds: PFOS declined while most perfluorocarboxylic acids (PFCAs) increased in tawny owls. In contrast, most PFASs were stable in goldeneyes. Moreover, there was no annual covariance between the OHC exposure in the two species: i.e., high concentrations in one species in a given year did not translate into high concentrations in the other. Hence, the two avian predators in adjacent ecosystems seem to be subject to different processes determining the OHC exposure, probably related to variation in diet and climate, long-range transport of different contaminants, and emissions of pollution loca		В
D600	蓄積性	Sun, Jennifer M; Kelly, Barry C; Gobas, Frank A P C; Sunderland, Elsie M	A food web bioaccumulation model for the accumulation of per- and polyfluoroalkyl substances (PFAS) in fish: how important is renal elimination?	2022	Environ Sci Process Impacts. 2022 Aug 17;24(8):1152-1164. doi: 10.1039/d2em00047d.	Per- and polyfluoroalkyl substances (PFAS) are a large class of highly fluorinated anthropogenic chemicals. Some PFAS bioaccumulate in aquatic food webs, thereby posing risks for seafood consumers. Existing models for persistent organic pollutants (POPs) perform poorly for ionizable PFAS. Here we adapt a well-established food web bioaccumulation model for neutral POPs to predict the bioaccumulation behavior of six perfluoroalkyl acids (PFAAs) and two perfluoroalkyl ether acids (HFPO-DA, 9-CI-PF3ONS) produced as PFAA replacements. The new model includes sorption to blood plasma proteins and phospholipids, empirically parameterized membrane transport, and renal elimination for PFAAs. Improved performance relative to prior models without these updates is shown by comparing simulations to field and lab measurements. PFAS with eight or more perfluorinated carbons (η pfc \geq 8, i.e., C8 perfluorosulfonic acid, C10-C11 perfluorocarboxylic acid, 9-CI-PF3ONS) are often the most abundant in aquatic food webs. The new model reproduces their observed bioaccumulation potential within a factor of two for >80% of fish species, indicating its readiness to support development of fish consumption advisories for these compounds. Results suggest bioaccumulation of η pfc \geq 8 PFAS is primarily driven by phospholipid partitioning, and that renal elimination is negligible for these compounds. However, specific protein binding mechanisms are important for reproducing the observed tissue concentrations of many shorter-chain PFAAs, including protein transporter-mediated renal elimination. Additional data on protein-binding and membrane transport mechanisms for PFAS are needed to better understand the biological behavior of shorter-chain PFAAs and their alternatives.		C
D601	蓄積性	Liang, Xiaoxue; Yang, Xinyi; Jiao, Wenqing; Zhou, Jian; Zhu, Lingyan	Simulation modelling the structure related bioaccumulation and biomagnification of per- and polyfluoroalkyl substances in aquatic food web	2022	Sci Total Environ. 2022 Sep 10;838(Pt 3):156397. doi: 10.1016/j.scitotenv.2022.156397. Epub 2022 Jun 1.	Until now, there is no bioaccumulation model to predict bioaccumulation of polyfluoroalkyl substances (PFASs) in aquatic organisms due to their unique amphiphilic properties. For the first time, protein contents instead of lipid contents of organisms were used in bioaccumulation models to predict the concentrations and reveal the accumulation mechanisms of PFASs in various aquatic organisms, based on the available data. Comparison between the modeled and measured results indicated the models were promising to predict the PFAS concentrations in the fishes at different trophic levels very well, as well as their bioaccumulation factors (BAF) and trophic magnification factors (TMF) of PFASs in fish. Both water and sediment are important exposure sources of PFASs in aquatic organisms. As the two main uptake pathways, the contribution of gill respiratory decreases while that of dietary intake increases with the chain length of PFASs increasing. Fecal excretion and gill respiration are the main pathways for fish to eliminate PFASs, and their relative contributions increase and decrease respectively with chain length. The short-chain (C6-C8) perfluoroalkyl acids (PFAAs) are greatly eliminated via gill respiratory quickly, leading to their very low BAFs. As the carbon chain length increases, dietary intake becomes dominant in the uptake, while elimination is mainly through fecal excretion with relatively low rates, especially in the fishes with high protein contents. For the very long chain (C12-C16) PFASs, they are very difficult to excrete with a low total elimination rate constant (ke = 0.463-0.743 d-1), thus leading to their high BAFs and TMFs. The high intake rate but low elimination rate, as well as the high water and sediment concentrations together contribute to the highest accumulated concentration perfluorooctane sulfonic acid in the fish of Taihu Lake.		В

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン文 ン文 ク献 ① ラ ② ラ
D602	蓄積性	Wang, Qi; Ruan, Yuefei; Jin, Linjie; Lu, Guangyuan; Ma, Lan; Yeung, Leo W Y; Wang, Wen-Xiong; Lam, Paul K S	Oysters for legacy and emerging per- and polyfluoroalkyl substances (PFASs) monitoring in estuarine and coastal waters: Phase distribution and bioconcentration profile	2022	Sci Total Environ. 2022 Nov 10;846:157453. doi: 10.1016/j.scitotenv.2022.157453. Epub 2022 Jul 19.	Per- and polyfluoroalkyl substances (PFASs) are a diverse group of widely used anthropogenic chemicals that are environmentally persistent and bioaccumulative, especially in aquatic ecosystem. The heavily industrialized and urbanized Greater Bay Area in China represents a notable contamination source for PFASs, which may potentially influence the health of local oysters as a keystone species in local ecosystems and a popular seafood. In this study, samples of oysters and their surrounding waters were collected from the littoral zones of the Pearl River Estuary (PRE), China during winter 2020, where 44 PFASs, including 19 perfluoroalkyl acids (PFAAs), 8 emerging PFASs, and 17 PFAA precursors (or intermediates), were analyzed. Total PFAS concentrations ranged 13.8-58.8 ng/L in the dissolved phase, 3.60-11.2 ng/g dry weight (dw) in the suspended particulate matter (SPM), and 0.969-1.98 ng/g dw in the oysters. Most short-chain PFASs were present in the dissolved phase (>95%), while long-chain PFASs generally showed higher concentrations in the SPM. Log field-based bioconcentration factors (BCFs) of long-chain PFASs increased linearly (r = 0.95, p < 0.01) with increasing estimated log membrane-water (D(mw)) and protein-water (D(pw)) distribution coefficients. Perfluorohexanoic acid (PFHAA) and perfluoroheptanoic acid (PFHpA) exhibited higher measured BCFs than those estimated by their D(mw) and D(pw). Considering the widespread occurrence of their precursors, the contribution of precursor transformation was likely to be a significant source of PFHxA and PFHpA. Oysters from the PRE littoral zones posed low risks to human health associated with PFAS consumption, which might be underestimated due to limited toxicity data available for PFAA precursors and emerging PFASs. This study sheds light on the practicality of applying oysters as biomonitors for timely PFAS monitoring in coastal environments.			В
D603	蓄積性	Zhu, Yumin; Jia, Yibo; Liu, Menglin; Yang, Liping; Yi, Shujun; Feng, Xuemin; Zhu, Lingyan	Mechanisms for tissue-specific accumulation and phase I/II transformation of 6:2 fluorotelomer phosphate diester in earthworm (M. guillelmi)	2021	Environ Int. 2021 Jun;151:106451. doi: 10.1016/j.envint.2021.106451. Epub 2021 Feb 26.	Polyfluoroalkyl phosphate esters (PAPs) are high production volume surfactants used in the food contact paper and packaging industries. They are prone to partition to soil due to their strong hydrophobicity and may biotransform into recalcitrant perfluoroalkyl carboxylic acids (PFCAs); little is known about their fate and behaviors in terrestrial organisms. Here, geophagous earthworms (M. guillelmi) were exposed to 6:2 fluorotelomer phosphate diester (6:2 diPAP)-contaminated soil to examine tissue-specific accumulation and biotransformation. 6:2 diPAP quickly accumulated in M. guillelmi with the highest biota-soil-accumulation factor (BSAF) in the gut, followed by the organs, skin, and body fluid. The total amount of 6:2 diPAP accumulated in the skin was the highest due to its high mass content. These results indicated that skin absorption and gut processes were two major pathways for earthworms to accumulate 6:2 diPAP from soil. In vitro desorption experiments indicated that the gut digestion fluid greatly promoted the desorption of 6:2 diPAP from the soil and enhanced its bioavailability. Degradation of 6:2 diPAP in the soil was stimulated when the earthworm appeared. In contrast to the soil, a more extensive transformation occurred in the earthworm. Perfluoropentanoic acid (PFHxA) was the primary phase I product, followed by perfluoropentyl propanoic acid (FPePA), perfluoropentanoic acid (PFHA), 2-perfluorohexyl ethanoic acid (FHEA), and perfluoroheptanoic acid (PFHpA), which confirmed the occurrence of α - and β -oxidation in earthworms. For the first time, a new phase II product, namely, a 6:2 fluorotelomer alcohol sulfate conjugate, was identified in earthworms at unexpectedly high levels, which might be the primary way earthworms eliminate 6:2 diPAP. Both in vivo and in vitro experiments suggested that 6:2 diPAP experienced faster and more extensive biotransformation in the gut than in the organs. This work sheds light on the bioaccumulation and biotransformation of α - and point and point experime			С
D604	蓄積性	Hofer, Tim; Myhre, Oddvar; Peltola-Thies, Johanna; Hirmann, Doris	Analysis of elimination half-lives in MamTKDB 1.0 related to bioaccumulation: Requirement of repeated administration and blood plasma values underrepresent tissues	2021	Environ Int. 2021 Oct;155:106592. doi: 10.1016/j.envint.2021.106592. Epub 2021 Jun 10.	Biz diPAP in terrestrial invertebrates, providing strong evidence of indirect sources of PPCAs in the environment. When building the novel public mammalian toxicokinetic database (MamTKDB) we collected and included 3927 elimination half- lives ((elim)t(1/2)) for 1407 xenobiotics in various species (rat, human, mouse, dog, monkey, rabbit, cattle, pig, sheep, guinea pig, hamster, horse and goat) with specification of compartment (whole body, organ/tissue, cell type, medium) studied. Here we describe and analyse the collected data in MamTKDB 1.0. Most (elim)t(1/2) are for humans and rats and their data differ in some ways: whereas the rat data are mainly for pesticides, the human data are mainly for pharmaceuticals and environmental contaminants. There are also differences in types of compartments studied and in metabolites followed: human (elim)t(1/2) are mainly whole body based (i.e. based on blood plasma or excretion), animal data are additionally for various organs/tissues, cells or media. Contrary to human studies, animal studies regularly administrate radiolabeled (e.g. (14)C) substances and distribution of both parent and eventual metabolites are followed, measuring the radioactivity. In rats, substances had been given through single, preconditioning or repeated administration. Single administration studies dominated, but repeated studies generally had longer (elim)t(1/2) than single or preconditioning studies for which (elim)t(1/2) were similar. Repeated administration studies should better ascertain steady state conditions throughout the body, a process involving time-dependent tissue loading, and the data show that for most substances, repeated studies are required to address bioaccumulation potential. About 65% of the substances in MamTKDB 1.0 fulfilled the octanol-water and octanol-air partitioning-based screening criteria (log K(ow) > 2 and log K(oa) > 5) for further bioaccumulation assessment and/or testing, and most of the substances with long (elim)t(1/2) in both humans and rats ful			В

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨 (原文)	備考	出 情 対 報 象 抽	ン文ン文 ク献 ① ラ ② ラ
D605	蓄積性	Lewis, Asa J; Yun, Xiaoyan; Spooner, Daniel E; Kurz, Marie J; McKenzie, Erica R; Sales, Christopher M	Exposure pathways and bioaccumulation of per- and polyfluoroalkyl substances in freshwater aquatic ecosystems: Key considerations	2022	Sci Total Environ. 2022 May 20;822:153561. doi: 10.1016/j.scitotenv.2022.153561. Epub 2022 Jan 29.	Due to the bioaccumulative behavior, toxicity, and recalcitrance to degradation, per- and polyfluoroalkyl substances (PFAS) are a focus for many researchers investigating freshwater aquatic ecosystems. PFAS are a diverse set of chemicals that accumulate and transport quite differently in the environment depending on the length of their fluoroalkyl chains and their functional groups. This diversity in PFAS chemical characteristics combined with varying environmental factors also impact the bioaccumulation of these compounds in different organisms. In this review, we evaluate environmental factors (such as organic carbon, proteins, lipids, and dissolved cations) as well as PFAS characteristics (head group, chain-length, and concentration) that contribute to the significant variation seen in the literature of bioaccumulation metrics reported for organisms in aquatic ecosystems. Of the factors evaluated, it was found that PFAS concentration, dissolved organic matter, sediment organic matter, and biotransformation of precursor PFAS tended to significantly impact reported bioaccumulation metrics the most. Based on this review, it is highly suggested that future studies provide sufficient details of important environmental factors, specific organism traits/ behavior, and PFAS concentrations/compounds when reporting on bioaccumulation metrics to further fill data gaps and improve our understanding of PFAS in aquatic ecosystems.			В
D606	蓄積性	McDermett, Kaylin; Anderson, Todd; Jackson, W Andrew; Guelfo, Jennifer	Assessing Potential Perfluoroalkyl Substances Trophic Transfer to Crickets (Acheta domesticus)	2022	Environ Toxicol Chem. 2022 Dec;41(12):2981-2992. doi: 10.1002/etc.5478. Epub 2022 Oct 11.	Although many studies have assessed the bioaccumulation of perfluoroalkyl substances (PFAS) in plant tissues, to date there has been minimal research on the bioaccumulation of PFAS in soil invertebrates that results from consuming PFAS-contaminated media. The present study focused on two different consumption pathways in a population of crickets: individuals consuming PFAS-contaminated alfalfa and individuals consuming PFAS-spiked drinking water. Alfalfa was grown in a greenhouse and irrigated with PFAS-spiked water (~1 ppm) containing seven unique PFAS. The alfalfa was then harvested and fed to crickets. Another population of crickets was supplied with PFAS-spiked drinking water at similar concentrations to irrigation water for direct consumption. Alfalfa accumulation of PFAS and subsequent consumption by the crickets resulted in overall similar tissue concentrations in the crickets who consumed PFAS-spiked water directly. This indicates that source concentration (water) may be an important factor in assessing the bioaccumulation of PFAS in organisms. To our knowledge, ours is the first study not only to assess the direct trophic transfer of PFAS from contaminated vegetation to invertebrates, but also to highlight the similarities in bioaccumulation regardless of ingestion pathway. Environ Toxicol Chem 2022;41:2981-2992. © 2022 SETAC.			В
D607	蓄積性	Wang, Qi; Ruan, Yuefei; Jin, Linjie; Lin, Huiju; Yan, Meng; Gu, Jiarui; Yuen, Calista N T; Leung, Kenneth M Y; Lam, Paul K S	Tissue-Specific Uptake, Depuration Kinetics, and Suspected Metabolites of Three Emerging Per- and Polyfluoroalkyl Substances (PFASs) in Marine Medaka	2022	Environ Sci Technol. 2022 May 17;56(10):6182-6191. doi: 10.1021/acs.est.1c07643. Epub 2022 Apr 19.	Restrictions on legacy per- and polyfluoroalkyl substances (PFASs) have led to the widespread use of emerging PFASs. However, their toxicokinetics have rarely been reported. Here, tissue-specific uptake and depuration kinetics of perfluoroethylcyclohexanesulfonate (PFECHS) and 6:2 and 8:2 chlorinated polyfluoroalkyl ether sulfonates (CI-PFESAs) were studied in marine medaka (Oryzias melastigma). The fish were exposed to these substances for 28 days ($0.2 \mu g/L$), followed by a clearance period of 14 days. The depuration constant (k(d)) of PFECHS [$0.103 \pm 0.009 \text{ day}(-1)$ (mean \pm standard deviation)] was reported for the first time. Among the six studied tissues, the highest concentrations of 6:2 CI-PFESA, 8:2 CI-PFESA, and PFECHS were found in the liver [1540, 1230, and 188 ng (g of wet weight)(-1), respectively] on day 28 while the longest residence times were found in the eyes (t(1/2) values of 21.7 \pm 4.3, 23.9 \pm 1.5, and 17.3 \pm 0.8 days, respectively). No significant positive correlation was found between the bioconcentration factors of the studied PFASs and the phospholipid or protein contents in different tissues of the studied fish. Potential metabolites of CI-PFESAs, i.e., their hydrogen-substituted analogues (H-PFESAs), were identified by time-of-flight mass spectrometry. However, the biotransformation rates were low (<0.19%), indicating the poor capacity of marine medaka to metabolize CI-PFESAs to H-PFESAs.			С
D608	蓄積性	Cheng, Weixiao; Doering, Jon A; LaLone, Carlie; Ng, Carla	Integrative Computational Approaches to Inform Relative Bioaccumulation Potential of Per- and Polyfluoroalkyl Substances Across Species	2021	Toxicol Sci. 2021 Apr 12;180(2):212-223. doi: 10.1093/toxsci/kfab004.	Predictive toxicology is increasingly reliant on innovative computational methods to address pressing questions in chemicals assessment. Of importance is the evaluation of contaminant impact differences across species to inform ecosystem protection and identify appropriate model species for human toxicity studies. Here we evaluated 2 complementary tools to predict cross-species differences in binding affinity between per- and polyfluoroalkyl substances (PFAS) and the liver fatty acid-binding protein (LFABP): the Sequence Alignment to Predict Across Species Susceptibility (SeqAPASS) tool and molecular dynamics (MD). SeqAPASS determined that the structure of human LFABP, a key determinant of PFAS bioaccumulation, was conserved in the majority of vertebrate species, indicating these species would have similar PFAS bioaccumulation potentials. Level 3 SeqAPASS evaluation identified several potentially destabilizing amino acid differences across species, which were generally supported by DUET stability change predictions. Nine single-residue mutations and 7 whole species sequences were selected for MD evaluation. One mutation (F50V for PFNA) showed a statistically significant difference with stronger affinity than wild-type human LFABP. Predicted binding affinities for 9 different PFAS across 7 species showed human, rat, chicken, and rainbow trout had similar binding affinities to one another for each PFAS, whereas Japanese medaka and fathead minnow had significantly weaker LFABP-binding affinity for some PFAS. Based on these analyses, the combined use of SeqAPASS and MD provides rapid screening for potential ligands.			С

パーフルオロ化合物に係る国際機関等の評価及び科学的知見の情報収集並びに整理 別添-2 文献データベース文献リスト

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン 文 ク 献 ① ラ ② ラ
D609	蓄積性	Jia, Yibo; Zhu, Yumin; Wang, Rouyi; Ye, Qingqing; Xu, Dashan; Zhang, Wei; Zhang, Yanfeng; Shan, Guoqiang; Zhu, Lingyan	Novel insights into the mediating roles of cluster of differentiation 36 in transmembrane transport and tissue partition of per- and polyfluoroalkyl substances in mice	2023	J Hazard Mater. 2023 Jan 15;442:130129. doi: 10.1016/j.jhazmat.2022.130129. Epub 2022 Oct 7.	Transmembrane transport is important for bioaccumulation of per- and polyfluoroalkyl substances (PFASs) in organisms, but has not yet been well understood. Here, the roles of cluster of differentiation 36 (CD36) in accumulation of PFASs were investigated. CD36 was overexpressed in Escherichia coli to get CD36-BL21 strain, and the binding affinities of 20 PFASs with CD36 were determined by microscale thermophoresis, which grew up to 17.5 μ M with increasing carbon chain length. Consequently, the accumulation of most PFASs was remarkably promoted in CD36-BL21 in comparison to the wild strain, and the enhancement was proportional to their binding affinities with CD36 (r = -0.96). However, this effect was depressed greatly as CD36 was inhibited by sulfo-N-succinimidyl oleate (SSO). Additionally, as the mice received SSO pretreatment before they were exposed to perfluorododecanoic acid, its accumulation in the tissues rich in CD36, such as liver, was suppressed, but increased by 1.1 times in the serum. These indicated that CD36 played critical roles in the transmembrane transport and tissue partition of PFASs in organisms. The developed relationship between liver-blood partition of PFASs and their binding affinities with intracellular proteins was distinctly improved by incorporating that with CD36 (r = -0.97).			С
D610	蓄積性	Wang, Qi; Ruan, Yuefei; Jin, Linjie; Zhang, Xiaohua; Li, Jing; He, Yuhe; Wei, Si; Lam, James C W; Lam, Paul K S	Target, Nontarget, and Suspect Screening and Temporal Trends of Per- and Polyfluoroalkyl Substances in Marine Mammals from the South China Sea	202:	Environ Sci Technol. 2021 Jan 19;55(2):1045-1056. doi: 10.1021/acs.est.0c06685. Epub 2021 Jan 4.	Per- and polyfluoroalkyl substances (PFASs) have been manufactured and widely used for over 60 years. Currently, there are thousands of marketed PFASs, but only dozens of them are routinely monitored. This work involved target, nontarget, and suspect screening of PFASs in the liver of Indo-Pacific humpback dolphin (Sousa chinensis) and finless porpoise (Neophocaena phocaenoides), two resident marine mammals in the South China Sea, stranded between 2012 and 2018. Among the 21 target PFASs, perfluorooctane sulfonate and 6:2 chlorinated polyfluoroalkyl ether sulfonate (6:2 CI-PFESA) predominated in the samples, accounting for 46 and 30% of the total PFASs, respectively. Significantly higher total target PFAS concentrations ($p < 0.05$) were found in dolphin liver samples [$3.23 \times 10(3) \pm 2.63 \times 10(3)$ ng/g dry weight (dw)] than in porpoise liver samples ($2.63 \times 10(3) \pm 1.10 \times 10(3)$ ng/g dw). Significant increasing temporal trends ($p < 0.05$) were found in the concentrations of two emerging PFASs, perfluoroethylcyclohexane sulfonate and 2,3,3,3-tetrafluoro-2-propanoate in porpoises, indicating increasing pollution by these emerging PFASs. Forty-four PFASs from 9 classes were additionally identified by nontarget and suspect screening, among which 15 compounds were reported for the first time in marine mammals. A primary risk assessment showed that the emerging PFAS 6:2 CI-PFESA could have possible adverse effects in terms of reproductive injury potential on most of the investigated cetaceans.			В
D611	蓄積性	Koch, Alina; Jonsson, Micael; Yeung, Leo W Y; Kärrman, Anna; Ahrens, Lutz; Ekblad, Alf; Wang, Thanh	Quantification of Biodriven Transfer of Per- and Polyfluoroalkyl Substances from the Aquatic to the Terrestrial Environment via Emergent Insects	202	Environ Sci Technol. 2021 Jun 15;55(12):7900-7909. doi: 10.1021/acs.est.0c07129. Epub 2021 May 24.	Emergent aquatic insects are important food subsidies to riparian food webs but can also transfer waterborne contaminants to the terrestrial environment. This study aimed to quantitatively assess this biodriven transfer for per- and polyfluoroalkyl substances (PFAS). Aquatic insect larvae, emergent aquatic insects, terrestrial consumers, sediment, and water were collected from a contaminated lake and stream and an uncontaminated pond, and analyzed for PFAS and stable isotopes of carbon and nitrogen. Top predators in this study were spiders, which showed the highest average Σ (24)PFAS concentration of 1400 \pm 80 ng g(-1) dry weight (dw) at the lake and 630 ng g(-1) dw at the stream. The transfer of PFAS from the lake to the riparian zone, via deposition of emergent aquatic insects, was 280 ng Σ (24)PFAS m(-2) d(-1) in 2017 and only 23 ng Σ (24)PFAS m(-2) d(-1) in 2018. Because of higher production of emergent aquatic insects, the lake had higher PFAS transfer and higher concentrations in terrestrial consumers compared to the stream, despite the stream having higher PFAS concentration in water and aquatic insect larvae. Our results indicate that biodriven transfer of PFAS from the aquatic systems and subsequent uptake in terrestrial food webs depend more on emergence amounts, i.e., aquatic prey availability, rather than on PFAS concentrations in water and aquatic prey.			В
D612	蓄積性	Baygi, Sadjad Fakouri; Fernando, Sujan; Hopke, Philip K; Holsen, Thomas M; Crimmins, Bernard S	Nontargeted Discovery of Novel Contaminants in the Great Lakes Region: A Comparison of Fish Fillets and Fish Consumers	202	Environ Sci Technol. 2021 Mar 16;55(6):3765-3774. doi: 10.1021/acs.est.0c08507. Epub 2021 Mar 1.	Sport fish fillets and human sera (fish consumers) were collected in the Lake Superior and Lake Michigan basin and screened for novel contaminants using the isotopic profile deconvoluted chromatogram (IPDC) algorithm. The IPDC algorithm was extended beyond traditional Cl/Br filters to detect additional potential bioaccumulative and toxic (PBT) such as perfluoroalkyl substances (PFAS). The IPDC algorithm screened for approximately 13.5 million theoretical molecular formulas. Additional algorithm modules were developed to detect data independent MS/MS fragmentation products and a retention time index calculator using a series of (13)C-labeled perfluoroalkyl carboxylic acids ((13)C-PFCAs). Ten potential compound classes were isolated including six untargeted PFAS, six homologue groups of polyfluorinated carboxylic acids, polyfluorinated telomer alcohols (PoFTOHs), two hydroxylated polychlorobiphenyls, pesticides, herbicides, antifungals, pharmaceuticals, artificial sweeteners, and personal care products with minimal postprocessing efforts. The algorithm isolated 48 ubiquitous PoFTOHs in both fish fillet and serum of fish consumers suggesting a region wide distribution of this class of compounds. The 3, 4, and 7 fluorine substituted PoFTOH were the most abundant congeners in both biological matrices.			В

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No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D613	蓄積性	de Wit, Cynthia A; Bossi, Rossana; Dietz, Rune; Dreyer, Annekatrin; Faxneld, Suzanne; Garbus, Svend Erik; Hellström, Peter; Koschorreck, Jan; Lohmann, Nina; Roos, Anna; Sellström, Ulla; Sonne, Christian; Treu, Gabriele; Vorkamp, Katrin; Yuan, Bo; Eulaers, Igor	Organohalogen compounds of emerging concern in Baltic Sea biota: Levels, biomagnification potential and comparisons with legacy contaminants	2020	Environ Int. 2020 Nov;144:106037. doi: 10.1016/j.envint.2020.106037. Epub 2020 Aug 21.	While new chemicals have replaced major toxic legacy contaminants such as polychlorinated biphenyls (PCBs) and dichlorodiphenyltrichloroethane (DDT), knowledge of their current levels and biomagnification potential in Baltic Sea biota is lacking. Therefore, a suite of chemicals of emerging concern, including organophosphate esters (OPEs), short-chain, medium-chain and long-chain chlorinated paraffins (SCCPs, MCCPs, LCCPs), halogenated flame retardants (HFRs), and per- and polyfluoroalkyl substances (PFAS), were analysed in blue mussel (Mytilus edulis), viviparous eelpout (Zoarces viviparus), Atlantic herring (Clupea harengus), grey seal (Halichoerus grypus), harbor seal (Phoca vitulina), harbor porpoise (Phocoena phocoena), common eider (Somateria mollissima), common guillemot (Uria aalge) and white-tailed eagle (Haliaeetus albicilla) from the Baltic Proper, sampled between 2006 and 2016. Results were benchmarked with existing data for legacy contaminants. The mean concentrations for Σ OPEs ranged from 57 to 550 ng g(-1) lipid weight (lw), for Σ CPs from 110 to 640 ng g(-1) lw for Σ HFRs from 0.42 to 80 ng g(-1) lw, and for Σ PFAS from 1.1 to 450 ng g(-1) were generally similar or higher than those of polybrominated diphenyl ethers (PBDEs) and/or hexabromocyclododecane (HBCDD). OPE, CP and HFR concentrations were also similar to PCBs and DDTs in blue mussel, viviparous eelpout and Atlantic herring. In marine mammals and birds, PCB and DDT concentrations remained orders of magnitude higher than those of OPEs, CPs, HFRs and PFAS. Predator-prey ratios for individual OPEs (0.28-3.9) and CPs (0.40-5.0) were similar or somewhat lower than those seen for BDE-47 (5.0-29) and HBCDD (2.4-13). Ratios for individual HFRs (0.010-37) and PFAS (0.15-47) were, however, of the same order of magnitude as seen for p.p'-DDE (4.7-66) and CB-153 (31-190), indicating biomagnification potential for many of the emerging contaminants. Lack of toxicity data, including for complex mixtures, makes it difficult to assess the risks		В
D614	蓄積性	Martinez-Varela, Alícia; Casas, Gemma; Piña, Benjamin; Dachs, Jordi; Vila-Costa, Maria	Large Enrichment of Anthropogenic Organic Matter Degrading Bacteria in the Sea-Surface Microlayer at Coastal Livingston Island (Antarctica)	2020	Front Microbiol. 2020 Sep 11;11:571983. doi: 10.3389/fmicb.2020.571983. eCollection 2020.	The composition of bacteria inhabiting the sea-surface microlayer (SML) is poorly characterized globally and yet undescribed for the Southern Ocean, despite their relevance for the biogeochemistry of the surface ocean. We report the abundances and diversity of bacteria inhabiting the SML and the subsurface waters (SSL) determined from a unique sample set from a polar coastal ecosystem (Livingston Island, Antarctica). From early to late austral summer (January-March 2018), we consistently found a higher abundance of bacteria in the SML than in the SSL. The SML was enriched in some Gammaproteobacteria genus such as Pseudoalteromonas, Pseudomonas, and Colwellia, known to degrade a wide range of semivolatile, hydrophobic, and surfactant-like organic pollutants. Hydrocarbons and other synthetic chemicals including surfactants, such as perfluoroalkyl substances (PFAS), reach remote marine environments by atmospheric transport and deposition and by oceanic currents, and are known to accumulate in the SML. Relative abundances of specific SML-enriched bacterial groups were significantly correlated to concentrations of PFASs, taken as a proxy of hydrophobic anthropogenic pollutants present in the SML and its stability. Our observations provide evidence for an important pollutant-bacteria interaction in the marine SML. Given that pollutant emissions have increased during the Anthropocene, our results point to the need to assess chemical pollution as a factor modulating marine microbiomes in the contemporaneous and future oceans.		C
D615	蓄積性	Munschy, C; Spitz, J; Bely, N; Héas-Moisan, K; Olivier, N; Pollono, C; Chouvelon, T	A large diversity of organohalogen contaminants reach the meso- and bathypelagic organisms in the Bay of Biscay (northeast Atlantic)	2022	Mar Pollut Bull. 2022 Nov;184:114180. doi: 10.1016/j.marpolbul.2022.114180. Epub 2022 Sep 29.	Deep-sea ecosystems play a key role in the cycling and vertical transfer of matter and energy in oceans. Although the contamination of deep-sea demersal and benthic organisms by persistent organic pollutants has been proven, deep pelagic species have been far less studied. To fill these gaps, we studied the occurrence of a large variety of hydrophobic organic contaminants including polychlorinated biphenyls (PCBs), organochlorine pesticides (OCPs), legacy and alternative brominated flame retardants (BFRs) and per- and polyfluoroalkyl substances (PFASs) in crustaceans and fish species collected in the Bay of Biscay, northeast Atlantic. The results highlighted the global predominance of PCBs in fish, followed by OCPs, PFASs and PBDEs, with highly variable concentrations among species. Most of the chlorinated or brominated contaminants showed increasing concentrations with increasing δ (15)N values, while most PFASs showed inverse trends. The contaminant profiles and diagnostic ratios revealed species-specific metabolic capacities and peculiar contribution of highly-brominated BFRs.		В

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン 文 ン 文 ク 献 ク 献 ① ラ ② ラ
D616	蓄積性	Li, Wenting; Bischel, Heather N	Are resource recovery insects safe for feed and food? A screening approach for bioaccumulative trace organic contaminants	2022	Sci Total Environ. 2022 Sep 1;837:155850. doi: 10.1016/j.scitotenv.2022.155850. Epub 2022 May 11.	Most bioaccumulation assessments select one or several compound classes a priori for analysis performed by either liquid or gas chromatography coupled with mass spectrometry (LC-MS or GC-MS). When organisms are exposed to complex mixtures of trace organic contaminants (TOrCs), targeted chemical assays limit understanding of contaminant profiles in biological tissues and associated risks. We used a semi-quantitative suspect-screening approach to assess the bioaccumulation potential of diverse TOrCs in black soldier fly larvae (BSFL) using almond hulls (by-products of the booming almond industry in California) as test substrates. BSFL digestion is gaining traction as a resource recovery strategy to generate animal feed from low-value organic wastes. We screened almond hulls from six California farms for the presence of 5728 TOrCs using high resolution mass spectrometry. We then categorized the risk potential of 46 TOrCs detected in the hulls based on their predicted bioaccumulation, persistence, and toxicity in order to select two hulls for an in situ BSFL bioaccumulation screening study. We analyzed larvae tissues and feeding substrate initially and after 14 days of growth using targeted, suspect-screening, and nontarget-screening methods. The survival rate of BSFL in all rearing reactors was greater than 90%, indicating low toxicity of the substrates to BSFL. Esfenvalerate, cyhalothrin, and bifenthrin were the most abundant pyrethroids quantified (81.7 to 381.6 ng/g-dw) in the hulls. Bifenthrin bioaccumulated in BSFL tissues (14-day bioaccumulation factor, BAF, of 2.17 \pm 0.24). For nontarget analysis, kendrick mass defect (KMD) analysis of PFAS homologous series revealed hydrogen-substituted perfluoroalkyl carboxylic acids (H-PFCAs) in the hulls and BSFL tissues after growth. Our approach demonstrates the utility of suspect-screening in chemical safety assessments when organic wastes with highly diverse and variable contaminant profiles are used in resource recovery pipelines.			C
D617	蓄積性	Midthaug, Hilde Karin; Hitchcock, Daniel J; Bustnes, Jan Ove; Polder, Anuschka; Descamps, Sé bastien; Tarroux, Arnaud; Soininen, Eeva M; Borgå, Katrine	Within and between breeding-season changes in contaminant occurrence and body condition in the Antarctic breeding south polar skua	2021	Environ Pollut. 2021 Sep 1;284:117434. doi: 10.1016/j.envpol.2021.117434. Epub 2021 May 24.	The Antarctic ecosystem represents a remote region far from point sources of pollution. Still, Antarctic marine predators, such as seabirds, are exposed to organohalogen contaminants (OHCs) which may induce adverse health effects. With increasing restrictions and regulations on OHCs, the levels and exposure are expected to decrease over time. We studied south polar skua (Catharacta maccormiciki), a top predator seabird, to compare OHC concentrations measured in whole blood from 2001/2002 and 2013/2014 in Dronning Maud Land. As a previous study found increasing organochlorine concentrations with sampling day during the 2001/2002 breeding season, suggesting dietary changes, we investigated if this increase was repeated in the 2013/2014 breeding season. In addition to organochlorines, we analyzed hydroxy-metabolites, brominated contaminants and per- and polyfluoroalkyl substances (PFAS) in 2013/2014, as well as dietary descriptors of stable isotopes of carbon and nitrogen, to assess potential changes in diet during breeding. Lipid normalized concentrations of individual OHCs were 63%, 87% and 105% higher for hexachlorobenzene (HCB), 1,1-dichloro-2,2-bis (p-chlorophenyl)ethylene (p,p'-DDE), and Σ Polychlorinated biphenyls (PCBs), respectively, in 2013/2014 compared to 2001/2002. South polar skuas males in 2013/2014 were in poorer body condition than in 2001/2002, and with higher pollutant levels. Poorer body condition may cause the remobilization of contaminants from stored body reserves, and continued exposure to legacy contaminants at overwintering areas may explain the unexpected higher OHC concentrations in 2013/2014 than 2001/2002. Concentrations of protein-associated PFAS increased with sampling day during the 2013/2014 breeding season, whereas the lipid-soluble chlorinated pesticides, PCBs and polybrominated diphenyl ether (PBDEs) showed no change. OHC occurrence was not correlated with stable isotopes. The PFAS biomagnification through the local food web at the colony should be investigated further.			В

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No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨 (原文)	備考	出 対 象 抽	ン文 ン文 ク献 ① ラ ② ラ
D618	蓄積性	Monclús, Laura; Løseth, Mari Engvig; Dahlberg Persson, Marie J; Eulaers, Igor; Kleven, Oddmund; Covaci, Adrian; Benskin, Jonathan P; Awad, Raed; Zubrod, Jochen P; Schulz, Ralf; Wabakken, Petter; Heggøy, Oddvar; Øien, Ingar Jostein; Steinsvåg, Magnus Johan; Jaspers, Veerle L B; Nygård, Torgeir	Legacy and emerging organohalogenated compounds in feathers of Eurasian eagle-owls (Bubo bubo) in Norway: Spatiotemporal variations and associations with dietary proxies (δ (13)C and δ (15)N)	2022	Environ Res. 2022 Mar;204(Pt D):112372. doi: 10.1016/j.envres.2021.112372. Epub 2021 Nov 11.	The occurrence of organohalogenated compounds (OHCs) in wildlife has received considerable attention over the last decades. Among the matrices used for OHCs biomonitoring, feathers are particularly useful as they can be collected in a minimally or non- invasive manner. In this study, concentrations of various legacy OHCs - polychlorinated biphenyls (PCBs), organochlorine pesticides (OCPs) and polybrominated diphenyl ethers (PBDEs)-, as well as emerging OHCs - per- and polyfluoroalkyl substances (PFAS) and organophosphate ester flame retardants (OPEs)- were determined in feathers of 72 Eurasian eagle-owls (Bubo bubo) from Norway, with the goal of studying spatiotemporal variation using a non-invasive approach. Molted feathers were collected at nest sites from northern, central and southern Norway across four summers (2013-2016). Additionally, two museum-archived feathers from 1979 to 1989 were included. Stable carbon (δ 13C) and nitrogen isotopes (δ 15N) were used as dietary proxies. In total, 11 PFAS (sum range 8.25-215.90 ng g(-1)), 15 PCBs (4.19-430.01 ng g(-1)), 6 OCPs (1.48-220.94 ng g(-1)), 5 PBDEs (0.21- 5.32 ng g(-1)) and 3 OPEs (4.49-222.21 ng g(-1)) were quantified. While we observed large variation in the values of both stable isotopes, suggesting a diverse diet of the eagle-owls, only δ 13C. Considerable spatial variation in PFAS concentrations. Geographic area and year were influential factors for δ 15N and δ 13C. Considerable spatial variation was observed in PFAS levels, with the southern area showing higher levels compared to northern and central Norway. For the rest of OHCs, we observed between-year variations; sum concentrations of PCBs, OCPs, PBDEs and OPEs reached a maximum in 2015 and 2016. Concentrations from 1979 to 1989 were within the ranges observed between 2013 and 2016. Overall, our data indicate high levels of legacy and emerging OHCs in a top predator in Norway, further highlighting the risk posed by OHCs to wildlife.			В
D619	蓄積性	津田 泰三, 居川 俊弘	世界河川および湖沼の水質および魚類中の有機フッ素化 合物	2012	環境化学, 22 巻 4 号 149-173, doi: 10.5985/jec.22.149	Concentrations of 10 perfluorinated compounds in water and fish from rivers and faxes in the world were reviewed from the surveys in the years of 1998-2011. A yearly decreasing tendency was recognized in the concentrations of Perfluorooctane sulfonate (PFOS) and Perfluorooctanoic acid (PFOA) in water from several rivers in Japan. The concentrations of PFOA in water from rivers and lakes in Japan had a tendency to be higher than those of PFOS but the concentration levels of both compounds were equal in Europe. Further, the concentrations of PFOS in water from rivers in Europe and North America were higher than those in Japan and Asia. Composition of the perfluorinated compounds was PFOA >> Perfluorononanoic acid (PFNA) \geq Perfluorohexanoic acid (PFHxA) in water from rivers and lakes in Japan and PFOS \geq PFOA in Asia, Europe and North America. Perfluorinated compounds with more carbon atoms were more highly accumulated in fish, and bioconcentration factor (BCF) of PFOS was lower than that of Perfluorododecanoic acid (PFDDA) and nearly equal to that of Perfluoroundecanoic acid (PFUA) or Perfluorodecanoic acid (PFDA). Each of the BCF data of the perfluorinated compounds by field survey data (Field BCF) was nearly in the same order as each of the BCF data by laboratory experimental data (Laboratory BCF). However, absolute values of the Field BCF had a tendency to be higher than those of the Laboratory BCF. To verify this tendency, it is necessary to accumulate additional data on Laboratory and Field BCF and to advance the research development in future on adding the uptake of the compounds via gill in the Field BCF values or on the differences of the environmental conditions.			В
D620	蓄積性・ 環境中運 命	白坂 華子, 門上 希和夫	日本の淡水域に生息するギンブナ(Carassius auratus (gibelio) langsdorfii) 中の有機フッ素化合物蓄積量調査	2014	環境化学, 24 巻 3 号 67-76, doi: 10.5985/jec.24.67	Perfluorinated compounds (PFCs) that are widely used as surfactants and coatings were determined in muscles of crucian carp (Carassius auratus (gibelio) langsdorfii) taken from 14 freshwater areas throughout Japan during 2003-2005. The sampling sites comprised 10 rivers and 4 ponds and were categorized into 4 groups based on local circumstances: large cities, small cities, agricultural areas and remote areas. PFCs were detected in all samples analyzed, and total PFCs concentrations ranged from 1.60 to 30.1 (average: 9.54, median: 8.80) ng/g wet wt. and 167 to 3496 (average: 914, median:645) ng/g lipid wt. The highest concentrations of PFCs were found in fish caught at sites in large cities. Fish in the remote area's had low PFCs concentrations. Branched chain PFC isomers were also detected, although the relative ratios of the straight chains to the branch isomers were different between sampling sites. To obtain maternal transfer rates for the PFCs, female fish were collected from the Murasaki River during the spawning season and their muscles and eggs were analyzed. The maternal transfer rate of PFCs was 9.1%, which is lower than those of hydrophobic substances such as dioxins, organochlorine pesticides and hexabromocyclododecanes. As a result, sexual differences between male and female fish were not found.		1	A

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 対報 ク献 象抽 ① ラ	: ンフ た ク II テ ②	文
D621	蓄積性・ 環境中運 命	Katsumi Iwabuchi, Norimasa Senzaki, Shuji Tsuda, Haruna Watanabe, Ikumi Tamura, Hitomi Takanobu, Norihisa Tatarazako	Bioconcentration of perfluorinated compounds in wild medaka is related to octanol/water partition coefficient	2015	; Fundamental Toxicological Sciences, 2 巻 5 号 201-208, doi: 10.2131/fts.2.201	Perfluorinated compounds (PFCs) have been used widely, detected worldwide in the environment, and have accumulated highly in animals. As far as we know, there have been no reports which relate the PFC concentration in wild animals to the physicochemical properties. Therefore, we measured the concentrations of 15 currently available PFCs (perfluorocarboxylic acids with x carbons: Cx, perfluorosulfonic acids with x carbons: CxS) in medaka and the environmental water where medaka live. Samples were obtained from 7 points in Japan (lwate, Ibaraki, Niigata, Hyogo, Yamaguchi, Ehime, and Nagasaki) from July to September in 2013. Twenty to forty medaka were collected from each point, as well as 2 L of water in a clean PET bottle. PFCs were extracted and concentrated using a solid-phase cartridge, and were measured by LC/MS/MS. The medaka samples were treated individually. C5-C9 and C8S were detected mainly in the water, C11-C13 and C8S were detected mainly in medaka. C8S was always detected in high concentrations in the water and medaka. The bioconcentration factors (BCFs) of PFCs were calculated from PFC concentrations of the water and the medaka. The BCFs of C8-C11 were increased exponentially with the length of carbon chain. The BCF of C8S (approx. 5,500) was far greater than C8 (approx. 330) or C9 (approx. 480). However, the BCFs of C8-C11 and C8S tended to increase in proportion with octanol/water partition coefficient (log Kow).		1 A		
D622	蓄積性・ 環境中運 命	岩渕 勝己, 鑪迫 典久	メダカ及びその生息地点の環境水, 底質中の有機フッ素 化合物の存在状況と生物濃縮の関係	2018	} 水環境学会誌, 41 巻 4 号 61-71, doi: 10.2965/jswe.41.61	有機フッ素化合物 (PFAA) は,環境残留性や蓄積性が世界的に問題となっている。本研究では,メダカ (Olyzias latipes),その生息地点 の環境水,底質を採取して15種のPFAA濃度を分析し,環境中の存在状況と生物濃縮を明らかにすることを目的とした。各サンプルから 検出されるPFAA濃度は採取地点により異なるが,組成比はほぼ一定していた。メダカへの生物濃縮係数 (BCF)と,PFAAのオクタノール /水分配係数 (Log Kow) との間には相関が見られた。環境水と底質のPFAA濃度は,底質の乾燥重量あたりよりも強熱減量 (IL) あたりの 濃度で比較した方が良好に相関しており,底質とメダカでも同様であった。底質のILあたりのPFAA濃度,性別,体長からメダカへの蓄積 量を重回帰分析により推定したところ,底質のILあたりのPFAA濃度がメダカへの蓄積に有意に関連していた。		1 A		
D623	蓄積性	田中 周平	マイクロプラスチックと私たちの暮らし	2020) 日本印刷学会誌, 57 巻 2 号 78-82, doi: 10.11413/nig.57.78	After the rain fall occurred, we often observed the plastic garbage such as plastic bags and PET bottles in the waterside. However, nobody knows the environmental fates of plastic garbage in the water environment. Plastics such as the container packaging are gradually decomposed in the environment, and they become microplastics. It is necessary to specify the sources in order to solve the aquatic environment pollution with microplastics. Most researchers who were focusing on the microplastics in marine tended to analyze the microplastics which size was bigger than 300 μ m. Recently, some researchers start to focus on smaller size of microplastics. There are many microfibers of the fiber origin such as fleeces, which sizes were about 30 μ m. It has been understood like this that the aquatic environment pollution with microplastics is serious as the size of them becomes small. To know where the microplastics are generated, and what size, and where they exist is one of the emergent issues in the world.		С		
D624	蓄積性	小林 裕太(島根大 学 医学部看護学 科基礎看護学講 座)	環境蓄積性化学物質と健康	2007	'島根医学(0559-829X)27巻1号 Page6-10(2007.03)	No abstract available		D		
D625	ヒト(生 殖発生毒 性)	Tarapore, Pheruza; Ouyang, Bin	Perfluoroalkyl Chemicals and Male Reproductive Health: Do PFOA and PFOS Increase Risk for Male Infertility?	2021	Int J Environ Res Public Health. 2021 Apr 5;18(7):3794. doi: 10.3390/ijerph18073794.	Poly- and perfluoroalkyl substances (PFAS) are manmade synthetic chemicals which have been in existence for over 70 years. Though they are currently being phased out, their persistence in the environment is widespread. There is increasing evidence linking PFAS exposure to health effects, an issue of concern since PFAS such as perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA) bioaccumulate in humans, with a half-life of years. Many epidemiological studies suggest that, worldwide, semen quality has decreased over the past several decades. One of the most worrying effects of PFOS and PFOA is their associations with lower testosterone levels, similar to clinical observations in infertile men. This review thus focuses on PFOS/PFOA-associated effects on male reproductive health. The sources of PFAS in drinking water are listed. The current epidemiological studies linking increased exposure to PFAS with lowered testosterone and semen quality, and evidence from rodent studies supporting their function as endocrine disruptors on the reproductive system, exhibiting non-monotonic dose responses, are noted. Finally, their mechanisms of action and possible toxic effects on the Leydig, Sertoli, and germ cells are discussed. Future research efforts must consider utilizing better human model systems for exposure, using more accurate PFAS exposure susceptibility windows, and improvements in statistical modeling of data to account for the endocrine disruptor properties of PFAS.		В		

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン 文 ン 文 ク 献 ク 献 ① ラ ② ラ
D626	ヒト (生 殖発生毒 性)	Erinc, Abigail; Davis, Melinda B; Padmanabhan, Vasantha; Langen, Elizabeth; Goodrich, Jaclyn M	Considering environmental exposures to per- and polyfluoroalkyl substances (PFAS) as risk factors for hypertensive disorders of pregnancy	2021	Environ Res. 2021 Jun;197:111113. doi: 10.1016/j.envres.2021.111113. Epub 2021 Apr 3.	Hypertensive disorders of pregnancy (HDP), including preeclampsia and gestational hypertension, lead to significant maternal morbidity and in some cases, maternal mortality. Environmental toxicants, especially those that disrupt normal placental and endothelial function, are emerging as potential risk factors for HDP. Per- and polyfluoroalkyl substances (PFAS) are a large group of ubiquitous chemicals found in consumer products, the environment, and increasingly in drinking water. PFAS have been associated with a multitude of adverse health effects, including dyslipidemia, hypertension, and more recently, HDP. In this review, we present epidemiological and mechanistic evidence for the link between PFAS and HDP and recommend next steps for research and prevention efforts. To date, epidemiological studies have assessed associations between only ten of the thousands of PFAS and HDP. Positive associations between six PFAS (PFOA, perfluorooctanoic acid; PFOS, perfluorooctane sulfonic acid; PFHxS, perfluorohexane sulfonic acid; PFHpA, perfluoroheptanoic acid; PFBS, perfluorobutanesulfonic acid; and PFNA, perfluoronanoic acid) and risk for HDP have been reported in some, but not all, studies. PFAS disrupt placental and immune function, cause oxidative stress, and disrupt lipid metabolism. These physiological disruptions may be mechanisms through which PFAS can lead to HDP. Overall, limited epidemiological evidence and plausible mechanisms support PFAS as possible. Such research should consider not only individual PFAS but also the totality of exposures to PFAS and other environmental chemicals. Pregnant women may be a group that is vulnerable to PFAS exposure, and as such HDP risk should be considered by policymakers setting PFAS exposure limits. In the interim, medical and public health professionals in regions with PFAS contamination could provide short-term solutions in the form of patient-level prevention, increased monitoring, and early intervention for HDP.			В
D627	ヒト (内 分泌系)	Wang, Jinghan; Zhang, Jie; Fan, Yun; Li, Zhi; Tao, Chengzhe; Yan, Wenkai; Niu, Rui; Huang, Yuna; Xu, Qiaoqiao; Wang, Xinru; Xu, Qiujin; Han, Li; Lu, Chuncheng	Association between per- and polyfluoroalkyl substances and risk of gestational diabetes mellitus	2022	Int J Hyg Environ Health. 2022 Mar;240:113904. doi: 10.1016/j.ijheh.2021.113904. Epub 2021 Dec 13.	BACKGROUND: Existing evidence suggests that perfluoroalkyl and polyfluoroalkyl substances (PFASs) exposure might contribute to the incidence of gestational diabetes mellitus (GDM). This study aimed to perform a meta-analysis to identify the association between PFAS and the risk of GDM. METHODS: We systematically searched PubMed, Ovid, Cochrane Library, and Web of Science databases for appropriate articles about the association between PFASs exposure and the risk of GDM before September 28, 2020. Odds ratios (OR) with 95% confidence intervals (CIs) were summarized by Stata 16.0 through fixed effect models according to heterogeneity. We also carried out subgroup analyses by geographic location, blood sampling time of subjects, method of chemical analysis, study design, sample size, and sampling year. In addition, a sensitivity analysis was conducted to explore the robustness of the results. RESULTS: A total of eight studies involving 5654 pregnant women were included in the meta-analysis. Perfluoroactanoic acid (PFOA) exposure was positively and significantly associated with the risk of GDM (OR = 1.27, 95% CI: 1.02-1.59). Exposure to other types of PFASs such as perfluoroactane sulfonate (PFOS), perfluorohexane sulfonate (PFHxS), perfluoronnanoic acid (PFNA) was not statistically significantly associated with the risk of GDM with the pooled effect estimates of 0.97 (95% CI: 0.86-1.09), 1.03 (95% CI: 0.86-1.24), and 0.80 (95% CI: 0.55-1.16) respectively. CONCLUSION: We conducted a meta-analysis to investigate the association between PFASs exposure and GDM and found that PFOA concentration was significantly associated with a higher risk of GDM, which is of great significance for the prevention and control of GDM in public health. Further studies are needed in order to establish causality and clarify the potential mechanism.		1	A
D628	ヒト(生 殖発生毒 性)	Hammarstrand, Sofia; Jakobsson, Kristina; Andersson, Eva; Xu, Yiyi; Li, Ying; Olovsson, Matts; Andersson, Eva M	Perfluoroalkyl substances (PFAS) in drinking water and risk for polycystic ovarian syndrome, uterine leiomyoma, and endometriosis: A Swedish cohort study	2021	Environ Int. 2021 Dec;157:106819. doi: 10.1016/j.envint.2021.106819. Epub 2021 Aug 12.	BACKGROUND: Perfluorinated substances (PFAS) are chemicals with endocrine disruptive properties that may interfere with the female reproductive system. However, few studies have explored the association between benign gynecological diseases and high PFAS exposure. OBJECTIVES: The aim of this study was to investigate the possible associations between PFAS exposure and subsequent diagnosis of polycystic ovarian syndrome (PCOS), uterine leiomyoma (fibroids), and endometriosis in a cohort exposed to PFAS through drinking water. MATERIAL AND METHODS: In 2013, high levels (with sum of PFAS above 10,000 ng/L), dominated by perfluoroctanesulfonic acid (PFOS) and perfluorohexane sulfonic acid (PFHxS), were found in the drinking water from one of the two waterworks in Ronneby, Sweden. The contamination came from firefighting foams used at a nearby airfield. Females of all ages (n = 29,106) who had ever resided in the municipality between 1985 and 2013 formed a cohort. Individual exposure was assessed based on municipality waterworks distribution data linked to annual residential address data; 27% of the females had ever lived at an address with PFAS-contaminated water. Gynecological health outcomes were retrieved from the Swedish National Patient Register. The Cox proportional hazards model was used to estimate the association between exposure and each diagnosis. RESULTS: There were in all 161 cases of PCOS, 1,122 cases of uterine leiomyoma, and 373 cases of endometriosis. In women aged 20-50 years (n = 18,503), those with the highest estimated PFAS exposure had increased hazard ratios (HR) for PCOS (HR = 2.18; 95% confidence interval (Cl) 1.43, 3.34) and uterine leiomyoma (HR = 1.28; 95% Cl 0.95, 1.74). No increased HR for endometriosis was found (HR = 0.74; 95% Cl 0.42, 1.29). CONCLUSIONS: Exposure to high levels of PFAS in drinking water was associated with increased risk of PCOS and possibly uterine leiomyoma, but not endometriosis. The findings for PCOS are consistent with prior studies reporting positive associatio			В

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No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン文ン文 ク献 ク献 ① ラ ② ラ
D629	ヒト (生 殖発生毒 性)	Kobayashi, Sumitaka; Sata, Fumihiro; Goudarzi, Houman; Araki, Atsuko; Miyashita, Chihiro; Sasaki, Seiko; Okada, Emiko; Iwasaki, Yusuke; Nakajima, Tamie; Kishi, Reiko	Associations among perfluorooctanesulfonic/perfluorooctanoic acid levels, nuclear receptor gene polymorphisms, and lipid levels in pregnant women in the Hokkaido study	2021	Sci Rep. 2021 May 11;11(1):9994. doi: 10.1038/s41598-021- 89285-2.	The effect of interactions between perfluorooctanesulfonic (PFOS)/perfluorooctanoic acid (PFOA) levels and nuclear receptor genotypes on fatty acid (FA) levels, including those of triglycerides, is not clear understood. Therefore, in the present study, we aimed to analyse the association of PFOS/PFOA levels and single-nucleotide polymorphisms (SNPs) in nuclear receptors with FA levels in pregnant women. We analysed 504 mothers in a birth cohort between 2002 and 2005 in Japan. Serum PFOS/PFOA and FA levels were measured using liquid chromatography-tandem mass spectrometry and gas chromatography-mass spectrometry. Maternal genotypes in PPARA (rs1800234; rs135561), PPARG (rs3856806), PPARGC1A (rs2970847; rs8192678), PPARD (rs1053049; rs2267668), CAR (rs2307424; rs2501873), LXRA (rs2279238) and LXRB (rs1405655; rs2303044; rs4802703) were analysed. When gene-environment interaction was considered, PFOS exposure (log(10) scale) decreased palmitic, palmitoleic, and oleic acid levels (log(10) scale), with the observed β in the range of - 0.452 to - 0.244; PPARGC1A (rs8192678) and PPARD (rs1053049; rs2267668) genotypes decreased triglyceride, palmitic, palmitoleic, and oleic acid levels, with the observed β in the range of - 0.452 to - 0.244; PPARGC1A (rs8192678) and PPARD (rs1053049; rs2267668) genotypes decreased triglyceride, palmitic, palmitoleic, and oleic acid levels, with the observed β in the range of - 0.266 to - 0.176. Interactions between PFOS exposure and SNPs were significant for palmitic acid (P(int) = 0.004 to 0.017). In conclusion, the interactions between maternal PFOS levels and PPARGC1A or PPARD may modify maternal FA levels.			В
D630	ヒト(生 殖発生毒 性)	Chang, Che- Jung; Barr, Dana Boyd; Ryan, P Barry; Panuwet, Parinya; Smarr, Melissa M; Liu, Ken; Kannan, Kurunthachalam; Yakimavets, Volha; Tan, Youran; Ly, ViLinh; Marsit, Carmen J; Jones, Dean P; Corwin, Elizabeth J; Dunlop, Anne L; Liang, Donghai	Per- and polyfluoroalkyl substance (PFAS) exposure, maternal metabolomic perturbation, and fetal growth in African American women: A meet-in-the-middle approach	2022	Environ Int. 2022 Jan;158:106964. doi: 10.1016/j.envint.2021.106964. Epub 2021 Nov 1.	BACKGROUND: Prenatal exposures to per- and polyfluoroalkyl substances (PFAS) have been linked to reduced fetal growth. However, the detailed molecular mechanisms remain largely unknown. This study aims to investigate biological pathways and intermediate biomarkers underlying the association between serum PFAS and fetal growth using high-resolution metabolomics in a cohort of pregnant African American women in the Atlanta area, Georgia. METHODS: Serum perfluorohexane sulfonic acid (PFHXS), perfluorooctane sulfonic acid (PFOS), perfluorooctanoic acid (PFOA), and perfluorononanoic acid (PFNA) measurements and untargeted serum metabolomics profiling were conducted in 313 pregnant African American women at 8-14 weeks gestation. Multiple linear regression models were applied to assess the associations of PFAS with birth weight and small-for-gestational age (SGA) birth. A high-resolution metabolomics workflow including metabolome-wide association study, pathway enrichment analysis, and chemical annotation and confirmation with a meet-in-the-middle approach was performed to characterize the biological pathways and intermediate biomarkers of the PFAS-fetal growth relationship. RESULTS: Each log(2)-unit increase in serum PFNA concentration was significantly associated with higher odds of SGA birth (OR = 1.32, 95% CI 1.07, 1.63); similar but borderline significant associations were found in PFOA (OR = 1.20, 95% CI 0.94, 1.49) with SGA. Among 25,516 metabolic features extracted from the serum samples, we successfully annotated and confirmed 10 overlapping metabolites associated with both PFAS and fetal growth endpoints, including glycine, taurine, uric acid, ferulic acid, 2-hexyl-3-phenyl-2-propenal, unsaturated fatty acid C18:1, androgenic hormone conjugate, parent bile acid, and bile acid-glycine conjugate. Also, we identified 21 overlapping metabolic pathways from pathway enrichment analyses. These overlapping metabolites and pathways were closely related to amino acid, lipid and fatty acid, bile acid, and androgenic ho			В
D631	ヒト(生 殖発生毒 性)	Li, Nan; Liu, Yun; Papandonatos, George D; Calafat, Antonia M; Eaton, Charles B; Kelsey, Karl T; Cecil, Kim M; Kalkwarf, Heidi J; Yolton, Kimberly; Lanphear, Bruce P; Chen, Aimin; Braun, Joseph M	Gestational and childhood exposure to per- and polyfluoroalkyl substances and cardiometabolic risk at age 12 years	2021	Environ Int. 2021 Feb;147:106344. doi: 10.1016/j.envint.2020.106344. Epub 2021 Jan 6.	BACKGROUND: Per- and polyfluoroalkyl substances (PFAS) may adversely influence cardiometabolic risk. However, few studies have examined if the timing of early life PFAS exposure modifies their relation to cardiometabolic risk. We examined the influence of gestational and childhood PFAS exposure on adolescents' cardiometabolic risk. METHODS: We quantified concentrations of four PFAS (perfluorooctanoate [PFOA], perfluorooctane sulfonate [PFOS], perfluorononanoate [PFNA], and perfluorohexane sulfonate [PFHxS]) in sera collected during pregnancy, at birth, and at ages 3, 8, and 12 years from 221 mother-child pairs in the HOME Study (enrolled 2003-06, Cincinnati, Ohio). We measured cardiometabolic risk factors using physical examinations, fasting serum biomarkers, and dual-energy X-ray absorptiometry scans at age 12 years. Cardiometabolic risk summary scores were calculated by summing age- and sex-standardized z-scores for individual cardiometabolic risk factors. We used multiple informant models to estimate covariate-adjusted associations of serum PFAS concentrations (log(2)-transformed) at each visit with cardiometabolic risk scores and their individual components, and tested for differences in associations across visits. RESULTS: The associations of serum PFOA concentrations were positively associated with cardiometabolic risk scores (β s and 95% confidence intervals [95% CIs]: gestational 0.8 [0.0, 1.6]; cord 0.9 [-0.1, 1.9] per interquartile range increase). These positive associations were primarily driven by homeostatic model assessment for insulin resistance index ($\beta = 0.3$ [0.1, 0.5]) and adiponectin to leptin ratio ($\beta = -0.5$ [-1.0, 0.0]). Other individual cardiometabolic risk factors associated with gestational PFOA included insulin and waist circumference. Gestational and cord PFHxS were also associated with higher gestational PFOA included insulin and waist circumference. Gestational and cord PFHxS were also associated with higher gestational PFOA included insulin and waist circumference. Gestation			В

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン 文 ン 文 ク 献 ク 献 ① ラ ② ラ
D632	ヒト(生 殖発生毒 性)	Harris, Maria H; Oken, Emily; Rifas-Shiman, Sheryl L; Calafat, Antonia M; Bellinger, David C; Webster, Thomas F; White, Roberta F; Sagiv, Sharon K	Prenatal and childhood exposure to per- and polyfluoroalkyl substances (PFAS) and child executive function and behavioral problems	2021	Environ Res. 2021 Nov;202:111621. doi: 10.1016/j.envres.2021.111621. Epub 2021 Jul 6.	Early life exposure to per- and polyfluoroalkyl substances (PFAS) may adversely impact neurodevelopment, but epidemiological findings are inconsistent. In the Project Viva pre-birth cohort, we examined associations of prenatal and childhood PFAS plasma concentrations with parent and teacher assessments of children's behavior problems [Strengths and Difficulties Questionnaire (SDQ)] and executive function abilities [Behavior Rating Inventory of Executive Function (BRIEF)] at age 6-10 years (sample sizes 485-933). PFAS concentrations in pregnant Project Viva mothers (in 1999-2002) and children at ages 6-10 (in 2007-10) were similar to concentrations at similar time points in women and children in the nationally representative U.S. National Health and Nutrition Examination Survey. We observed no consistent associations of prenatal PFAS concentrations with behavior or executive function. Childhood concentrations of perfluoroctanoate (PFOA), perfluoroctane sulfonate (PFOS), perfluorohexane sulfonate (PFHxS), perfluorononanoate (PFNA) and perfluorodecanoate (PFOA) were associated with higher parent-rated SDQ Total Difficulties scores (mean = 6.7, standard deviation (SD) = 4.9), suggesting greater behavioral problems (top (Q4) versus bottom (Q1) quartile PFOA: 1.5, 95% confidence interval (CI): 0.3, 2.7; PFOS: 1.4, 95% CI: 0.3, 2.5; PFHxS: 1.2, 95% CI: 0.1, 2.3; PFNA: 1.2, 95% CI: 0.1, 2.2; PFDA: 1.1, 95% CI: 0.0, 1.1); teacher-rated SDQ scores did not show associations. Higher childhood PFOS was associated with higher (indicating more problems) parent-rated BRIEF General Executive Composite (GEC) scores (standardized to mean = 50, SD = 10) (Q4 vs. Q1: 2.4, 95% CI: 0.2, 4.6), while teacher BRIEF GEC scores indicated more problems among children with higher PFHxS (Q4 vs. Q1: 3.5, 95% CI: 0.4, 6.3). There were no consistent patterns of sexual dimorphism in associations. In a cohort of U.S. children, we observed cross-sectional associations of childhood PFAS concentrations with greater behavioral and executive function p			В
D633	ヒト(生 殖発生毒 性)	Carrizosa, Christian; Murcia, Mario; Ballesteros, Virginia; Costa, Olga; Manzano- Salgado, Cyntia B; Ibarluzea, Jesus; Iñiguez, Carmen; Casas, Maribel; Andiarena, Ainara; Llop, Sabrina; Lertxundi, Aitana; Schettgen, Thomas; Sunyer, Jordi; Ballester, Ferran; Vrijheid, Martine; Lopez- Espinosa, Maria-	Prenatal perfluoroalkyl substance exposure and neuropsychological development throughout childhood: The INMA Project	2021	J Hazard Mater. 2021 Aug 15;416:125185. doi: 10.1016/j.jhazmat.2021.125185. Epub 2021 Jan 20.	BACKGROUND: Perfluoroalkyl substances (PFASs) have been related to neurodevelopmental toxicity in animals. However, human studies are inconclusive. OBJECTIVES: To evaluate the association between prenatal PFAS exposure and neuropsychological development during childhood. METHODS: 1240 mother-child pairs from the Spanish INMA Project were analyzed. Perfluorohexanesulfonic acid (PFNS), perfluorooctanoic acid (PFOA), perfluorooctane sulfonate (PFOS), and perfluorononanoic acid (PFNA) were measured in first-trimester maternal plasma. Neuropsychological development was assessed at 14 months, 4-5 and 7 years covering four domains: general cognitive, general motor, attention, and working memory. Associations were studied by means of multivariable regression analyses. RESULTS: PFHxS, PFOA, PFOS, and PFNA medians were: 0.6, 2.4, 6.1, and 0.7 ng/mL. Higher PFAS prenatal exposure was associated with worse motor development at 14 months, especially in the case of PFHxS (β [95%CI]: -1.49[-2.73, -0.24]) and to a lesser extent PFOS (-1.25[-2.62, 0.12]). There was also a marginal positive association between general cognitive development at 4-5 years and PFOS (1.17[-0.10, 2.43]) and PFNA (0.99[-0.13, 2.12]). No clear associations for other neuropsychological outcomes or any sex differences were found. DISCUSSION: This study shows no clear-cut evidence of an association between prenatal PFAS exposure and adverse neuropsychological development in children up to the age of 7 years.			В

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン 文 ン 文 ク 献 ク 献 ① ラ ② ラ
D634	ヒト (生 殖発生毒 性)	Romano, Megan E; Gallagher, Lisa G; Eliot, Melissa N; Calafat, Antonia M; Chen, Aimin; Yolton, Kimberly; Lanphear, Bruce; Braun, Joseph M	Per- and polyfluoroalkyl substance mixtures and gestational weight gain among mothers in the Health Outcomes and Measures of the Environment study	2021	Int J Hyg Environ Health. 2021 Jan;231:113660. doi: 10.1016/j.ijheh.2020.113660. Epub 2020 Nov 9.	BACKGROUND: Per- and polyfluoroalkyl substances (PFAS) are environmentally persistent chemicals commonly used in the production of household and consumer goods. While exposure to PFAS has been associated with greater adiposity in children and adults, less is known about associations with gestational weight gain (GWG). METHODS: We quantified using mass spectrometry perfluoroctanoate (PFOA), perfluoroctanesulfonate (PFOS), perfluorohexanesulfanoate (PFHxS) and perfluorononanoate (PFNA) in maternal serum from 18 \pm 5 weeks' gestation (mean \pm standard deviation (std)) in a prospective pregnancy and birth cohort (2003-2006, Cincinnati, Ohio) (n = 277). After abstracting weight data from medical records, we calculated GWG from 16 \pm 2 weeks' gestation (mean \pm std) to the measured weight at the last visit or at delivery, rate of weight gain in the 2nd and 3rd trimesters (GWR), and total weight gain z-scores standardized for gestational age at delivery and pre-pregnancy BMI. We investigated covariate-adjusted associations between individual PFAS using multivariable linear regression; we assessed potential effect measure modification (EMM) by overweight/obese status (pre-pregnancy BMI<25 kg/m(2) v. \geq 25 kg/m(2)). Using weighted quantile sum regression, we assessed the combined influence of these four PFAS on GWG and GWR. RESULTS: Each doubling in serum concentrations of PFOA, PFOS, and PFNA was associated with a small increase in GWG (range 0.5-0.8 lbs) and GWR (range 0.03-0.05 lbs/week) among all women. The association of PFNA with GWG was stronger among women with BMI \geq 25 kg/m(2) (β = 2.6 lbs; 95% CI:-0.8, 6.0) than those with BMI<25 kg/m(2) (β = -1.0 lbs; 95% CI:-3.8, 1.8; p-EMM = 0.10). We observed associations close to the null between PFAS and z-scores and between the PFAS exposure index (a combined summary measure) and the outcomes. CONCLUSION: Although there were consistent small increases in gestational weight gain with increasing PFOA, PFOS, and PFNA serum concentrations in this cohort, the assoc			В
D635	ヒト (生 殖発生毒 性)	Espindola Santos, Aline de Souza; Meyer, Armando; Dabkiewicz, Vanessa Emídio; Câmara, Volney de Magalhães; Asmus, Carmen Ildes Rodrigues Froes	Serum levels of perfluorooctanoic acid and perfluorooctane sulfonic acid in pregnant women: Maternal predictors and associations with birth outcomes in the PIPA Project	2021	J Obstet Gynaecol Res. 2021 Sep;47(9):3107-3118. doi: 10.1111/jog.14883. Epub 2021 Jun 10.	AIM: Perfluorooctanoate (PFOA) and perfluorooctane sulfonate (PFOS) are persistent pollutants associated with adverse birth outcomes. This study aimed to identify predictors of blood PFOA and PFOS concentrations in pregnant women and to estimate their associations with birth outcomes in Brazil. METHODS: We conducted a cross-sectional study with 139 pregnant women enrolled in the pilot study of the Rio Birth Cohort Study on Environmental Exposure and Childhood Development (PIPA Project). Multiple linear regression was used to estimate associations between PFOA and PFOS with maternal predictors and birth outcomes. RESULTS: Higher levels of PFOA were observed in women aged 16-19 and 20-39 years, while fish consumption from 0.6 to 2.0 times per week was associated with lower levels of the substance. PFOS levels were higher in women living in houses with up to four rooms but lower in those who reported passive exposure to smoking. Increased newborn length and head circumference were also associated with higher maternal levels of PFOA. CONCLUSIONS: In our study, age, fish consumption, passive smoking, and the number of rooms in the house were predictors of maternal PFAS levels. However, we did not observe significant associations between maternal plasma PFAS concentrations and birth outcomes.			В
D636	ヒト(生殖発生毒性)	Skogheim, Thea S; Weyde, Kjell Vegard F; Aase, Heidi; Engel, Stephanie M; Sur én, Pål; Øie, Merete G; Biele, Guido; Reichborn- Kjennerud, Ted; Brantsæter, Anne Lise; Haug, Line S; Sabaredzovic, Azemira; Auyeung, Bonnie; Villanger, Gro D	Prenatal exposure to per- and polyfluoroalkyl substances (PFAS) and associations with attention- deficit/hyperactivity disorder and autism spectrum disorder in children	2021	Environ Res. 2021 Nov;202:111692. doi: 10.1016/j.envres.2021.111692. Epub 2021 Jul 19.	BACKGROUND: Prenatal exposure to per- and polyfluoroalkyl substances (PFAS) may be a risk factor for neurodevelopmental deficits and disorders, but evidence is inconsistent. OBJECTIVES: We investigated whether prenatal exposure to PFAS were associated with childhood diagnosis of attention-deficit/hyperactivity disorder (ADHD) or autism spectrum disorder (ASD). METHODS: This study was based on the Norwegian Mother, Father and Child Cohort Study and included n = 821 ADHD cases, n = 400 ASD cases and n = 980 controls. Diagnostic cases were identified by linkage with the Norwegian Patient Registry. In addition, we used data from the Medical Birth Registry of Norway. The study included the following PFAS measured in maternal plasma sampled mid-pregnancy: Perfluorooctancic acid (PFOA), perfluorononancic acid (PFNA), perfluorodecancic acid (PFDDA), perfluorooctance sulfonate (PFOS). Relationships between individual PFAS and ADHD or ASD diagnoses were examined using multivariable adjusted logistic regression models. We also tested for possible non-linear exposure-outcome associations. Further, we investigated the PFAS mixture associations with ASD and ADHD diagnoses using a quantile-based g-computation approach. RESULTS: Odds of ASD was significantly elevated in PFOA quartile 2 [OR = 1.71 (95% Cl: 1.20, 2.45)] compared to quartile 1, and PFOA appeared to have a non-linear, inverted U-shaped dose-response relationship with ASD. PFOA was also associated with increased odds of ADHD, mainly in quartile 2 [OR = 1.54 (95% Cl: 1.16, 2.04)] compared to quartile 1, and displayed a non-linear relationship in the restricted cubic spline model. Several PFAS (PFUNDA, PFDA, and PFOS) were inversely associated with odds of ADHD and/or ASD. Some of the associations were modified by child sex and maternal education. The overall PFAS (no.9.0.9)] and the sulfonate mixture [OR = 0.78 (95% Cl: 0.73, 0.96)]. CONCLUSION: Prenatal exposure to PFOA was associated with increased risk of ASD and ADHD in children. For some PFAS, as well as the in			в

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D637	ヒト (代 謝)	Braun, Joseph M; Eliot, Melissa; Papandonatos, George D; Buckley, Jessie P; Cecil, Kim M; Kalkwarf, Heidi J; Chen, Aimin; Eaton, Charles B; Kelsey, Karl; Lanphear, Bruce P; Yolton, Kimberly	Gestational perfluoroalkyl substance exposure and body mass index trajectories over the first 12 years of life	2021	Int J Obes (Lond). 2021 Jan;45(1):25-35. doi: 10.1038/s41366-020-00717-x. Epub 2020 Nov 18.	BACKGROUND/OBJECTIVES: Gestational exposure to perfluoroalkyl substances (PFAS), a ubiquitous class of persistent endocrine disrupting chemicals, is associated with increased risk of obesity and cardiometabolic disease. However, it is unclear if gestational PFAS exposure is associated with adiposity trajectories related to adult obesity and cardiometabolic health. SUBJECTS/METHODS: We measured perfluoroctanoic acid (PFOA), perfluoroctanesulfonic acid (PFOS), perfluorononaoic acid, and perfluorohexanesulfonic acid (PFHxS) concentrations in maternal serum collected between 16 weeks gestation and delivery in a cohort of 345 mother-child pairs in Cincinnati, OH (enrolled 2003-06). From age 4 weeks to 12 years, we measured weight and length or height up to eight times and calculated child body mass index (BMI) (1865 repeated measures). Using covariate- adjusted linear mixed models and splines to account for repeated BMI measures and nonlinear BMI patterns, respectively, we estimated the age/magnitude of infancy BMI zenith (~1 year) and childhood BMI nadir (~5 years), BMI accrual from 8 to 12 years, and BMI at age 12 years by PFAS terciles. RESULTS: BMI trajectories varied by PFOA concentrations (age × PFOA interaction p value = 0.03). Children born to women with higher PFOA concentrations had lower infancy and early childhood BMI, earlier BMI nadir, accelerating BMI gains in mid-childhood, and adolescence, and higher BMI at age 12 years. Some of these associations were non-monotonic. PFOS and PFHxS were not associated with alterations in BMI trajectories, but were monotonically associated with lower BMI across infancy, childhood, and adolescence. Compared to children in the first PFOS tercile, those in the second (β : -0.83; 95% confidence interval (CI): -2.11, 0.51 kg/m(2)), and third (β : -1.41; 95% CI: -2.65, -0.14 kg/m(2)) had lower BMI at age 12 years. CONCLUSIONS: These results suggest that gestational PFOA exposure may be associated with BMI trajectories related to adult obesity and cardiometabolic disease		1 A
D638	ヒト(生 殖発生毒 性)	Zhu, Yachen; Bartell, Scott M	Per- and polyfluoroalkyl substances in drinking water and hypertensive disorders of pregnancy in the United States during 2013-2015	2022	Environ Epidemiol. 2022 May 4;6(3):e209. doi: 10.1097/EE9.00000000000000000000000000000000000	BACKGROUND: Per- and polyfluoroalkyl substances (PFAS) widely exist in the environment and human bodies. Contaminated drinking water is one of the major exposure pathways for humans. Previous studies found weak or moderate associations between PFAS and hypertensive disorders of pregnancy (HDP). METHODS: We obtained the number of births and counts of HDP cases for singleton births multiply stratified by county, maternal age, race, education, smoking status, and parity from CDC WONDER, and PFAS water concentrations from EPA UCMR3 data in the United States during 2013-2015. We used binomial regression on the multiply stratified HDP data to produce equal effect estimates and standard errors to those that would be derived from using individual-level data on binary HDP status and demographic covariates in logistic regression. RESULTS: After adjusting for demographic covariates, we found small but statistically significant positive associations between HDP and population-weighted average water concentrations (ng/L) of all four PFAS: Odds ratio (OR) = 1.009, 95% CI = (1.001, 1.016) per IQR increase in perfluorooctanoic acid (PFOA); 1.030, 95% CI = (1.021, 1.040) per IQR increase in perfluoroactane sulfonate (PFOS); 1.008, 95% CI = (1.005, 1.011) per IQR increase in perfluoroheptanoic acid (PFHAS), and 1.032, 95% CI = (1.022, 1.042) per IQR increase in the sum of four PFAS. Further adjustment for coexposures reversed the effect of PFOA from positive to inverse, and attenuated the effects of PFOS and PFHxS toward the null. After drinking water to serum concentration conversions, our effect estimates for PFOA, PFOS, and PFHxS are similar to previous studies. CONCLUSIONS: We found a weak positive association between the PFAS mixture and HDP, although the generalizability is subject to inherent limitations of the public-available datasets.		В
D639	ヒト(生殖発生毒性)	Mitro, Susanna D; Sagiv, Sharon K; Rifas-Shiman, Sheryl L; Calafat, Antonia M; Fleisch, Abby F; Jaacks, Lindsay M; Williams, Paige L; Oken, Emily; James- Todd, Tamarra M	Per- and Polyfluoroalkyl Substance Exposure, Gestational Weight Gain, and Postpartum Weight Changes in Project Viva	2020	Obesity (Silver Spring). 2020 Oct;28(10):1984-1992. doi: 10.1002/oby.22933.	OBJECTIVE: The purpose of this study was to test the extent to which pregnancy per- and polyfluoroalkyl substance (PFAS) concentrations were associated with gestational weight gain and postpartum weight changes. METHODS: This study was composed of 1,614 women recruited between 1999 and 2002 via the Project Viva cohort with pregnancy plasma concentrations of six PFAS, including perfluorooctanesulfonic acid, perfluorooctanoic acid (PFOA), and 2-(N-ethyl-perfluorooctane sulfonamido) acetic acid. Gestational weight gain was defined as the difference between last pregnancy weight and prepregnancy weight, 1-year postpartum weight retention as the difference between 1-year postpartum weight and prepregnancy weight, and 3-year postpartum weight change as the difference between 3-year postpartum weight and prepregnancy weight. RESULTS: During pregnancy, women gained 0.37 kg (95% CI: 0.11-0.62) more weight per doubling of 2-(N-ethyl-perfluorooctane sulfonamido) acetic acid. At 1 year post partum, women retained 0.55 kg (95% CI: 0.07-1.04) more weight per doubling of PFOA. At 3 years post partum, women gained 0.91 kg (95% CI: 0.25-1.56) more weight per doubling in PFOA. Findings were similar after adjustment for all PFAS. Other PFAS were not associated with weight changes. Postpartum associations were stronger among women with higher prepregnancy BMI. Models were adjusted for demographics. CONCLUSIONS: Pregnancy PFAS were associated with greater gestational weight gain, weight retention, and weight gain years after pregnancy.		В

分野 タイトル 発行年 書誌情報 要旨 (原文) No. 著者 (参考) Per- and polyfluoroalkyl substances (PFAS) are widespread chemicals. Legacy PFAS have b developed countries and emerging PFAS (short-chain PFAS and polyfluorinated compounds) alternatives. The effect of legacy and emerging PFAS on cytokine homeostasis in human ren aimed to evaluate the associations between legacy and emerging PFAS and cytokine profile the disturbance of cytokine homeostasis. We quantified 21 PFAS in 198 Chinese women of c Nian, Min; Zhou cytokines were measured using the Meso Scale Discovery U-PLEX and V-PLEX platforms. T ヒト (生 Wei; Feng, Yan; 2022 Sci Rep. 2022 Apr 20;12(1):6517. doi: 10.1038/s41598-022-10501-8. Emerging and legacy PFAS and cytokine homeostasis exposure and cytokine levels were assessed using multiple linear regression (single-exposu 殖発生毒 Wang, Yan; D640 n women of childbearing age regression (BKMR) models (PFAS mixture exposure). In single PFAS models, legacy and alt (牛) Chen, Qian; associated with Th1 and Treg cytokines, and negatively associated with Th2 and Th17 cytok Zhang, Jun increase in 6:2 chlorinated perfluoroalkyl ether sulfonic acid (6:2 CI-PFESA), perfluorooctand sulfonate (PFOS) was associated with a decrease in IL-10 by - 0.228 (95% CI: - 0.336, - 0. and - 0.174 (95% CI: - 0.339, - 0.010), respectively. The BKMR model showed a significant with TGF- β and a negative association with IL-10. Overall, these results indicate that both the homeostasis of cytokines. BACKGROUND: Studies of prenatal per- and polyfluoroalkyl substances (PFAS) and attention (ADHD)-related behaviors in children are inconsistent. OBJECTIVES: To examine association concentrations and child behavior in 241 mother-child dyads within the Health Outcomes an (HOME) Study. METHODS: We quantified perfluorooctanoate (PFOA), perfluorooctane sulfo sulfonate (PFHxS), and perfluorononanoate (PFNA) in maternal serum collected during preg total of 17 outcomes of child behavior using the Behavioral Assessment System for Children Vuong, Ann M; 240) and ADHD diagnostic symptoms and criteria with the Diagnostic Interview Schedule for Webster, Glenys years (n = 190). We used linear mixed models and logistic regression with generalized estim M: Yolton associations between PFAS and continuous or dichotomous "at risk" BASC-2 scores; negati ヒト (生 Prenatal exposure to per- and polyfluoroalkyl Kimberly; Environ Res. 2021 Apr;195:110825. doi: 2021 10.1016/j.envres.2021.110825. Epub 2021 Feb 2. D641 殖発生毒 substances (PFAS) and neurobehavior in US children incident rate ratios for counts of ADHD symptoms; and Poisson regression with robust stand Calafat, Antonia 性) through 8 years of age: The HOME study of meeting ADHD diagnostic criteria. RESULTS: Each In-unit increase in PFOS, PFHxS, and M; Muckle, Gina BASC-2 scores and increased odds of "at-risk" scores for externalizing behaviors, including Lanphear, Bruce 2.7, 95% confidence interval [CI] 1.2, 5.9; PFHxS: OR 2.5, 95% CI 1.5, 4.3; PFNA: OR 3.2, 95% P; Chen, Aimin associated with internalizing problems (OR 2.0, 95% CI 1.1, 3.4) and somatization (OR 2.2, 95 significantly associated with 50-80% more DISC-YC symptoms and diagnostic criteria relate Prenatal PFNA was associated with increased risk of any-type ADHD. CONCLUSIONS: Pren consistently associated with measures related to hyperactive-impulsive type ADHD across t PFHxS was associated with increased problems with both externalizing and internalizing be between PFOA and child neurobehavior. Exposure to perfluoroalkyl substances (PFASs) has in some studies been associated with re Christensen, newborns as a sensitive indicator of prenatal anti-androgenic exposure. The aim of this stuc Jonathan Vibe between maternal PFAS exposure and offspring AGD in a population with wide ranges of PF Retbøll: recruited in the Faroe Islands in 2007-2009, and information on AGD and PFAS exposure wa Bangash, pairs, Perfluorooctanoic acid (PFOA), perfluorooctanesulfonic acid (PFOS), perfluorohexane Khushal Khan: perfluorononanoic acid (PFNA) and perfluorodecanoic acid (PFDA) were measured in mater ヒト(生 Weihe, Pál; Maternal exposure to perfluoroalkyl chemicals and Reprod Toxicol. 2021 Sep;104:52-57. doi: multiple linear regression analysis adjusted for birth weight, child age at examination, parity, D642 殖発生毒 Grandjean, anogenital distance in the offspring: A Faroese cohort 2021 10.1016/j.reprotox.2021.06.016. Epub 2021 Jun 25. boys, higher maternal serum concentrations of PFOA, PFOS, PFNA and PFDA were significa 性) Phillippe; study both with the exposure entered as a continuous variable and as quartiles. Boys in the highes Nielsen, PFDA exposure had an increase in AGD of 1.2 mm (95 % CI 0.1;2.2), 1.3 mm (95 % CI 0.3;2.3) Flemming; (95 % CI 0.3;2.4), respectively, when compared to boys in the lowest quartile of exposure (p Jensen, Tina found between male AGD and PFHxS. No association was found for girls. In conclusion, elev Kold; Petersen PFASs was significantly associated with a longer AGD in boys. No significant associations v Maria Skaalum suggesting a sex-dimorphic effect of PFAS exposure.

	備考	出 情 対 報 象 抽	ン 文 ク 献 ① ラ	ン 文 ク 献 ② ラ
een phased out of production in most) are used as legacy PFAS mains poorly understood. This study s, and identify the main contributors to childbearing age from 2015 to 2016. 13 The associations between PFAS re), and Bayesian kernel machine ernative PFAS were positively tines. For instance, each In-unit bic acid (PFOA), and perfluorooctane 120), - 0.153 (95% CI: - 0.277, - 0.030), y positive association of PFAS mixture legacy and emerging PFAS may affect			В	
on deficit hyperactivity disorder ns between maternal serum PFAS ad Measures of the Environment onate (PFOS), perfluorohexane gnancy or at delivery. We evaluated a -2 (BASC-2) at 5 and 8 years (n = r Children-Young Child (DISC-YC) at 5 nating equations to assess we binomial regression to calculate dard errors to calculate relative risks PFNA was associated with higher hyperactivity (PFOS: odds ratio [OR] o CI 1.3, 8.0). PFHxS was also 5% CI 1.2, 4.0). PFOS and PFNA were d to hyperactive-impulsive type ADHD. atal PFOS and PFNA were wo validated assessment instruments. haviors. No associations were noted			В	
duced anogenital distance (AGD) in dy was to investigate the association FAS exposures. Participants were as obtained from 463 mother-infant sulfonic acid (PFHxS), nal serum. Data were analyzed using , and maternal education level. Among ntly associated with a longer AGD, st quartile of PFOA, PFOS, PFNA and), 1.0 mm (95 % CI 0.0:2.0) and 1.3 mm < 0.05). No significant association was vated maternal exposure to major vere found among girls, thus			В	

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D643	ヒト (生 殖発生毒 性)	Kung, Yen-Ping; Lin, Ching-Chun; Chen, Mei-Huei; Tsai, Meng- Shan; Hsieh, Wu-Shiun; Chen, Pau-Chung	Intrauterine exposure to per- and polyfluoroalkyl substances may harm children's lung function development	2021	Environ Res. 2021 Jan;192:110178. doi: 10.1016/j.envres.2020.110178. Epub 2020 Sep 28.	BACKGROUND: Per- and polyfluoroalkyl substances (PFAS), such as perfluorooctancic acid (PFOA), perfluorooctane sulfonate (PFOS), perfluoronanoic acid (PFNA) and perfluoroundecanoic acid (PFUA), are common persistent environmental organic pollutants. Animal studies have indicated that PFAS influence inflammatory responses and lung development. However, whether prenatal or childhood PFAS exposure affects children's lung function remains unclear. This study aimed to investigate both in utero exposure and childhood exposure to PFAS and the relationships between them and lung function development in childhood. METHODS: In total, 165 children were recruited from the Taiwan Birth Panel Study (TBPS). Cord blood plasma and children's serum were collected when they were eight years old. PFAS levels were analysed by ultra-high-performance liquid chromatography/tandem mass spectrometry. When these children reached eight years of age, we administered detailed questionnaires and lung function examinations. RESULTS: The mean concentrations of PFOA, PFOS, PFNA and PFUA in cord blood among the 165 study children were 2.4, 6.4, 6.0, and 15.4 ng/mL, respectively. The mean concentrations in serum from eight-year-olds were 2.7, 5.9, 0.6, and 0.3 ng/mL, respectively. At eight years of age, the mean FEV1 (forced expiratory volume per sec), FVC (forced vital capacity), PEF (peak expiratory flow) and FEV1/FVC values were 1679 mL, 1835 mL, 3846 mL/s and 92.0%, respectively. PFOA, PFOS, PFNA and PFUA levels in cord blood were inversely associated with FEV1, FVC and PEF values. The PFOS concentration in cord blood was the most consistently correlated with decreasing lung function in subgroups with lower birth weight and allergic rhinitis. CONCLUSIONS: Our cohort study revealed that the concentrations of PFOA, PFOS, PFNA and PFOA, PFOS, PFNA and PFUA were higher in cord blood than in serum from eight-year-olds. Some trends were also noted between intrauterine PFOS exposure and children's decreasing FEV1, FVC and PEF, especially in subgroup		В
D644	ヒト(生 殖発生毒 性)	Li, Yuqian; Lu, Xinyan; Yu, Nanyang; Li, Aijing; Zhuang, Taifeng; Du, Letian; Tang, Song; Shi, Wei; Yu, Hongxia; Song, Maoyong; Wei, Si	Exposure to legacy and novel perfluoroalkyl substance disturbs the metabolic homeostasis in pregnant women and fetuses: A metabolome-wide association study	2021	Environ Int. 2021 Nov;156:106627. doi: 10.1016/j.envint.2021.106627. Epub 2021 May 13.	BACKGROUND: Perfluoroalkyl substances (PFASs) exist extensively and several of these have been verified to be toxic. Prenatal exposure to PFASs has attracted much attention. Metabolome-wide association analyses can be used to explore the toxicity mechanisms of PFASs by identifying associated biomarkers. OBJECTIVES: To evaluate associations between the metabolites in maternal and cord serum and internal exposure to several common PFASs. METHODS: Paired maternal and cord serum samples were collected from 84 pregnant women who gave birth between 2015 and 2016. Seven legacy and two novel PFASs were measured. A nontarget metabolomic method and an iterative metabolite annotation based on metabolic pathways were applied to characterize the metabolic profiles. Linear regression adjusted with the false discovery rate and covariates was used to indicate the associations. RESULTS: A total of 279 features in maternal serum and 338 features in cord serum were identified as metabolites associated with PFAS exposure. Perfluorooctanoic acid (PFOA) and perfluorohexane sulfonic acid (CI-PFESAs) showed less relevance to the metabolites, while the two novel chlorinated polyfluorinated ether sulfonic acids (CI-PFESAs) showed less relevance to the metabolome. With pathway enrichment analysis, we found that three fatty acid metabolisms and retinol metabolism were correlated with PFAS exposure in maternal blood, and that sterol metabolism showed the correlation in both maternal serum and cord serum. CONCLUSIONS: We identified metabolites and pathways in pregnant women and fetuses associated with the exposure to several PFAS, indicating a promising application for metabolome-wide association studies. Additional research is needed to confirm causation.		В
D645	ヒト(生 殖毒性)	Wang, Wei; Hong, Xiang; Zhao, Fanqi; Wu, Jingying; Wang, Bei	The effects of perfluoroalkyl and polyfluoroalkyl substances on female fertility: A systematic review and meta-analysis	2022	Environ Res. 2022 Nov 2;216(Pt 3):114718. doi: 10.1016/j.envres.2022.114718. Online ahead of print.	OBJECTIVE: The reproductive toxicity of perfluoroalkyl and polyfluoroalkyl substances (PFAS) has been verified in both animal and in vitro experiments, however, the association between PFAS and female fertility remains contradictory in population studies. Therefore, in this systematic review and meta-analysis, we evaluated the effects of PFAS on female fertility based on population evidence. METHODS: Electronic searches of the Web of Science, PubMed, The Cochrane Library, and Embase databases were conducted (from inception to March 2022) to collect observational studies related to PFAS and female fertility. Two evaluators independently screened the literature, extracted information and evaluated the risk of bias for the included studies, meta-analysis was performed using R software. RESULTS: A total of 5468 records were searched and 13 articles fully met the inclusion criteria. Meta-analysis showed that perfluoroctanoic acid (PFOA) exposure was negatively associated with the female fecundability odds ratio (FOR = 0.88, 95% confidence interval (CI) [0.78; 0.98]) and positively associated with the fecundability odds ratio (FOR = 0.94, 95% CI [0.90; 0.98]). Pooled effect values for perfluorononanoic acid (PFNA), perfluorodecanoic acid (PFDA), and perfluorohexane sulfonate (PFHXS) exposure did not find sufficient evidence for an association with female fertility. CONCLUSION: Based on the evidence provided by the current study, increased levels of PFAS exposure are associated with reduced fertility in women, this was characterized by a reduction in fecundability odds ratio and an increase in odds ratio for infertility. This finding could partially explain the decline in female fertility and provide insight into risk assessment when manufacturing products containing PFAS.		1 A

分野 タイトル 発行年 書誌情報 要旨 (原文) No 著者 (参考) Vitamin D has been linked to various physiological functions in pregnant women and their fe Chang, Chesuggested that some per- and polyfluoroalkyl substances (PFAS) may alter serum vitamin D Jung; Barr, Dana has investigated the relationship between PFAS and vitamin D in pregnant women. This stud Boyd; Zhang, serum PFAS with serum total and free 25-hydroxyvitamin D (25(OH)D) during pregnancy in Atlanta, GA. Blood samples from 442 participants were collected in early pregnancy (8-14 we Qiang; Dunlop, Anne L; Smarr, 25(OH)D measurements, and additional samples were collected in late pregnancy (24-30 we Melissa M: measurements. We fit multivariable linear regressions and weighted quantile sum (WQS) reg Associations of single and multiple per- and ヒト (生 Kannan of individual PFAS and their mixtures with 25(OH)D concentrations. We found mostly positiv 2021 Environ Res. 2021 Nov;202:111713. doi: polyfluoroalkyl substance (PFAS) exposure with D646 殖発生毒 Kurunthachalam PFHxS (perfluorohexane sulfonic acid), PFOS (perfluorooctane sulfonic acid), PFDA (perfluo 10.1016/j.envres.2021.111713. Epub 2021 Jul 18. vitamin D biomarkers in African American women (件) methyl perfluorooctane sulfonamido acetic acid), and negative associations with PFPeA (pe Panuwet during pregnancy Parinya; 25(OH)D, positive associations were observed with PFHxS, PFOS, PFOA (perfluorooctanoic Tangpricha, Vin; association with PFPeA among the women with male fetuses in the models using 25(OH)D Shi, Liuhua; models, a quartile increase in WQS index was associated with 2.88 ng/mL (95%CI 1.14-4.59) Liang, Donghai; increases in total 25(OH)D measured in the early and late pregnancy, respectively. NMeFOS Corwin, Elizabeth most to the overall effects among the eight PFAS. No association was found between free 2 J; Ryan, P Barry results suggest that PFAS may affect vitamin D biomarker concentrations in pregnant Africa associations were modified by fetal sex. Birukov, Anna: BACKGROUND: Previous studies of association between exposure to poly- and perfluoroalk hypertension (GH) and preeclampsia (PE) have shown conflicting results, but most dichotor Andersen, Louise **Biørkholt** continuous blood pressure (BP) changes. OBJECTIVES: To study the association between Pl Andersen, maternal BP trajectories in pregnancy, gestational hypertension and preeclampsia. METHOD Marianne Odense Child Cohort in early pregnancy and had a serum sample drawn, from which perfluo Skovsager; perfluorooctane sulfonic acid (PFOS), perfluorooctanoic acid (PFOA), perfluorononanoic aci Nielsen, Julie H: (PFDA) were measured using LC-MS/MS. Repeated BP measurements through pregnancy ヒト (生 Nielsen, Exposure to perfluoroalkyl substances and blood from hospital files. Adjusted linear mixed models were used to investigate association betwee Environ Int. 2021 Jun;151:106442. doi: 2021 10.1016/j.envint.2021.106442. Epub 2021 Feb 17. D647 殖発生毒 Flemming; Kyhl, pressure in pregnancy among 1436 women from the Associations between PFAS and PE and GH were assessed by Cox proportional hazards mo neasurable concentrations of PFAS. In all of many comparisons higher PFAS exposure (apa 性) Henriette Boye; J Odense Child Cohort higher systolic (SBP) and diastolic (DBP) blood pressures, although not all were significant, ørgensen, Jan Stener; After adjustment, each doubling in PFOS or PFOA exposure was associated with 0.47 mmHg (-0.19; 0.92) higher SBP; and 0.58 mmHg (0.13; 1.04) and 0.37 mmHg (-0.05; 0.79) higher DE Grandjean, Philippe: PFAS exposure and PE or GH were found. DISCUSSION: The magnitude of the association b Dechend, Ralf appear small, statistically non-significant and the possible clinical importance low. However shift the distribution of BP towards an increased incidence of GH. If BP increases in pregnar Jensen, Tina Kold health not only of the pregnant woman but also of her offspring. BACKGROUND: Residents of a large area of North-Eastern Italy were exposed for decades and polyfluoroalkyl substances (PFAS) via drinking water. Serum PFAS levels have been cor serum lipids, but few studies have been conducted among pregnant women, and none has s gestation. Elevated serum lipid levels during pregnancy can have both immediate and long-l Dalla Zuanna the developing fetus. We evaluated the association between perfluorooctane sulfonate (PFC Teresa: Savitz and perfluoro-hexanesulfonate (PFHxS) levels in relation to lipid profiles in highly-exposed David A; Barbieri sectional analysis was conducted in 319 pregnant women (age 14-48 years) enrolled in the Giulia; Pitter, Non-fasting blood samples were obtained in any trimester of pregnancy and analyzed for PF Gisella; Zare cholesterol (TC), high-density lipoprotein cholesterol (HDL-C). Low-density lipoprotein chol ヒト (生 Jeddi, Maryam; The association between perfluoroalkyl substances associations between In-transformed PFAS (and categorized into quartiles) and lipids were Ecotoxicol Environ Saf. 2021 Feb;209:111805. doi: D648 殖発生毒 and lipid profile in exposed pregnant women in the 2021 Daprà 10.1016/j.ecoenv.2020.111805. Epub 2020 Dec 24 models. Analyses were adjusted for potential confounders and stratified according to pregn (牛) Francesca; Veneto region, Italy geometric means of PFOA, PFOS and PFHxS were 14.78 ng/mL, 2.67 ng/mL and 1.89 ng/ml Fabricio, Aline S TC, HDL-C and LDL-C increased steadily throughout the trimesters. In the 1st trimester, PF C; Russo, and PFHxS with HDL-C. In the 3rd trimester, instead, an inverse relationship was seen betw Francesca: and LDL-C. CONCLUSIONS: Results suggest the associations between PFAS concentration: Fletcher, Tony; might differ by trimesters of pregnancy. In the first trimester, patterns are similar to those of Canova, Cristina differ late in pregnancy. Different independent behavior of PFAS and lipid levels throughout observations. These findings support the ubiquitous exposure to PFAS and possible influence pregnancy and suggest a careful evaluation of the timing of PFAS measurement, when exan pregnancy on gestational outcomes related to serum lipids amounts

	備考	出 対 象 抽	ン 文 ク 献 ① ラ	ン 文 献 ② ラ
etuses. Previous studies have concentrations. However, no study dy aims to evaluate the associations of a cohort of African American women in eeks of gestation) for PFAS and eeks) for the second 25(OH)D gressions to estimate the associations we associations of total 25(OH)D with prodecanoic acid), and NMeFOSAA (N- rfluoropentanoic acid). For free acid), and PFDA, and a negative measured in late pregnancy. In mixture and 5.68 ng/mL (95%CI 3.31-8.04) SAA, PFDA, and PFOS contributed the 5(OH)D and the PFAS mixture. These in American women, and some of the			В	
yl substances (PFAS) and gestational nized outcome and did not study FAS exposure in early pregnancy and DS: 1436 women were enrolled in the rohexane sulfonic acid (PFHxS), d (PFNA) and perfluorodecanoic acid and information on PE were obtained een PFAS exposure and BP trajectory. del. RESULTS: All women had rt from PFHxS) was associated with which is unlikely to be due to chance. g (95% CI: -0.13; 1.08) and 0.36 mmHg BP. No clear associations between petween PFAS exposure and BP might , at a population level this may slightly ncy, it may have long-term impact on			В	
to high concentrations of perfluoroalkyl hisistently associated with elevated stratified analyses by trimester of asting effects on pregnant women and DS), perfluorooctanoic acid (PFOA), bregnant women. METHODS: A cross- Regional health surveillance program. FOA, PFOS and PFHxS, total esterol (LDL-C) was calculated. The assessed using generalized additive ancy trimester. RESULTS: The L, respectively. The plasma levels of OS was positively associated with TC reen PFOA and PFHxS and both TC is and lipid profiles in pregnant women f non-pregnant women, while they the pregnancy might explain our ce on lipid metabolisms during hining effects of PFAS during			В	

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D649	ヒト(生 殖発生毒 性)	Buckley, Jessie P; Kuiper, Jordan R; Lanphear, Bruce P; Calafat, Antonia M; Cecil, Kim M; Chen, Aimin; Xu, Yingying; Yolton, Kimberly; Kalkwarf, Heidi J; Braun, Joseph M	Associations of Maternal Serum Perfluoroalkyl Substances Concentrations with Early Adolescent Bone Mineral Content and Density: The Health Outcomes and Measures of the Environment (HOME) Study	2021	Environ Health Perspect. 2021 Sep;129(9):97011. doi: 10.1289/EHP9424. Epub 2021 Sep 29.	BACKGROUND: Per- and polyfluoroalkyl substances (PFAS) may impair bone accrual and strength via endocrine disruption and nuclear receptor agonism, but human studies are primarily of adults or cross-sectional. OBJECTIVES: We assessed associations of individual PFAS and their mixture during pregnancy with child bone mineral content (BMC) and areal bone mineral density (aBMD) at age 12 y. METHODS: Among 206 mother-child pairs enrolled in a prospective cohort (2003-2006), we quantified perfluorooctanoic acid (PFOA), perfluorononanoic acid (PFNA), perfluorohexane sulfonic acid (PFHxS), and perfluorooctane sulfonic acid (PFOS) in maternal serum collected during gestation or delivery. When children were age 12 y, we performed dual energy X-ray absorptiometry and calculated BMC, aBMD, and bone mineral apparent density (BMAD) z-scores for six skeletal sites. We estimated covariate-adjusted z-score differences per doubling of individual PFAS using linear regression and assessed the PFAS mixture using quantile g-computation and Bayesian kernel machine regression. We explored whether associations were modified by child's sex or mediated by whole-body lean mass. RESULTS: In covariate-adjusted models, we found that higher maternal serum concentrations of PFOA, PFNA, and the PFAS mixture were associated with lower total hip and forearm (one-third distal radius) BMC z-scores in children. Differences in forearm BMC z-scores were - 0.17 [95% confidence interval (CI): - 0.35, 0.01] and - 0.24 (95% CI: - 0.44, - 0.05) per doubling of PFOA and PFNA, respectively, and - 0.18 (95% CI: - 0.34, - 0.02) per quartile increase in the PFAS mixture. Child's sex modified PFOA associations for some skeletal sites; for example, differences in spine BMAD z-score per doubling were - 0.31 (95% CI: - 0.58, - 0.03) among males and 0.07 (95% CI: - 0.16, 0.30) among females (modification p = 0.04). Except for PFNA among females, these associations were not mediated by whole-body lean mass. DISCUSSION: Maternal PFAS concentrations during pregnancy may		в
D650	ヒト(生 殖毒性)	Fan, Xiarui; Tang, Song; Wang, Ying; Fan, Wenhong; Ben, Yujie; Naidu, Ravi; Dong, Zhaomin	Global Exposure to Per- and Polyfluoroalkyl Substances and Associated Burden of Low Birthweight	2022	Environ Sci Technol. 2022 Apr 5;56(7):4282-4294. doi: 10.1021/acs.est.1c08669. Epub 2022 Mar 16.	Low birthweight (LBW) is a worldwide public health concern, while the global burden of LBW attributable to endocrine-disrupting chemicals, such as per- and polyfluoroalkyl substances (PFAS), has not yet been evaluated. Here, we established a large dataset for the biomonitoring of seven representative congeners of PFAS by examining data from 2325 publications. Global exposure to perfluorooctanesulfonic acid (PFOS) was the highest, followed by perfluorohexanesulfonic acid (PFHxS) and perfluorooctanoic acid (PFOA). Spatiotemporal exposure to PFAS varied considerably, with daily intake estimated in the range of 0.01-1.7 ng/kg/day. Moreover, decreasing trends in PFOS, PFHxS, and PFOA exposure were noted in most regions of the world over the past two decades, but such trends were not observed for other PFAS with long carbon chains, especially in East Asia. Furthermore, we estimated that human exposure to PFOA contributed to approximately 461,635 (95% confidence interval: 57,418 to 854,645) cases per year of LBW during the past two decades, predominantly from Asian regions. Although our estimation may be constrained by uncertainties from the dose-response curve and data availability, this study has unveiled that PFAS might be a contributor to global LBW prevalence during 2000-2019, supporting continuous actions to mitigate PFAS contamination.		1 A
D651	ヒト (生 殖発生毒 性)	Liu, Yun; Eliot, Melissa N; Papandonatos, George D; Kelsey, Karl T; Fore, Ruby; Langevin, Scott; Buckley, Jessie; Chen, Aimin; Lanphear, Bruce P; Cecil, Kim M; Yolton, Kimberly; Hivert, Marie- France; Sagiv, Sharon K; Baccarelli, Andrea A; Oken, Emily; Braun, Joseph M	Gestational Perfluoroalkyl Substance Exposure and DNA Methylation at Birth and 12 Years of Age: A Longitudinal Epigenome-Wide Association Study	2022	Environ Health Perspect. 2022 Mar;130(3):37005. doi: 10.1289/EHP10118. Epub 2022 Mar 10.	BACKGROUND: DNA methylation alterations may underlie associations between gestational perfluoroalkyl substances (PFAS) exposure and later-life health outcomes. To the best of our knowledge, no longitudinal studies have examined the associations between gestational PFAS and DNA methylation. OBJECTIVES: We examined associations of gestational PFAS exposure with longitudinal DNA methylation measures at birth and in adolescence using the Health Outcomes and Measures of the Environment (HOME) Study (2003-2006; Cincinnati, Ohio). METHODS: We quantified serum concentrations of perfluorooctanoate (PFOA), perfluorooctane sulfonate (PFOS), perfluorononanoate (PFNA), and perfluorohexane sulfonate (PFHxS) in mothers during pregnancy. We measured DNA methylation in cord blood (n = 266) and peripheral leukocytes at 12 years of age (n = 160) using the Illumina HumanMethylation EPIC BeadChip. We analyzed associations between log2-transformed PFAS concentrations and repeated DNA methylation measures using linear regression with generalized estimating equations. We included interaction terms between children's age and gestational PFAS. We performed Gene Ontology enrichment analysis to identify molecular pathways. We used Project Viva (1999-2002; Boston, Massachusetts) to replicate significant associations. RESULTS: After adjusting for covariates, 435 cytosine-guanine dinucleotide (CpG) sites were associated with PFAS (false discovery rate, q < 0.05). Specifically, we identified 2 CpGs for PFOS, 12 for PFOA, 8 for PFHxS, and 413 for PFNA; none overlapped. Among these, 2 CpGs for PFOA and 4 for PFNA were replicated in Project Viva. Some of the PFAS-associated CpG sites annotated to gene regions related to cancers, cognitive health, cardiovascular disease, and kidney function. We found little evidence that the associations between PFAS and DNA methylation differed by children's age. DISCUSSION: In these longitudinal data, PFAS biomarkers were associated with differences in several CpGs at birth and at 12 years of age in or near gen		В

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D652	ヒト (生 殖発生毒 性)	Horikoshi, Takanobu; Nishimura, Tomoko; Nomura, Yoko; Iwabuchi, Toshiki; Itoh, Hiroaki; Takizawa, Takumi; Tsuchiya, Kenji J	Umbilical cord serum concentrations of perfluorooctane sulfonate, perfluorooctanoic acid, and the body mass index changes from birth to 5 1/2 years of age	202	Sci Rep. 2021 Oct 5;11(1):19789. doi: 10.1038/s41598-021- 99174-3.	Prenatal exposure to perfluoroalkyl substances (PFAS) has been reported to affect body weight from birth to childhood, but the results remain inconclusive. We investigated whether umbilical cord blood concentrations of perfluoroactane sulfonate (PFOS) and perfluoroactaneic acid (PFOA) are associated with children's risk trajectory for obesity. 600 children were randomly selected from the Hamamatsu Birth Cohort for Mothers and Children (HBC study) and their umbilical cord serum PFAS concentrations were quantified. Participants underwent BMI measurements at ages 1, 4, 10, 18, 24, 32, 40, 50, and 66 months. Growth curve modeling with random intercept was performed with standardized BMI as outcome variable. PFOS was negatively associated with standardized BMI (β = - 0.34; p = 0.01), with a marginally significant interaction with the child's age (β = 0.0038; p = 0.08). PFOA was negatively associated with standardized BMI (β = - 0.26, 95% CI - 0.51, 0; p = 0.05), with a significant interaction with the child's age (β = 0.005; p = 0.01). Stratified analysis by sex revealed that these effects were significant only among girls. Prenatal exposure to PFAS initially was associated with lower standardized BMI during infancy, but this effect dissipated over time and reversed in direction during later childhood. The effects of prenatal PFAS on higher standardized BMI is stronger in girls.		В
D653	ヒト(生 殖発生毒 性)	Sinisalu, Lisanna; Yeung, Leo W Y; Wang, Jinghua; Pan, Yitao; Dai, Jiayin; Hyötyläinen, Tuulia	Prenatal exposure to poly-/per-fluoroalkyl substances is associated with alteration of lipid profiles in cord- blood	2023	Metabolomics. 2021 Nov 24;17(12):103. doi: 10.1007/s11306-021-01853-9.	INTRODUCTION: Poly-/per-fluoroalkyl substances (PFAS) are widespread environmental pollutants that may induce metabolic perturbations in humans, including particularly alterations in lipid profiles. Prenatal exposure to PFAS can cause lasting effects on offspring metabolic health, however, the underlying mechanisms are still unknown. OBJECTIVES: The goal of the study was to investigate the impact of prenatal PFAS exposure on the lipid profiles in cord blood. METHODS: Herein, we combined determination of bile acids (BAs) and molecular lipids by liquid chromatography with ultra-high-resolution mass spectrometry, and separately quantified cord blood concentrations of sixteen PFAS in a cohort of Chinese infants (104 subjects) in a cross-sectional study. We then evaluated associations between PFAS concentration and lipidome using partial correlation network analysis, debiased sparse partial correlation, linear regression analysis and correlation analysis. RESULTS: PFAS levels showed significant associations with the lipid profiles; specifically, PFAS exposure was positively correlated with triacylgycerols (TG) and several bile acids. Importantly, exposure to perfluorooctanoic acid (PFOA), perfluorooctane sulfonic acid (PFOS), perfluorononanoic acid (PFNA) and perfluorohexane sulfonic acid (PFHXS) were associated with increased levels of TGs with saturated fatty acids while multiple classes of phospholipids were decreased. In addition, several free fatty acids showed significant positive correlations with PFOS. CONCLUSIONS: Our results indicated that prenatal exposure to PFAS mediated metabolic changes, which may explain the associations reported between PFAS exposure and metabolic health later in life.		В
D654	ヒト(神経毒性)	Qu, Aibin; Cao, Tengrui; Li, Zixuan; Wang, Wenjuan; Liu, Ran; Wang, Xue; Nie, Yaxiong; Sun, Suju; Liu, Xuehui; Zhang, Xiaolin	The association between maternal perfluoroalkyl substances exposure and early attention deficit hyperactivity disorder in children: a systematic review and meta-analysis	202	Environ Sci Pollut Res Int. 2021 Dec;28(47):67066-67081. doi: 10.1007/s11356-021-15136-2. Epub 2021 Jul 9.	Some studies have shown that maternal exposure to perfluoroalkyl substances (PFASs) may be associated with early attention deficit hyperactivity disorder (ADHD) in children. The purpose of this systematic review and meta-analysis is to verify this association by reviewing existing studies and to provide a strong basis for preventing ADHD. The researchers searched electronic databases such as PubMed, Science Direct, Scopus, Google Scholar, Web of Science, and Embase for all studies published before October 2020. Finally, we included nine articles for analysis. Our meta-analysis showed that maternal exposure to PFASs was not significantly associated with the prevalence rate of early childhood ADHD (perfluorooctanoic acid (PFOA), odds ratio (OR) = 1.00, 95% confidence interval (95% CI) = 0.75-1.25; perfluorooctane sulfonate (PFOS), OR = 1.01, 95% CI = 0.88-1.14; perfluorohexane sulfonate (PFHxS), OR = 1.08, 95% CI = 0.80-1.09; perfluorononanoic acid (PFNA), OR = 1.13, 95% CI = 0.99-1.28; perfluorodecanoic acid (PFDA), OR = 1.23, 95% CI = 0.15-2.32). Due to significant heterogeneity, we subsequently performed subgroup analysis and sensitivity analysis. Through subgroup analysis, we found that PFOS concentration of children's blood and the prevalence rate of early childhood ADHD were statistically positively correlated, and there was also a positive correlation between PFOS exposure and the prevalence rate of early childhood ADHD in the America. Moreover, there was also a statistically positive correlation between PFNA concentration in maternal blood and the prevalence rate of early childhood ADHD. Sensitivity analysis showed that the final results did not change much, the sensitivity was low, and the results were relatively stable. In conclusion, a causal relationship between maternal PFASs exposure and ADHD in children was unlikely. Among them, PFOS, PFNA, and ADHD might have positive associations worthy of further investigation.		1 A

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 村 報 抽	ン 文 ン 文 ク 献 ク 献 ① ラ ② ラ
D655	ヒト(生 殖発生毒 性)	Li, Jincan; Yang, Limei; He, Gengsheng; Wang, Binbin; Miao, Maohua; Ji, Honglei; Wen, Sheng; Cao, Wencheng; Yuan, Wei; Liang, Hong	Association between prenatal exposure to perfluoroalkyl substances and anogenital distance in female neonates	2022	Ecotoxicol Environ Saf. 2022 Oct 15;245:114130. doi: 10.1016/j.ecoenv.2022.114130. Epub 2022 Sep 28.	BACKGROUND: Perfluoroalkyl substances (PFASs) have been reported to exert reproductive toxicity. Anogenital distance (AGD) is a biomarker of intrauterine androgen exposure and an indicator of genital development. An animal study reported that female neonatal rats exposed to perfluorooctanoic acid or perfluorooctane sulfonate (PFOS) during postnatal days 1-5 exhibited a longer AGD, while epidemiological studies have shown inconsistent results. This study aimed to examine the effects of prenatal exposure to PFASs on the AGD in female neonates. METHODS: PFAS levels were measured in plasma samples obtained from pregnant women at 12-16 gestational weeks using high-performance liquid chromatography/mass spectrometry. The AGD of each female neonate was measured within 3 days after delivery. The anogenital index (AGI), calculated as AGD divided by weight, was also determined. A total of 362 motherinfant pairs were included in this study. A multivariate linear regression model was used to examine the association between prenatal In-transformed concentrations of PFASs and AGD/AGI. In addition, weighted quantile sum regression (WQSR) and Bayesian kernel machine regression (BKMR) models were used to assess the overall effects of a mixture of PFASs on the AGD/AGI and to identify important contributors to the overall effect. RESULTS: There was a consistent pattern of association between maternal PFAS concentrations and increased AGDanus to posterior fourchette (AF), AGDanus to clitoris (AC), and AGIAF lengths at birth. Statistical significance was found between maternal In-transformed concentrations of perfluorohexane sulfonate (PFHxS), perfluorododecanoic acid, and perfluorotridecanoic acid and AGDAF, with β values (95% confidence interval [CI]) of 0.83 (0.16, 1.51), 0.32 (0.05, 0.59), and 0.25 (0.00, 0.51) mm, respectively; between PFOS and AGDAC, with a β value (95% CI) of 0.63 (0.04, 1.21) mm; and between PFHxS and AGIAF, with a β value (95% CI) of 0.22 (0.02, 0.43) mm/kg. Similarly, the WQSR and BKMR models showe			В
D656	ヒト (生 殖発生毒 性)	Macheka, Linda R; Abafe, Ovokeroye A; Mugivhisa, Liziwe L; Olowoyo, Joshua O	Occurrence and infant exposure assessment of per and polyfluoroalkyl substances in breast milk from South Africa	2022	Chemosphere. 2022 Feb;288(Pt 2):132601. doi: 10.1016/j.chemosphere.2021.132601. Epub 2021 Oct 18.	The exposure of infants to per and polyfluoroalkyl substances (PFAS) through breast-feeding is of global concern owing to their numerous detrimental health effects. This study investigated the occurrence of eleven perfluorocarboxylic acids (PFCAs) and four perfluorosulfonates (PFSAs) in breast milk of nursing mothers from South Africa. The concentrations of PFAS in these samples were measured by using a validated UHPLC - MS/MS method. The median concentrations of Σ (15) PFAS ranged from <loq -<br="">0.420 ng mL(-1), with PFCAs frequently detected in breast milk than PFSAs. However, perfluoropentanoic acid (PFPeA) accounted for 28% of total PFAS concentrations in all samples, the median concentrations of PFUdA, PFDoA and PFTrDA were at par with those of PFOA. The estimated feeding frequency and infant sex but not birth weight and gestation period, were strongly correlated with the body-burden of some short- and long-chain PFAS in breastmilk. On the average, the EDI and HQ of PFOA and Σ (4) PFAS (PFOA, PFNA, PFHxS & PFOS) but not PFOS present significant risk to exclusively breastfed infants in South Africa. The results of this study reflect the widespread occurrence of short chain (i.e., C < 6) and long chain (i.e., C(11) - C(13)) PFAS and provide preliminary data for future human biomonitoring of PFAS and other persistent organic pollutants in South Africa, and indeed the African continent.</loq>			С
D657	ヒト(生 殖発生毒 性)	Kobayashi, Sumitaka; Sata, Fumihiro; Ikeda- Araki, Atsuko; Miyashita, Chihiro; Itoh, Sachiko; Goudarzi, Houman; Iwasaki, Yusuke; Mitsui, Takahiko; Moriya, Kimihiko; Shinohara, Nobuo; Cho, Kazutoshi; Kishi, Reiko	Associations among maternal perfluoroalkyl substance levels, fetal sex-hormone enzymatic gene polymorphisms, and fetal sex hormone levels in the Hokkaido study	2021	Reprod Toxicol. 2021 Oct;105:221-231. doi: 10.1016/j.reprotox.2021.09.003. Epub 2021 Sep 16.	Prenatal sex hormones affect fetal growth; for example, prenatal exposure to low levels of androgen accelerates female puberty onset. We assessed the association of perfluoroalkyl substances (PFASs) in maternal sera and infant genotypes of genes encoding enzymes involved in sex steroid hormone biosynthesis on cord sera sex hormone levels in a prospective birth cohort study of healthy pregnant Japanese women (n = 224) recruited in Sapporo between July 2002 and October 2005. We analyzed PFAS and five sex hormone levels using liquid chromatography-tandem mass spectrometry. Cytochrome P450 (CYP) 17A1 (CYP17A1 rs743572), 19A1 (CYP19A1 rs10046, rs700519, and rs727479), 3 β -hydroxysteroid dehydrogenase type 1 (HSD3B1 rs6203), type 2 (HSD3B2 rs1819698, rs2854964, and rs4659175), 17 β -hydroxysteroid dehydrogenase type 1 (HSD17B1 rs605059, rs676387, and rs2676531), and type 3 (HSD17B3 rs4743709) were analyzed using real-time PCR. Multiple linear regression models were used to establish the influence of log(10)-transformed PFAS levels and infant genotypes on log(10)-transformed sex steroid hormone levels. When the interaction between perfluoroctanesulfonate (PFOS) levels and female infant genotype CYP17A1 (rs743572) on the androstenedione (A-dione) levels was considered, the estimated changes (95 % confidence intervals) in A-dione levels against PFOS levels, female infant genotype CYP17A1 (rs743572)-AG/GG, and interaction between them showed a mean increase of 0.445 (0.102, 0.787), mean increase of 0.392 (0.084, 0.707), and mean reduction of 0.579 (0.161, 0.997) (P(int) = 0.007), respectively. Moreover, a female-specific interaction with testosterone levels was observed. A-dione and T levels showed positive main effects and negative interaction with PFOS levels and the female infant CYP17A1 genotype.			В

分野 タイトル 発行年 書誌情報 要旨 (原文) No 著者 (参考) Per- and polyfluoroalkyl substances (PFAS) are ubiquitous environmental contaminants con Previous studies have observed associations between maternal serum PFAS and adverse pr ower birth weight or pre-eclampsia; however, few studies have explored these associations tissue PFAS concentration. The placenta is a vital contributor to a healthy pregnancy and ma PFAS reproductive toxicity. Our goal was to measure placental PFAS concentrations and exa Hall, Samantha outcomes (e.g., birth weight, gestational duration). Placenta samples (n = 120) were collect M; Zhang, enrolled in the Healthy Pregnancy, Healthy Baby cohort (HPHB) in Durham, North Carolina. ヒト (生 Sharon; Concentrations of per- and polyfluoroalkyl substances Chemosphere. 2022 May;295:133873. doi: 10.1016/j.chemosphere.2022.133873. Epub 2022 Feb 7. detectable PFAS, with perfluorooctane sulfonic acid (PFOS), perfluorooctanoic acid (PFOA) D658 殖発生毒 Hoffman, Kate; (PFAS) in human placental tissues and associations perfluorodecanoic acid (PFDA) being the most abundant and most frequently detected (all : 性) Miranda, Marie with birth outcomes placental PFAS concentrations did not differ by infant sex, higher PFAS levels were observe Lynn; Stapleton suggesting that parity influences the accumulation of PFAS in the placenta. We used linear Heather M associations between placental PFAS and birth outcomes. After adjustment for parity, tobac race, we found that placental PFOS was associated with lower birth weight for gestational a weight for gestational age in female infants. Similar findings were seen for PFNA for birth we differences in birth outcomes based on infant sex highlight a need to explore mechanistic dir gestation for male and female infants Per- and poly-fluoroalkyl substances (PFASs) have been widely used and detected in human exposure may be associated with adverse human reproductive health effects exists, howeve matrix such as follicular fluid to determine chemical exposure, along with reproductive data relationship between PFAS exposure and human fertility. OBJECTIVE: This study aims to: (1) PFAS concentrations and/or age and fertilisation rate (as determined in follicular fluid of wo assisted reproductive treatment (ART)); and (2) assess if associations exist between PFAS Kim, Young Ran METHODS: Follicular fluids were originally collected from participants who underwent fully White, Nicole; Br in vitro fertilisation (IVF) clinic in the period 2006-2009 and 2010-11 in Queensland, Australi äunig, Jennifer; analysis of 32 PFASs including perfluorooctane sulfonate (PFOS), perfluorooctanoic acid (PI Vijayasarathy, (PFHxS), and perfluorononanoic acid (PFNA) using high performance liquid chromatography ヒト (生 Environ Res. 2020 Nov;190:109963. doi: Soumini; Mueller, Per- and poly-fluoroalkyl substances (PFASs) in MS/MS). 97 samples were matched with limited demographic data (age and fertilisation rat D659 殖発生毒 Jochen F; Knox, follicular fluid from women experiencing infertility in 10.1016/j.envres.2020.109963. Epub 2020 Jul 21. known female factors): 1) endometriosis, 2) polycystic ovarian syndrome (PCOS), and 3) ger Christine I : 性) Australia inflammation disease; as well as 4) male factor, and 5) idiopathic or unknown from either m Harden, Fiona A linear regression analysis. RESULTS: PFASs were detected in all follicular fluid samples with Pacella, Rosana and PFOA, 4.9, and 2.4 ng/ml, respectively. A lower fertilisation rate was observed at higher Toms, Leisa covariate, but there was no relationship between PFAS concentrations and fertilisation rate. Maree L significant associations between PFAS concentrations in follicular fluid and infertility factor concentrations were lower in females with endometriosis (factor 1) than in women who had infertility, while PFHpA was higher in women who had infertile due to female factors (factor nfertile due to male factor. CONCLUSION: PFASs were detected in follicular fluid of Austral an IVF clinic. PFAS exposure found in follicular fluids is linked to increased risk of some infe associated with decreased fertilisation rate in our data. But there was no relationship betwe Telomere length (TL) at birth predicts later life TL and is related to health. Prenatal exposur affect TL, but the associations between intrauterine per- and polyfluoroalkyl substances (PF emained inconclusive. This study aimed to explore the single pollutant and mixture associa and TL in newborns. In 908 mother-newborn pairs from Wuhan, China, thirteen PFASs were determined in cord leukocytes. Weighted quantile sum (WQS) regression and generalized lin Li, Xiaojun; Liu analyze the associations between PFASs mixture and single PFASs and TL in newborns. Fu Hongxiu; Wan, Sex-specific associations between legacy and novel ヒト (生 analyses were performed to evaluate if there were sex-specific associations. The concentration per- and polyfluoroalkyl substances and telomere Sci Total Environ. 2022 Oct 22:159676. doi: longxia: Li D660 殖発生毒 2022 (PFOS), perfluorooctanoic acid (PFOA), and 6:2 chlorinated polyfluorinated ether sulfonate length in newborns in Wuhan, China: Mixture and Yuanyuan; Xu, 10.1016/j.scitotenv.2022.159676. Online ahead of print. 性) (geometric mean, 4.12, 1.61, and 0.77 ng/mL, respectively) among the 13 measured PFASs. Shunging; Xiao, single pollutant associations PFASs mixture was associated with -5.19 % change (95% CI, -9.44, -0.73) of neonatal TL, ar Han: Xia, Wei (32.59 %) to the mixture association. In stratified analyses by neonatal sex, PFOS (-4.73 % c doubling concentration) and 8:2 CI-PFESA (-4.52 % change, 95% CI, -8.20, -0.70) were nega male newborns, but no significant association appeared in females. In summary, intrauterine associated with shorter neonatal TL, and the negative associations of 8:2 CI-PFESA and PFC only in boys. Future risk assessments are needed to pay more attention to the health effect

	備考	出 情 対 報 独	ン 文 ク 献 ① ラ	ン 文 ク 献 ② ラ
nmonly detected in human serum. egnancy and birth outcomes such as with birth outcomes and placental ay be involved in the mechanism of amine associations with birth ed during delivery from women All placenta samples contained . perfluorononanoic acid (PFNA), and >96% detection frequency). While d in placenta from nulliparous women, regression models to examine co use, maternal age, and maternal ge in male infants and higher birth eight for gestational age. These			В	
fferences in PFAS toxicity during				
n matrices. Evidence that PFAS rr, data is limited. The use of a human will be used to investigate if there is a) assess if associations exist between omen in Australia who received concentrations and infertility aetiology. stimulated ART treatment cycles at an a. The samples were available for FOA), perfluorohexane sulfonate r tandem mass spectrometry (HPLC- e) and five infertility factors (three nital tract infections - tubal/pelvic ales or females. SPSS was used for h the mean concentrations of PFOS age when age was added as a There were few statistically s. Log-transformed PFHxS reported 'male factors' as a reason of 1-3) compared to those who had ian women who had been treated at rtility factors, and increased age was then PFAS and ferlitisation rate. Further	評価書文 献と重複		В	
e to environmental pollutants might FASs) exposure and neonatal TL tions between legacy and novel PFASs measured in cord serum, and TL was tear model (GLM) were utilized to thermore, stratified and interaction tions of perfluorooctane sulfonate (6:2 CI-PFESA) ranked the highest Each unit increase in WQS index of thange, 95% CI, -8.40, -0.93 for per tively associated with neonatal TL in the exposure to PFASs in mixture was DS with neonatal TL were observed s of novel PFASs.			В	

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン 文 ク 献 ① ラ ② ラ
D661	ヒト(生殖生毒性)	Wise, Lauren A; Wesselink, Amelia K; Schildroth, Samantha; Calafat, Antonia M; Bethea, Traci N; Geller, Ruth J; Coleman, Chad M; Fruh, Victoria; Claus Henn, Birgit; Botelho, Julianne C; Harmon, Quaker E; Thirkill, Maya; Wegienka, Ganesa R; Baird, Donna D	Correlates of plasma concentrations of per- and poly- fluoroalkyl substances among reproductive-aged Black women	2022	Environ Res. 2022 Jan;203:111860. doi: 10.1016/j.envres.2021.111860. Epub 2021 Aug 14.	BACKGROUND: Per- and polyfluoroalkyl substances (PFAS) are synthetic chemicals used in commercial and consumer goods. Black women are underrepresented in studies of PFAS exposure. METHODS: We performed a cross-sectional analysis of correlates of plasma PFAS concentrations among 1499 Black women aged 23-35 participanting in the Study of Environment, Lifestyle, and Fibroids (SELF), a Detroit-based cohort study. At baseline (2010-2012), participants provided questionnaire data on socio-demographics; behaviors; diet; and menstrual, contraceptive, and reproductive histories. Using mass spectrometry in non- fasting plasma samples collected at enrollment, we quantified several PFAS, including perfluorohexane sulfonate (PFHXS), perfluorooctane sulfonate (PFOS), perfluorooctanoate (PFOA), perfluoronanoate (PFNA), perfluorodecanoate (PFDA), perfluoroundecanoate (PFUNDA), and 2-N-methyl-perfluorooctane sulfonamido acetate (MeFOSAA). We used linear regression to calculate percentage differences (%D) and 95 % confidence intervals (CIs) for associations between selected correlates and PFAS concentrations, adjusting for all other correlates. RESULTS: PFHxS, PFOS, PFOA, and PFNA were detected in ≥97 % of women; PFDA in 86 %; MeFOSAA in 70 %; and PFUnDA in 52 %. Age, income, education, and intakes of water, alcohol, and seafood were positively associated with most PFAS, except PFHxS. Strong inverse associations (%D; 95 % CI) were observed between parity (≥3 vs. 0 births) and PFHxS (-34.7; -43.0, -25.1) and PFOA (-33.1; -39.2, -26.3); breastfeeding duration (≥6 months vs. nulliparous) and PFOA (-33.1; -37.8, -23.7), PFHxS (-24.2; -34.5, -12.3), and PFOS (-18.4; -28.3, -7.1); recent birth (<2 years ago vs. nulliparous) and PFOA (-33.1; -39.6, -25.8), PFHxS (-29.3; -39.0, -18.1), PFNA (-25.2; -32.7, -16.8), and PFOS (-18.3; -28.3, -6.9); and intensity of menstrual bleed (heavy vs. light) and PFNA (15.3; 0.4, 32.4). CONCLUSIONS: Reproductive factors that influence PFAS elimination showed strong associations with several PFAS (redu			С
D662	ヒト(内 分泌系)	Ding, Jiayun; Dai, Yiming; Zhang, Jiming; Wang, Zheng; Zhang, Lei; Xu, Sinan; Tan, Ruonan; Guo, Jianqiu; Qi, Xiaojuan; Chang, Xiuli; Wu, Chunhua; Zhou, Zhijun	Associations of perfluoroalkyl substances with adipocytokines in umbilical cord serum: A mixtures approach	2022	Environ Res. 2022 Oct 27;216(Pt 3):114654. doi: 10.1016/j.envres.2022.114654. Online ahead of print.	BACKGROUND: Per- and polyfluoroalkyl substances (PFAS), a kind of emerging environmental endocrine disruptors, may interfere with the secretion of adipokines and affect fetal metabolic function and intrauterine development. However, the epidemiological evidence is limited and inconsistent. We examined the associations of single and multiple PFAS exposures in utero with adipocytokine concentrations in umbilical cord serum. METHODS: This study included 1111 mother-infant pairs from Sheyang Mini Birth Cohort Study (SMBCS), and quantified 12 PFAS and two adipokine in umbilical cord serum. Generalized linear models (GLMs) and Bayesian Kernel Machine Regression (BKMR) models were applied to estimate the associations of single- and mixed- PFAS exposure with adipokines, respectively. Furthermore, sex-stratification was done in each model to assess the sexually dimorphic effects of PFAS. RESULTS: 10 PFAS were detected with median concentrations (μ g/L) ranging from 0.04 to 3.97, (except 2.7% for PFOSA and 1.7% for PFDS, which were excluded). In GLMs, for each doubling increase in PFBS, PFHpA, PFHxS, PFHpS, PFUnDA and PFDoDA, leptin decreased between 14.04% for PFBS and 22.69% for PFHS (P < 0.05). PFAS, except for PFNA, were positively associated with adiponectin, and for each doubling of PFAS, adiponectin increased between 3.27% for PFBS and 12.28% for PFHxS (P < 0.05). In addition, infant gender modified the associations of PFAS mixtures with leptin and adiponectin were observed in the BKMR models. PFDA, PFOS, PFNA and PFHpS were identified as important contributors. In the sex-stratified analysis of BKMR models, the associations between PFAS mixtures and adipokines were more pronounced in males. CONCLUSIONS: PFAS levels were significantly associated with adipokines in cord serum, suggesting that intrauterine mixture of PFAS exposure may be related to decreased fetal leptin level but increased fetal adiponectin level and the associations may be sex-specific.		1	A
D663	ヒト(生 殖発生毒 性)	Jensen, Richard Christian; Glintborg, Dorte; Timmermann, Clara Amalie Gade; Nielsen, Flemming; Boye, Henriette; Madsen, Jeppe Buur; Bilenberg, Niels; Grandjean, Philippe; Jensen, Tina Kold; Andersen, Marianne S	Higher free thyroxine associated with PFAS exposure in first trimester. The Odense Child Cohort	2022	Environ Res. 2022 Sep;212(Pt D):113492. doi: 10.1016/j.envres.2022.113492. Epub 2022 May 18.	BACKGROUND: Perfluoroalkyl substances (PFAS) are endocrine disrupting chemicals with elimination half-lives ranging from four to eight years. Experimental studies found PFAS able to interfere with thyroid hormone-binding proteins. During the first 20 weeks of gestation (GW), the fetus is reliant on placental transfer of maternal thyroid hormones, mainly free thyroxine (FT4). However, previous studies investigating associations between exposure to PFAS and thyroid hormone status mainly focused on blood samples from late pregnancy or umbilical cord with mixed findings. OBJECTIVES: To investigate associations between serum-PFAS concentrations and thyroid hormone status in early pregnancy as reflected by FT4 and thyroid-stimulating hormone (TSH). METHODS: In the Odense Child Cohort, a single-center study, we measured maternal pregnancy serum concentrations of five PFAS: perfluorohexane sulfonic acid (PFHxS), perfluoroactane sulfonic acid (PFOS), perfluoroactanoic acid (PFOA), perfluoronanoic acid (PFNA), perfluoroactanoic acid (PFDA); and TSH and TSH in 1048 pregnant women at median GW 12 (25th, 75th percentile: 10, 15). Multivariate linear regression models were performed to estimate associations between PFAS exposure and thyroid hormone status. RESULTS: A doubling in PFOS, PFOA, and PFNA concentrations was associated with an increment in FT4 concentration by 1.85% (95% CI: 0.66%, 3.05%), 1.29% (95% CI: 0.21%, 2.39%), and 1.70% (95% CI: 0.48%, 2.94%), respectively, in adjusted analyses. A statistically significant dose-response relationship was observed across exposure quartiles for PFOS, PFOA, and PFNA was associated with higher FT4 concentrations in women during early pregnancy. The potential clinical implications of these findings remain to be clarified.			В

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨 (原文)	備考	 出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D664	ヒト(生 殖発生毒 性)	Xu, Chenye; Zhang, Long; Zhou, Quan; Ding, Jiaxin; Yin, Shanshan; Shang, Xuejun; Tian, Yonghong	Exposure to per- and polyfluoroalkyl substances as a risk factor for gestational diabetes mellitus through interference with glucose homeostasis	2022	Sci Total Environ. 2022 Sep 10;838(Pt 4):156561. doi: 10.1016/j.scitotenv.2022.156561. Epub 2022 Jun 9.	Per- and polyfluoroalkyl substances (PFASs) are hypothesized to trigger gestational diabetes mellitus (GDM) through modulation of glucose metabolism. However, studies investigating links between joint PFASs to GDM are limited and led to discrepant conclusions. This study included 171 women with GDM development in pregnancy and 169 healthy controls from Hangzhou, China between October 2020 and September 2021. By using the solid-phase extraction (SPE)-ultra performance liquid chromatography-tandem-mass-spectrometry (UPLC/MS-MS), 15 PFASs were detected to be widely distributed in maternal serum, with highest median concentrations of 7.43, 4.23, and 3.64 ng/mL for perfluoroctanoic acid (PFOA), perfluoroctane sulfonic acid (PFOS), and 6:2 chlorinated polyfluorinated ether sulfonates (6:2 CI-PFESA). Multivariable logistic regressions suggested that the adjusted odds ratios (ORs) with 95% confidence intervals (CI) of GDM for second and highest tertiles of PFOA were 2.57 (1.24, 4.86), p = 0.001 and 1.98 (1.06, 3.65), p = 0.023. Compared with the reference tertile, the ORs of GDM were also significantly increased at the highest tertile of perfluoroundecanoic acid (PFUnDA), perfluorodecanoic acid (PFDoA), PFOS and 6:2CI-PFESA. Multiple linear regressions further indicated that exposure to these PFASs congeners were positively associated with continuous glycemic outcomes of fasting blood glucose (FBG), 1-h, and 2-h glucose after 75 g oral glucose tolerance (OGTT) test as well as glycohemoglobin (HbA1c). Nevertheless, perfluorohexane sulfonic acid (PFHxS), 4:2 fluorotelomer sulfonates (FTSs), and 3H-perfluoro-3-[(3-methoxy-propoxy) propanoic acid] (ADONA) exhibited protective effects on some of these glycemic outcomes. When assessing the PFASs as mixtures by conducting the Bayesian kernel machine regression (BKMR), the risks of GDM and values of glycemic outcomes increased significantly as the concentrations of the PFASs mixture increased, with PFOA being the largest contributor. We therefore propose that although the effe		В
D665	ヒト(生 殖発生毒 性)	Yu, Yunjiang; Qin, Xiao-Di; Bloom, Michael S; Chu, Chu; Dai, Xin; Li, Qin-Qin; Chen, Zan-Xiong; Kong, Min-Li; Xie, Yan-Qi; Meng, Wen-Jie; Yang, Bo-Yi; Hu, Li-Wen; Zeng, Xiao-Wen; Zhao, Xiao-Miao; Zhou, Yang; Dong, Guang-Hui	Associations of prenatal exposure to perfluoroalkyl substances with preterm birth: A family-based birth cohort study	2022	Environ Res. 2022 Nov;214(Pt 1):113803. doi: 10.1016/j.envres.2022.113803. Epub 2022 Jul 8.	Studies have investigated associations between maternal exposure to PFAS and pretern birth, but the impact of paternal and overall family exposure to PFAS mixtures on pretern birth remains unknown. To address this knowledge gap, a total of 355 pretern births and 481 controls were selected for a family-based birth cohort study in a coastal area of China, between 2016 and 2018. Seven PFAS, including perfluorobutanoic acid (PFBA), perfluorohexanoic acid (PFHxS), perfluoroncanoic acid (PFOA), perfluoroctanoic acid (PFDA), perfluoroctanesulfonic acid (PFLxS), perfluorononanoic acid (PFDA), were quantified in maternal, paternal and neonatal sera. Pretern birth was defined as live delivery at <37 completed gestational weeks. Bayesian kernel machine regression (BKMR) model was used to inspect the combined effect of family PFAS mixtures. Latent class analysis was used to identify family-level PFAS exposure profiles. Multiple linear regression analysis showed higher odds of pretern birth in association with higher maternal PFBA (OR = 1.16, 95%Cl:1.09, 1.25), PFOA (OR = 1.51, 95%Cl:1.27, 1.80), PFOS (OR = 2.07, 95%Cl:1.07, 2.52) and PFNA (OR = 1.36, 95%Cl: 1.01, 1.83), and neonatal PFBA (OR = 1.16, 95%Cl:1.09, 1.25), PFOA (OR = 1.16, 95%Cl:1.05, 1.29), PFHxA (OR = 1.46, 95%Cl:1.32, 1.62), PFHxS (OR = 1.15, 95%Cl:1.05, 1.26) and PFNA (OR = 1.30, 95%Cl:1.05, 1.29), PFHxA (OR = 1.46, 95%Cl:1.32, 1.62), PFHxS (OR = 1.15, 95%Cl:1.05, 1.26) and PFNA (OR = 1.30, 95%Cl:1.05, 1.29), PFHxA (OR = 1.46, 95%Cl:1.32, 1.62), PFHxS (OR = 1.15, 95%Cl:1.05, 1.26) and PFNA (OR = 1.30, 95%Cl:1.09, 1.56). The associations were reversed between individual paternal PFAS exposures and pretern birth. At the family level, higher PFAS mixture concentration was associated with higher odds of pretern birth. In particular, higher PFNA and PFDA exposure was associated with greater pretern birth risk (OR = 2.55, 95%Cl:1.45, 4.50). The PFAS-preterm association was modified by family-level seafood consumption. Our results suggest that higher family-level		В
D666	ヒト(生 殖発生毒 性)	Oh, Jiwon; Shin, Hyeong-Moo; Nishimura, Tomoko; Rahman, Mohammad Shafiur; Takahashi, Nagahide; Tsuchiya, Kenji J	Perfluorooctanoate and perfluorooctane sulfonate in umbilical cord blood and child cognitive development: Hamamatsu Birth Cohort for Mothers and Children (HBC Study)	2022	Environ Int. 2022 May;163:107215. doi: 10.1016/j.envint.2022.107215. Epub 2022 Mar 28.	laboratory animals. Several epidemiological studies investigated associations between prenatal PFAS exposure and child neurodevelopment, but results were inconclusive. We examined associations between cord blood concentrations of perfluorooctanoate (PFOA) and perfluorooctane sulfonate (PFOS) and cognitive development in children from 4 to 40 months of age. METHODS: This study included 598 mother-child pairs who participated in the Hamamatsu Birth Cohort Study for Mothers and Children (HBC Study), a prospective birth cohort study in Japan. PFOA and PFOS were quantified in cord blood. The Mullen Scales of Early Learning (MSEL) was used to assess child cognitive function at 4, 6, 10, 14, 18, 24, 32, and 40 months of age. For each of log 2-transformed PFOA and PFOS concentrations, we examined: 1) associations with the scores of MSEL Early Learning Composite (Composite) and four subscales (Fine Motor, Visual Reception, Receptive Language, Expressive Language) at each assessment time point; and 2) associations with longitudinal changes in the Composite and subscale scores. RESULTS: MSEL Composite scores were inversely associated with PFOA at 18 months of age (per 2-fold increase in concentration: $\beta = -2.23$, 95% CI: -3.91, -0.56), but not at other ages. When accounting for changes in scores from 4 to 40 months of age, PFOA and PFOS were positively associated with Composite as well as Receptive and Expressive Language scores. Child's sex modified associations between PFOA and Composite scores at 14, 18, and 40 months and those between PFOS and Composite scores at 14 months, showing negative associations among females. CONCLUSIONS: In this study, cord blood PFOA and PFOS concentrations showed mixed associations with child cognitive functions at specific age but had positive associations with longitudinal changes in cognitive development from 4 to 40 months of age.		В

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	 出情ン文ン文 対報ク献ク ク献 の
D667	ヒト(生 殖発生毒 性)	Liu, Bihu; Wei, Bincai; Mo, Meile; Song, Yanye; Tang, Chuanqiao; Tang, Peng; Guo, Xiaojing; Tan, Chao; Liu, Shun; Huang, Dongping; Qiu, Xiaoqiang	Exposure to perfluoroalkyl substances in early pregnancy and the risk of hypertensive disorders of pregnancy: A nested case-control study in Guangxi, China	2022	Chemosphere. 2022 Feb;288(Pt 1):132468. doi: 10.1016/j.chemosphere.2021.132468. Epub 2021 Oct 5.	BACKGROUND: Previous epidemiological studies have examined the associations between exposure to perfluoroalkyl substances (PFASs) and the risk of hypertensive disorders of pregnancy (HDP). However, these studies have drawn discrepant conclusions and have some limitations. METHODS: A nested case-control study was conducted with the Guangxi Zhuang Birth Cohort (GZBC), a prospective, ongoing birth cohort that was implemented in Guangxi, China, in June 2015. Maternal serum concentrations of nine PFASs were measured using ultra-high-performance liquid chromatography-tandem mass spectrometry (UPLC-MS). The associations between PFAS exposure and the risk of HDP were assessed using logistic regression (single-exposure), weighted quantile sum (WQS) regression, and Bayesian kernel machine regression (BKMR) models. RESULTS: A total of 136 HDP cases and 408 controls were enrolled in this study. In logistic regression models, perfluoroundecanoic acid (PFUA), perfluoroctane sulfonate (PFOS), perfluorononanoic acid (PFNA) and perfluorobutanesulfonic acid (PFBS) were positively associated with HDP, while perfluorohexane sulfonate (PFHxS) was inversely associated with HDP. In the BKMR analysis, the joint effect of PFASs was positively associated with HDP. PFOS and PFBS showed positive trends, while PFHxS and PFHpA showed inverse trends. In WQS regression analysis, we calculated two WQS indices that were estimated using constraints in both the positive and negative directions of effects. Both WQS indices were significantly associated with HDP (OR: 2.663, 95% CI: 1.795-3.951; OR: 0.338, 95% CI: 0.229-0.499, respectively). PFBS, PFOS and PFUA had significant weights in the positive effect direction; PFHxS, perfluoroheptanoic acid (PFHpA) and perfluorododecanoic acid (PFDoA) had significant weights in the negative effect direction. CONCLUSION: Considering all model results, we found that combined exposure to nine PFASs had a positive effect on the development of HDP. Moreover, PFOS and PFBS were positively associated with the HDP r		В
D668	ヒト(生 殖発生毒 性)	Liao, Qian; Tang, Peng; Song, Yanye; Liu, Bihu; Huang, Huishen; Liang, Jun; Lin, Mengrui; Shao, Yantao; Liu, Shun; Pan, Dongxiang; Huang, Dongping; Qiu, Xiaoqiang	Association of single and multiple prefluoroalkyl substances exposure with preterm birth: Results from a Chinese birth cohort study	2022	Chemosphere. 2022 Nov;307(Pt 1):135741. doi: 10.1016/j.chemosphere.2022.135741. Epub 2022 Jul 18.	BACKGROUND: Perfluoroalkyl substances (PFASs) are persistent organic pollutants that may lead the adverse birth outcomes, including preterm birth (PTB). However, previous studies have reported inconsistent results on the association between PFASs and PTB, and lack of the epidemiological evidence regarding the effect of PFASs mixture on PTB. This study aimed to explore association of individual and multiple exposure to PFASs with PTB. METHODS: The study subjects were consisted of 1341 pregnant women from Guangxi Zhuang Birth Cohort in Guangxi, China, from June 2015 to April 2019. Nine PFASs concentrations in the maternal serum were examined by ultrahigh liquid performance chromatography-tandem mass spectrometry, and the gestational weeks were obtained from medical records. We applied binary logistics regression model to explore correlation between individual PFAS and PTB and inspected the combined effect of PFASs mixture on PTB by applying Bayesian kernel machine regression (BKMR) and weighted quantile sum (WQS) regression models. RESULTS: In adjusted logistics regression model, perfluorooctane sulfonate (PFOS), perfluoroheptanoic acid (PFHpA), perfluorobutanesulfonic acid (PFBS), Σ perfluorinated sulfonic acids (PFSA), and Σ PFASs were positively associated with the risk of PTB. In contrast, perfluoroundecanoic acid (PFUnA), perfluorohexane sulfonate (PFHxS), and perfluorooctanoic acid (PFOA) were negatively associated with the risk of PTB. These associations of n PFOS and PFHpA with PTB were found to be more pronounced in male infants. Restricted cubic splines (RCSs) showed an inverse U-shaped relationship between PFBS and PTB. Analysis from BKMR model showed a positive association between PFASs mixture and PTB, and no evidence of interactions among the nine PFASs were detected. Additionally, PFHpA, PFOS, and PFBS were identified as the main contributors for the effect of PFASs mixture on increasing the risk of PTB by BKMR and WQS models. CONCLUSION: Prenatal exposure to higher levels of PFASs mixture was		В
D669	ヒト(生 殖発生毒 性)	Kobayashi, Sumitaka; Sata, Fumihiro; Ikeda- Araki, Atsuko; Miyashita, Chihiro; Goudarzi, Houman; Iwasaki, Yusuke; Nakajima, Tamie; Kishi, Reiko	Relationships between maternal perfluoroalkyl substance levels, polymorphisms of receptor genes, and adverse birth outcomes in the Hokkaido birth cohort study, Japan	2022	Reprod Toxicol. 2022 Jan;107:112-122. doi: 10.1016/j.reprotox.2021.12.004. Epub 2021 Dec 9.	We assessed the associations between perfluorooctanesulfonate (PFOS) and perfluorooctanoate (PFOA) levels in third trimester maternal serum, the maternal genotypes of genes encoding nuclear receptors, and birth outcomes. We studied a prospective birth cohort of healthy pregnant Japanese women (n = 372) recruited in Sapporo between July 2002 and October 2005. We analyzed PFOS and PFOA levels using liquid chromatography-tandem mass spectrometry and analyzed 13 single nucleotide polymorphisms (SNPs) of proliferator-activated receptor alpha, gamma, gamma coactivator 1A, delta, constitutive androstane receptor, liver X receptor alpha, and beta (LXRB) using real-time polymerase reaction (PCR). We employed multiple linear regression models to establish the influences of log(10)-transformed PFOS and PFOA levels and maternal genotypes on birth size. In female infants, we identified interactions between PFOS levels, the maternal genotype of LXRB (rs1405655), and birth weight. The estimated mean changes in birth weight in response to PFOS levels, the maternal genotype LXRB (rs1405655)-TC/CC (compared to TT), and their interactions were -502.9 g (95 % confidence interval [CI] = -247.3, -758.5 g), -526.3 g (95 % CI = -200.7, -852.0 g), and 662.1 g (95 % CI = 221.0, 1,103.2 g; p(int) = 0.003), respectively. Interactions between PFOS levels and the maternal genotype of LXRB (rs1405655) also significantly affected birth chest circumference and the Ponderal index (p(int) = 0.037 and 0.005, respectively). Thus, interactions between PFOS levels and the maternal genotype of LXRB (rs1405655) affects birth sizes in female infants. We found that certain SNPs modify the effects of PFOS levels on birth size.		В

分野 タイトル 発行年 書誌情報 要旨 (原文) No 著者 (参考) Prenatal perfluoroalkyl substance (PFAS) exposure has been linked to adverse birth outcom yet to be elucidated. DNA methylation changes in mesoderm-specific transcript (MEST) imp the prenatal exposure effects of PFASs on fetal growth. The aim was to investigate the prer methylation changes in MEST imprinted gene involved in fetal growth. Among 486 mother-in Ku, Mei-Sheng; Study, PFASs and DNA methylation levels at 5 CpG sites of MEST promoter region were me Pan, Wen-Chi; multivariable linear regressions were performed to estimate the associations between prena Huang, Yen methylation levels, and child birth outcomes. Mediation analysis was performed to examine ヒト (生 Environ Pollut. 2022 Jul 1;304:119183. doi: Associations between prenatal exposure to Tsung; Hsieh methylation between PFASs and birth outcomes. We found that higher prenatal perfluorooc D670 殖発生毒 perfluoroalkyl substances, hypomethylation of MEST 10.1016/j.envpol.2022.119183. Epub 2022 Mar 21. Wu-Shiun; Hsu, significantly associated with lower methylation levels at 5 CpG sites of MEST promoter region 性) mprinted gene and birth outcomes Yi-Hsiang; Chen Significant negative associations were also found between MEST methylation levels and chi associations between PFOS and perfluorooctanoic acid (PFOA) exposure and MEST methyl Pau-Chung; Liu Chen-Yu girls than in boys. The mediated effect of average MEST methylation level between PFOS e> (95% CI = 2.1, 40.2; p = 0.014). The direct effect of PFOS exposure to birth weight independ was -93.2 (95% CI = -170.5, -17.8; p = 0.018). In conclusion, our results suggest that prenat associated with lower methylation levels at MEST promoter region, which not only leverages the integrity of fetal growth but also provides a potential mechanism for evaluating the pren-CONTEXT: Per- and polyfluoroalkyl substances (PFAS) are widespread chemicals that may reproductive aging in midlife women. OBJECTIVE: To examine associations between serum (1999-2000) and longitudinal serum concentrations of follicle-stimulating hormone (FSH), es Harlow, Siobán normone-binding globulin (SHBG) at baseline and through 2015-2016. DESIGN: Prospective D; Hood, PARTICIPANTS: 1371 midlife women 45 to 56 years of age at baseline in the Study of Wome Michelle M: MAIN OUTCOME MEASURE(S): FSH, estradiol, testosterone, SHBG. RESULTS: In linear mix Ding, Ning; hormones and log-transformed PFAS adjusting for age, site, race/ethnicity, smoking status, ヒト (生 Mukherjee, Per- and Polyfluoroalkyl Substances and Hormone J Clin Endocrinol Metab. 2021 Oct 21;106(11):e4427-e4437. mass index, FSH was positively associated with linear perfluorooctanoate [n-PFOA; 3.12% (D671 殖発生毒 Bhramar; 2021 Levels During the Menopausal Transition doi: 10.1210/clinem/dgab476. doubling in serum concentration), linear perfluorooctane sulfonate [PFOS; 2.88% (0.21%, 5.6 性) Calafat, Antonia sulfonate [2.25% (0.02%, 4.54%)], total PFOS (3.03% (0.37%, 5.76%)), and 2-(N-ethyl-perfluction of the second seco M; Randolph, [EtFOSAA; 1.70% (0.01%, 3.42%)]. Estradiol was inversely associated with perfluorononanoa John F: Gold. and n-PFOA (-2.43% (-4.97%, 0.18%)]. Significant linear trends were observed in the associa Ellen B; Park, with SHBG across parity (Ps trend \leq 0.01), with generally inverse associations among nullipsed on the second state of the s Sung Kyun among women with 3+ births. No significant associations were observed between PFAS and study observed positive associations of PFOA and PFOS with FSH and inverse associations midlife women during the menopausal transition, consistent with findings that PFAS affect Perfluoroalkyl substances (PFASs) exposure is suggested to interfere with fetal growth. Hov considered the roles of parity and delivery on PFASs distributions and the joint effects of PF study, 506 birth cohorts were investigated in Hangzhou, China with 14 PFASs measured in r maternal ages who underwent cesarean section were associated with elevated PEASs burd Shen, Chensi; but diverse influence. A logarithmic unit increment in perfluorooctanoic acid (PFOA), perfluo Ding, Jiaxin; Xu, perfluorononane sulfonate (PFNS) was significantly associated with a reduced birth weight ヒト (生 Perfluoroalkyl Mixture Exposure in Relation to Fetal Chenye; Zhang, Toxics. 2022 Oct 28;10(11):650. doi: (CI): -0.274, -0.031, p = 0.014), 0.217 kg (95% CI: -0.385, -0.049, p = 0.012), and 0.137 kg (95% CI: -0.385, -0.049, p = 0.012), and 0.137 kg (95% CI: -0.385, -0.049, p = 0.012), and 0.137 kg (95% CI: -0.385, -0.049, p = 0.012), and 0.137 kg (95% CI: -0.385, -0.049, p = 0.012), and 0.137 kg (95% CI: -0.385, -0.049, p = 0.012), and 0.137 kg (95% CI: -0.385, -0.049, p = 0.012), and 0.137 kg (95% CI: -0.385, -0.049, p = 0.012), and 0.137 kg (95% CI: -0.385, -0.049, p = 0.012), and 0.137 kg (95% CI: -0.385, -0.049, p = 0.012), and 0.137 kg (95% CI: -0.385, -0.049, p = 0.012), and 0.137 kg (95% CI: -0.385, -0.049, p = 0.012), and 0.137 kg (95% CI: -0.385, -0.049, p = 0.012), and 0.137 kg (95% CI: -0.385, -0.049, p = 0.012), and 0.137 kg (95% CI: -0.385, -0.049, p = 0.012), and 0.137 kg (95% CI: -0.385, -0.049, p = 0.012), and 0.137 kg (95\% CI: -0.385, -0.049), and 0.1385, -0.049), and 0.1385, and 0.1400, and 0.1400, and 0.1400, and 0.1400, and 0.1400, and 0.1400, and D672 殖発生毒 Growth: Potential Roles of Maternal Characteristics 2022 10.3390/toxics10110650. Long; Liu, respectively. Higher perfluoroheptanoic acid (PFHpA) and perfluoroheptane sulphonate (PF 性) and Associations with Birth Outcomes Shuren; Tian, Apgar-1 scores. PFOA (Odds ratio (OR): 2.17, 95% CI: 1.27, 3.71, p = 0.004) and PFNS (OR:1 also risk factors to preterm birth. In addition, the quantile-based g-computation showed tha Yonghong significantly associated with Apgar-1 (OR: 0.324, 95%CI: 0.068, 0.579, p = 0.013) and preter p = 0.019). In conclusion, PFASs were widely distributed in the maternal serum, which was and significantly associated with several birth outcomes. Further investigation should focus of PFASs

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es, but the underlying mechanism has wrinted gene may be a mechanism of atal PFASs exposure effects on DNA affant pairs from the Taiwan Birth Panel asured in cord blood. Univariable and atal PFAS exposure, MEST DNA the potential pathway of MEST tyl sulfonate (PFOS) exposure was on (an adjusted β range: -1.56, -2.22). Id birth weight. Furthermore, the ation levels were more profound in exposure and birth weight was 18.3 ent to average MEST methylation level al PFAS exposure, especially PFOS, is a the role of imprinted gene in ensuring atal exposure effect.			В	
affect sex hormones and accelerate PFAS concentrations at baseline stradiol, testosterone, and sex cohort. SETTING: General community. en's Health Across the Nation (SWAN). ked models fitted with log-transformed menopausal status, parity, and body 95% CI 0.37%, 5.95%) increase for a 63%)], branched perfluorooctane borooctane sulfonamido) acetate (te [PFNA; -2.47% (-4.82%, -0.05%)) ations between PFOS and EtFOSAA arous women but positive associations d testosterone. CONCLUSIONS: This of PFNA and PFOA with estradiol in reproductive aging.			В	
vever, limited investigations FASs mixture on birth outcomes. In this naternal serum. Mothers with higher en, while parity showed a significant prooctane sulfonate (PFOS), and of 0.153 kg (95% confidence interval 5% CI: -0.270, -0.003, $p = 0.044$), HpS) were associated with increased .59, 95% CI: 1.01, 2.50, $p = 0.043$) were t PFASs mixture exposure was m birth (OR: 0.356, 95% CI: 0.149, 0.845, nfluenced by maternal characteristics on the placenta transfer and toxicities			В	

分野 著者 タイトル 発行年 書誌情報 要旨 (原文) No. (参考) Emerging per- and polyfluoroalkyl substances (PFAS) alternatives are increasingly used in d been associated with miscarriage in previous studies, it remains unknown whether exposure any impact on the risk of unexplained recurrent spontaneous abortion (URSA). We conducte cases who had at least 2 unexplained miscarriages and 440 normal controls who had at leas Nian. Min: Huo. of 21 PFAS in plasma, including three emerging PFAS alternatives, eight linear and branched Xiaona; Zhang, ヒト (生 Association of emerging and legacy per- and PFAS, and six legacy PFAS, were measured by ultra-performance liquid chromatography cou Jiangtao; Mao, Ecotoxicol Environ Saf. 2022 Jul 1;239:113691. doi: D673 殖発生毒 spectrometry (UPLC-MS/MS). Multiple logistic regression was applied to evaluate the relati polyfluoroalkyl substances with unexplained recurrent 2022 10.1016/j.ecoenv.2022.113691. Epub 2022 May 25. Yuchan; Jin, Fan 性) spontaneous abortion Perfluorooctanoic acid (PFOA, median: 6.18 ng/mL), perfluorooctane sulfonate (PFOS, medi Shi, Yuhua; perfluoroalkyl ether sulfonic acid (6:2 CI-PFESA, median: 2.27 ng/mL) were the predominan Zhang, Jun CI-PFESA [adjusted odds ratio (aOR) = 1.18 (95% CI: 1.00, 1.39)] and hexafluoropropylene c 1.35 (95% CI: 1.15, 1.59)] were significantly associated with increased risks of URSA. Wome stronger association between PFAS and URSA. Our results suggest that emerging PFAS alte factor for URSA Sevelsted, Astrid; BACKGROUND: Perfluoroalkyl substances PFOS and PFOA are persistent and bioaccumulat Gürdeniz, Gözde human body with a range of suspected negative health effects. It is hypothesised that expos Rago, Daniela; postnatal life might have particularly detrimental effects on intrauterine and childhood growt Pedersen, child cohort we investigate effect of PFOS and PFOA in pregnancy and infancy on intrauterin Casper-Emil anthropometry. METHODS: COPSAC(2010) is an ongoing population based mother-child col Tingskov; Lasky children followed from 24 week gestation with longitudinal deep clinical phenotyping until ag Su, Jessica A; cohort sub study plasma PFOS and PFOA concentrations were semi-quantified by untargete Checa, Antonio week 24 and 1 week postpartum and in the children at ages 6 and 18 months and calibrated Zhang, Pei; examined associations to intrauterine and childhood growth and anthropometry, including in Wheelock, Craig Effect of perfluoroalkyl exposure in pregnancy and and targeted blood metabolomics profiles were integrated to investigate underlying mechan ヒト (生 E: Normann. infancy on intrauterine and childhood growth and EBioMedicine. 2022 Sep;83:104236. doi: PFOA concentrations were associated with lower birth size -0.19 [-0.33; -0.05] BMI z-score D674 殖発生毒 2022 10.1016/j.ebiom.2022.104236. Epub 2022 Aug 26. Stine S: anthropometry. Sub study from COPSAC2010 birth height (z-scored) at age 6: 0.18 [0.05; 0.31], but there was no association between childs' ov (牛) cohort and height. Pregnancy plasma PFOS concentrations were also associated with lower birth B Kristensen. David M; childhood pregnancy plasma PFOS concentration interacted with child sex on BMI and fat pe Rasmussen. associations in girls and positive in boys. The effect of maternal plasma PFOS concentration Morten Arendt; mediated through increasing child plasma lactosyl-ceramide levels (p-mediation=0.08). Sim Schullehner, Jö PFOS concentration on higher boy fat percentage was borderline mediated through increasi rg; Sdougkou evels (p-mediation=0.07). Infancy concentrations of plasma PFOS associated with lower he Kalliroi; Martin, 6 [-0.19; -0.03]. INTERPRETATION: Higher PFOS and PFOA plasma concentrations during p Jonathan W; fetal growth. The effects on childhood growth were not similar as PFOA increased child heig Stokholm, Jakob models suggesting a differing fetal programming effect. Sex specific growth effects were bo Bønnelykke, lactosyl-ceramide metabolism, proposing a possible mechanism of PFOS that has long-lasti Previous studies have reported inconsistent associations between perfluoroalkyl and polyflu gestational hypertension (GH) and blood pressure (BP) during pregnancy. Herein, we aimed effects of PFAS on GH and longitudinal BP measures during pregnancy. We included 826 pr Cohort established between 2016 and 2018. Concentrations of thirteen PFAS were quantifie within 16 weeks of gestation. Longitudinal BP measures were obtained from medical records Yang, Lan; Ji, Honglei; Liang, vere available for 85.60% of participants. GH was defined as new-onset hypertension occur Hong; Yuan, We logistic regression models were used to examine the effect of PFAS on GH, while generalize ヒト (生 Song, Xiuxia; Li, Associations of perfluoroalkyl and polyfluoroalkyl evaluated the average effect of PFAS on BP in each trimester. The potential effect modificat Environ Res. 2022 Dec;215(Pt 2):114284. doi: 殖発生毒 D675 Xiufeng: Niu. substances with gestational hypertension and blood 2022 Bayesian kernel machine regression (BKMR) and quantile g-computation (OgC) were impler 10.1016/j.envres.2022.114284. Epub 2022 Sep 8. 性) Jinbo; Shi, the PFAS mixture. PFOA, PFOS, and PFHxS presented the highest median concentrations of pressure during pregnancy: A cohort study Huijuan; Wen, respectively. Overall, 5.57% of subjects developed GH. PFOS, PFDA, PFUdA, and PFDoA we Sheng; Miao, GH odds, and odds ratios ranged between 0.62 and 0.68. We noted associations between PF Maohua diastolic BP in the third trimester, with PFDA and PFUdA exhibiting the effect on systolic BP female fetus. These associations were further confirmed by BKMR and QgC, showing an inve mixture. Higher concentrations of PFAS during early pregnancy were associated with lower in the third trimester in a population with relatively high exposure levels. Fetal sex might mo on systolic BP in the third trimester.

	備考	出 情 対 報 象 抽	ン 文 ク 献 ① ラ	ン 文 ク 献 ② ラ
aily life. Although legacy PFAS have a to emerging and legacy PFAS has ad a case-control study with 464 URSA at one normal livebirth. Concentrations d PFAS isomers, four short-chain upled with a tandem mass ionship between PFAS and URSA risk. ian: 4.10 ng/mL), and 6:2 chlorinated t PFAS in the controls. Exposure to 6:2 exide dimer acid (HFPO-DA) [aOR = n with older age (>30 years old) had a ernatives may be an important risk			В	
tive exogenous chemicals in the sure during prenatal and early th. In a Danish longitudinal mother- ne and childhood growth and hort of 738 pregnant women and their ge 10 years. In this observational ed metabolomics in the mothers at using a targeted pipeline. We atteractions with child sex. Untargeted isms. FINDINGS: Pregnancy plasma per 1-ng/mL and increased childhood wn infancy plasma PFOA concentration MI (-0.04 [-0.08; -0.01]), but in ercentage at 6 years with negative to on lower girl BMI was borderline ilarly the effect of maternal plasma ng child plasma lactosyl-ceramide eight in childhood, -0.06 z-score at age regnancy had detrimental effects on sht, opposite of PFOS in multipollutant rderline mediated through an altered ng health consequences in this			В	
are significantly associated with lower FAS and lower systolic BP and Point of the systolic BP and to evaluate individual and overall egnant women from the Jiashan Birth d using plasma samples collected s, and more than nine measurements ring after 20 weeks of gestation. ed estimating equation models tion by fetal sex was also examined. mented to explore the overall effect of f 11.99, 8.81 and 5.43 ng/mL, re significantly associated with lower FAS and lower systolic BP and P only in pregnant women carrying a erse overall effect of the PFAS GH risk and longitudinal BP measures dify the effects of PFDA and PFUdA			В	

パーフルオロ化合物に係る国際機関等の評価及び科学的知見の情報収集並びに整理 別添-2 文献データベース文献リスト

No.	分野 (参考)	著者	タイトル	発行年 書誌情報	要旨(原文)	備考	出 対 象 抽	ン文 ク献 ク献 ② ラ
D676	ヒト(生 殖発生毒 性)	Li, Zijie; Lin, Ziyi; Ji, Shuqin; Lai, Keng-Po; Wan, Hin-Ting; Wong, Chris Kong Chu; Li, Lei	Perfluorooctanesulfonic acid exposure altered hypothalamic metabolism and disturbed male fecundity	2022 Sci Total Environ. 2022 Oct 20;844:156881. doi: 10.1016/j.scitotenv.2022.156881. Epub 2022 Jun 23.	Previous studies have examined the effects of perfluorooctanesulfonic acid (PFOS) on disruption of the blood-testis barrier and spermatogenesis. Sertoli and Leydig cells were perturbed, resulting in a decrease in testosterone levels and sperm counts. However, the effects of PFOS on male fecundity are not limited to the testes. In this study, we demonstrated that oral PFOS exposure (1 μ g/g BW and 5 μ g/g BW) decreased the function of the Luteinizing hormone (LH)/Luteinizing hormone receptor (LHr) and decreased epididymal sperm motility. Consistently, testicular transcriptome analysis revealed that PFOS altered the expression of a cluster of genes associated with sperm motility and steroidogenesis. In mice exposed to PFOS, c-Fos immunostaining showed activation of the lateral septal nucleus (LS), paraventricular thalamus (PVT), locus coeruleus (LC), which are known to be related to anxiety-like behaviors. Metabolomic analyses of the hypothalamus revealed that exposure to PFOS perturbed the translation of proteins, as well as the biosynthesis of neurotransmitters and neuromodulators. Altogether, the activation of brain nuclei, shift of hypothalamic metabolome, and reduction of LH/LHr circuit resulted from PFOS exposure suggested the toxicant's systematic effects on male reproduction.			В
D677	ヒト(生 殖発生毒 性)	Kelly-Schuette, Kathrine Ann; Fomum-Mugri, Larissa; Walker, Jessica; Hoppe, Allison; Mbanugo, Chi- Chi; Nikroo, Nadia; Oboh, Oselenonome; Wright, G Paul; Chung, Mathew; Assifi, M Mura	Tumor and serum levels of per- and polyfluoroalkyl (PFAS) in hepatobiliary and gastrointestinal malignancy	Am J Surg. 2022 Mar;223(3):514-518. doi: 10.1016/j.amjsurg.2021.11.014. Epub 2021 Nov 18.	BACKGROUND: There has been significant controversy over the carcinogenic potential of per- and polyfluoroalkyl substances (PFAS). STUDY DESIGN: A total of 37 serum and tumor samples from patients with hepatobiliary and gastrointestinal malignancy were tested for 24 analytes of PFAS. RESULTS: At least one PFAS analyte was found in 97% (36/37) of the serum samples and 41% (15/37) of the tumor samples. The serum Perfluorooctanesulfonic acid (PFOS) levels were significantly higher than the national levels (6.77 ng/mL vs. 5.20 ng/mL; $p = 0.038$). Patients with PFOS in tumor samples had significantly higher levels in serum when compared to tumor samples without PFOS (9.4 ng/mL vs 5.5 ng/mL; $p = 0.015$). CONCLUSIONS: Patients were found to have significantly higher levels of PFOS when compared to the reported national levels. Additionally, the patients with higher serum levels of PFOS also had tumor positive samples.			В
D678	ヒト(内 分泌系)	Boesen, Sophie A H; Long, Manhai; Wielsøe, Maria; Mustieles, Vicente; Fernandez, Mariana F; Bonefeld-Jø rgensen, Eva C	Exposure to Perflouroalkyl acids and foetal and maternal thyroid status: a review	2020 Environ Health. 2020 Oct 13;19(1):107. doi: 10.1186/s12940- 020-00647-1.	BACKGROUND: Exposure to perfluorinated-alkyl-acids (PFAAs) is ubiquitous. PFAAs are hormone-disrupting compounds that are strongly suspected to affect mother-child-health such as fetal growth. Thyroid disruption is a plausible mechanism of action. We aim to summarize the epidemiological evidence for the relation between prenatal and postnatal exposure to PFAAs and disruption of thyroid homeostasis in mothers and/or infants. METHOD: Fifteen original publications on PFAAs concentrations and thyroid hormones (TH) in pregnant women and/or infants were found upon a literature search in the PubMed database. Information on exposure to seven PFAAs congeners [Perfluorooctane sulfonate (PFOS), Perfluoroncatanoate (PFOA), Perfluorohexane sulfonate (PFHXS), Perfluorononanoic acid (PFNA), Perfluorodecanoic acid (PFDA), and Perfluorodecanoic acid (PFDA)] and thyroid stimulating hormone (TSH), free and total thyroxine (FT4 and TT4), free and total triiodothyronine (FT3 and TT3), T3RU (Free triiodothyronine resin uptake) and FT4-index (FT4I) levels were recorded. We evaluated sampling of maternal TH by trimester, and infant TH by sex stratification. Reported associations between mother or infant PFAAs concentration and TSH level. Seven studies showed significant associations between TSH and exposure to six PFAAs congeners, most of them were positive. Maternal T4 and T3 were investigated in nine studies and five studies found inverse associations between exposure to six PFAAs concentrations and infant TSH. Infant TSH level was significant associations with PFAAs exposure. However, both inverse and positive significant associations with PFAAs exposure. However, both inverse and positive significant associations with PFAAs exposure. Associations with PFAAs exposure. Associations with T4 and/or T3 levels. Associations of infant TH with PFAAs concentration and TSH level. Associations of infant TH were found eliciting no clear direction. CONCLUSION: Results indicate a mainly positive relationship between maternal PFAAs concentration		1	A
No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
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D679	ヒト (生 殖発生毒 性)	Pham, Angela; Zhang, Jun; Feng, Liping	Exposure to perfluorobutane sulfonate and perfluorooctanesulfonic acid disrupts the production of angiogenesis factors and stress responses in human placental syncytiotrophoblast	2020	Reprod Toxicol. 2020 Dec;98:269-277. doi: 10.1016/j.reprotox.2020.10.013. Epub 2020 Nov 2.	Poly- and per-fluoroalkyl substances (PFAS) have attracted widespread attention in recent years due to their bioaccumulation, toxicity, and ubiquitous nature. We and others have reported that maternal exposure to PFAS is associated with adverse birth outcomes due to altered placental functions. In this study, we investigated the effects of two major PFAS compounds, perfluorobutane sulfonate (PFBS) and perfluoroctanesulfonic acid (PFOS), on the regulation of the production of angiogenic factors and stress response in placental multinucleated syncytial BeWo cells using qRT-PCR and ELISA. Using this in vitro model, we showed that 1) PFOS or PFBS treatment did not seem to interrupt BeWo cell fusion through syncytins; 2) Exposure to PFOS at 10 μ M decreased a potent angiogenic factor PIGF gene expression, which is implicated in preeclampsia; 3) Exposure to either PFOS or PFBS significantly decreased the production of CGB7 and hCG except hCG secretion in PFOS (10 nM) and PFBS (100 nM) treatment groups; 4) Exposure to PFOS (10 μ M) increased the gene expression. Our results demonstrate that exposure to PFOS or PFBS impacts several key pathways involved in placental cell functions. PFOS seems more potent than PFBS. These novel findings provide a potential explanation for the adverse reproductive complications associated with prenatal exposure to PFOS or PFBS, including preeclampsia and contribute to our knowledge of the reproductive toxicity of PFAS, specifically PFOS and PFBS.		В
D680	ヒト(生 殖発生毒 性)	Cao, Tengrui; Qu, Aibin; Li, Zixuan; Wang, Wenjuan; Liu, Ran; Wang, Xue; Nie, Yaxiong; Sun, Suju; Zhang, Xiaolin; Liu, Xuehui	The relationship between maternal perfluoroalkylated substances exposure and low birth weight of offspring: a systematic review and meta-analysis	2021	Environ Sci Pollut Res Int. 2021 Dec;28(47):67053-67065. doi: 10.1007/s11356-021-15061-4. Epub 2021 Jul 9.	Some studies have shown that maternal perfluoroalkylated substances (PFAS) exposure may be associated with low birth weight (LBW) of offspring. We conducted a meta-analysis to assess the association between maternal PFASs exposure and LBW in offspring. The researchers searched PubMed, Science Direct, Scopus, Google Scholar, Web of Science, and Embase to find all the articles before October 2020. The Newcastle-Ottawa Scale was used to evaluate the quality of the studies. Finally, six articles were included for meta-analysis. Our meta-analysis showed no significant correlation between maternal perfluorooctanoic acid (PFOA) exposure and LBW of offspring: odds ratio (OR) = 0.90, 95% confidence interval (95% CI) = 0.80-1.01, with low heterogeneity (I(2) = 18.4%, P = 0.289); there was a significant positive correlation between maternal perfluorooctane sulfonate (PFOS) exposure and LBW of offspring (OR = 1.32, 95% CI = 1.09-1.55) with no heterogeneity (I(2) = 0.00%, P = 0.570). The grouping analysis of PFOS showed was a significant positive correlation between maternal PFOS exposure and LBW of offspring in American (OR = 1.44, 95% CI = 1.15-1.72). This study provided a systematic review and meta-analysis evidence for the relationship between maternal PFASs exposure and LBW of offspring in American (OR = 1.44, 95% CI = 1.15-1.72). This study provided a systematic review and meta-analysis evidence for the relationship between maternal PFASs exposure and LBW of offspring through a small number of studies. Researchers should conduct further studies between different regions.		В
D681	ヒト(生 殖発生毒 性)	Petersen, Kajsa Ugelvig; Hærvig, Katia Keglberg; Flachs, Esben Meulengracht; Bonde, Jens Peter; Lindh, Christian; Hougaard, Karin Sørig; Toft, Gunnar; Ramlau- Hansen, Cecilia Høst; Tø ttenborg, Sandra Søgaard	Per- and polyfluoroalkyl substances (PFAS) and male reproductive function in young adulthood; a cross- sectional study	2022	Environ Res. 2022 Sep;212(Pt A):113157. doi: 10.1016/j.envres.2022.113157. Epub 2022 Mar 19.	BACKGROUND: Per- and polyfluoroalkyl subtances (PFAS) are a large family of persistent industrial chemicals with endocrine disrupting properties. OBJECTIVES: To examine biomarkers of reproductive function in young adult males according to current environmental exposure to single and combined PFAS. METHODS: The study population consisted of young men (n = 1041, age 18-21) from the Fetal Programming of Semen Quality (FEPOS) cohort. These men were recruited from pregnancies included in the Danish National Birth Cohort (DNBC) between 1996 and 2002. From 2017 to 2019, participants answered an online questionnaire, completed a clinical examination and provided a blood and a semen sample. Exposure to 15 PFAS was measured in plasma. Six compounds were quantified above the limit of detection in at least 80% of the participants. We applied negative binomial regression and weighted quantile sum (WQS) regression models to assess associations between single and combined exposure to PFAS and measures of semen quality, testicular volume and reproductive hormones among the young men. RESULTS: We found no consistent associations between plasma concentrations of PFAS, semen quality and testicular volume. Higher levels of single and combined PFAS were associated with slightly higher levels of follicle-stimulating hormone (FSH) (WQS 4% difference, 95% confidence interval: 0, 9). Perfluorooctanoic acid (PFOA) was the main contributor to this finding with positive signals also from perfluorodecanoic acid (PFDA) and perfluorohexane sulfonic acid (PFHxS). DISCUSSION: We examined exposure to a range of common PFAS in relation to biomarkers of male reproductive function and sociation with higher levels of FSH among young men from the general population in Denmark. Further studies on especially combined exposure to PFAS are needed to expand our understanding of potential endocrine disruption from both legacy and emerging compounds in relation to male reproductive function.		В

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン 文 ン 文 ク 献 ク 献 ① ラ ② ラ
D682	ヒト(生 殖毒性)	Cui, Qianqian; Pan, Yitao; Wang, Jinghua; Liu, Hongxiu; Yao, Bing; Dai, Jiayin	Exposure to per- and polyfluoroalkyl substances (PFASs) in serum versus semen and their association with male reproductive hormones	2020	Environ Pollut. 2020 Nov;266(Pt 2):115330. doi: 10.1016/j.envpol.2020.115330. Epub 2020 Aug 6.	Given that per- and polyfluoroalkyl substances (PFASs) exhibit different distribution in the serum and semen of adult men, improving our understanding of the predictors of PFAS concentrations in paired serum and semen samples from an individual is essential. Here, we investigated and compared the effects of emerging and legacy PFAS concentrations in serum and semen on reproductive hormone levels in serum within a Chinese adult male population. We explored the relationships among perfluorooctanoate (PFOA), perfluorononanoate (PFNA), perfluorooctane sulfonate (PFOS), and chlorinated polyfluorinated ether sulfonate (6:2 CI-PFESA) in serum and semen with reproductive hormones in serum among 651 adult men from Nanjing, China. Significant relationships among all analyzed serum and semen PFASs and decreased total testosterone (total T) were found. Serum and semen PFOA levels were associated with significant decreases in free T. Furthermore, the levels of sex hormone- binding globulin (SHBG) were significantly decreased in association with PFNA, PFOS, and 6:2 CI-PFESA exposure. Negative relationships between the total T/luteinizing hormone (LH) ratio and semen concentrations of selected PFASs with total T, free T, estradiol (E2), SHBG, and total T/LH were observed in semen than in serum. We found that 84.8% of the associations between serum PFOA with total T were mediated by semen PFOA. Thus, elevated PFAS exposure may have negative effects on male reproductive health, and semen PFAS may be a better exposure indicator for the male reproductive system than serum PFAS.	評価書文 献と重複		A
D683	ヒト(生 殖発生毒 性)	Wang, Hexing; Li, Wenyun; Yang, Jiaqi; Wang, Yuanping; Du, Hongyi; Han, Minghui; Xu, Linji; Liu, Shuping; Yi, Jianping; Chen, Yue; Jiang, Qingwu; He, Gengsheng	Gestational exposure to perfluoroalkyl substances is associated with placental DNA methylation and birth size	2022	Sci Total Environ. 2022 Oct 26;858(Pt 1):159747. doi: 10.1016/j.scitotenv.2022.159747. Online ahead of print.	DNA methylation is one potential mechanism for the effects of gestational exposure to perfluoroalkyl substances (PFASs) on fetal growth. We investigated 180 pregnant women who participated in a cohort study conducted in Tangshan City, Northern China, and determined the concentrations of 11 PFASs and the methylation of two genes related to fetal growth [insulin-like growth factor 2 (IGF2) and nuclear receptor subfamily 3 group C member 1 (NR3C1)] and one surrogate marker for global methylation [long interspersed nuclear element-1 (LINE-1)] in placenta tissue. Multiple linear regression analysis was performed to examine the associations of log transformed PFASs with the DNA methylation and birth size. Weighted quantile sum regression was used to determine the mixture effect of PFASs. After adjusting for potential confounders, perfluorooctane sulfonate (PFOS) was negatively associated with the overall methylation of LINE-1. PFASs mixture was negatively associated with the methylation of all CpG loci of LINE-1 and overall methylation of NR3C1. Perfluorootanoic acid (PFOA), perfluoronanoic acid (PFNA), perfluorodecanoic acid (PFDA), and the PFASs mixture was negatively associated with overall methylation of Sex, PFOA, PFNA and the PFASs mixture was negatively associated with ponderal index only in the female subgroup. The interaction of newborns' sex with PFOS and PFOA on overall methylation of IGF2 was statistically significant and so was the interaction of sex with PFOS on overall methylation of LINE-1. These findings suggested that intrauterine exposure to PFASs affected placental DNA methylation and reduced fetal growth, which might be modified by sex.			В
D684	ヒト(生 殖発生毒 性)	Gui, Si-Yu; Chen, Yue-Nan; Wu, Ke-Jia; Liu, Wen; Wang, Wen-Jing; Liang, Huan-Ru; Jiang, Zheng- Xuan; Li, Ze- Lian; Hu, Cheng- Yang	Association Between Exposure to Per- and Polyfluoroalkyl Substances and Birth Outcomes: A Systematic Review and Meta-Analysis	2022	Front Public Health. 2022 Mar 24;10:855348. doi: 10.3389/fpubh.2022.855348. eCollection 2022.	BACKGROUND: A large body of emerging evidence suggests that per- and polyfluoroalkyl substances (PFAS) affect birth outcomes in various pathways, but the evidence is inconsistent. Therefore, this study aimed to systematically review the epidemiological evidence on PFAS exposure and birth outcomes. METHODS: Three electronic databases were searched for epidemiological studies through February 13, 2021. We used random-effects meta-analysis for eight birth outcome indicators to calculate summary effect estimates for various exposure types. The risk of bias and the overall quality and level of evidence for each exposure-outcome pair were assessed. RESULTS: The initial search identified 58 potentially eligible studies, of which 46 were ultimately included. Many PFAS were found to have previously unrecognized statistically significant associations with birth outcomes. Specifically, birth weight (BW) was associated with PFAS, with effect sizes ranging from -181.209 g (95% confidence interval (CI) = -360.620 to -1.798) per 1 ng/ml increase in perfluoroheptanesulfonate (PFHpS) to -24.252 g (95% CI = -38.574 to - 9.930) per 1 ln (ng/ml) increase in perfluorodecaoic acid (PFDA). Similar patterns were observed between other PFAS and birth outcomes: perfluorooctanoic acid (PFOA) and perfluoroctane sulfonate (PFOS) with birth length (BL) and ponderal index (PI), PFOS and perfluorododecanoic acid (PFDoA) with head circumference (HC), PFHpS with gestational age (GA), and perfluorononanoic acid (PFNA) and PFHpS with preterm birth (PTB). Additionally, PFDA showed a statistically significant associated with increased risks of various adverse birth outcomes and that different birth outcome indicators had different degrees of sensitivity to PFAS. Further studies are needed to confirm our results by expanding the sample size, clarifying the effects of different types or doses of PFAS and the time of blood collection on birth outcomes, and fully considering the possible confounders.			в

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No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨 (原文)	備考	出 情 対 報 象 抽	ン 文 ク 献 ① ラ ② ラ
D685	ヒト(生 殖発生毒 性)	Oh, Jiwon; Bennett, Deborah H; Calafat, Antonia M; Tancredi, Daniel; Roa, Dorcas L; Schmidt, Rebecca J; Hertz-Picciotto, Irva; Shin, Hyeong-Moo	Prenatal exposure to per- and polyfluoroalkyl substances in association with autism spectrum disorder in the MARBLES study	2021	Environ Int. 2021 Feb;147:106328. doi: 10.1016/j.envint.2020.106328. Epub 2020 Dec 30.	BACKGROUND: Prenatal exposure to per- and polyfluoroalkyl substances (PFAS) has shown potential to adversely affect child brain development, but epidemiologic evidence remains inconsistent. We examined whether prenatal exposure to PFAS was associated with increased risk of autism spectrum disorder (ASD). METHODS: Participants were 173 mother-child pairs from MARBLES (Markers of Autism Risk in Babies - Learning Early Signs), a high-risk ASD cohort. At 3 years old, children were clinically confirmed for ASD and classified into ASD (n = 57) and typical development (TD, n = 116). We quantified nine PFAS in maternal serum collected during pregnancy. We examined associations of ASD with individual PFAS as well as the combined effect of PFAS on ASD using scores of the first principal component (PC-1) accounting for the largest variance. RESULTS: Prenatal perfluoroctanoate (PFOA) and perfluoronanaote (PFNA) showed positive associations (per 2 nanogram per milliliter increase: relative risk (RR) = 1.20, 95% CI: 0.90, 1.61 [PFOA]; RR = 1.24, 95% CI: 0.91, 1.69 [PFNA]), while perfluorohexane sulfonate (PFHxS) showed a negative association (RR = 0.88, 95% CI: 0.77, 1.01) with ASD risk. When examining associations of ASD with untransformed PFAS concentrations, PFOA, PFNA, and PC-1 were associated with increased ASD risk (per nanogram per milliliter increase: RR = 1.31, 95% CI: 1.04, 1.65; RR = 1.79, 95% CI: 1.13, 2.85; RR = 1.10, 95% CI: 0.97, 1.25, respectively), while the RR of PFHxS moved toward the null. CONCLUSIONS: From this high-risk ASD cohort, we observed increased risk of ASD in children exposed to PFOA and PFNA. Further studies should be conducted in the general population because this population may have a larger fraction of cases resulting from genetic sources.			В
D686	ヒト(生 殖発生毒 性)	Varshavsky, Julia R; Robinson, Joshua F; Zhou, Yan; Puckett, Kenisha A; Kwan, Elaine; Buarpung, Sirirak; Aburajab, Rayyan; Gaw, Stephanie L; Sen, Saunak; Gao, Songmei; Smith, Sabrina Crispo; Park, June-Soo; Zakharevich, Igor; Gerona, Roy R; Fisher, Susan J; Woodruff, Tracey J	Organophosphate Flame Retardants, Highly Fluorinated Chemicals, and Biomarkers of Placental Development and Disease During Mid-Gestation	2021	Toxicol Sci. 2021 May 27;181(2):215-228. doi: 10.1093/toxsci/kfab028.	Perfluoroalkyl and polyfluoroalkyl substances (PFASs) and organophosphate flame retardants (OPFRs) are chemicals that may contribute to placenta-mediated complications and adverse maternal-fetal health risks. Few studies have investigated these chemicals in relation to biomarkers of effect during pregnancy. We measured 12 PFASs and four urinary OPFR metabolites in 132 healthy pregnant women during mid-gestation and examined a subset with biomarkers of placental development and disease (n = 62). Molecular biomarkers included integrin alpha-1 (ITGA1), vascular endothelial-cadherin (CDH5), and matrix metalloproteinase-1 (MMP1). Morphological endpoints included potential indicators of placental stress and the extent of cytotrophoblast (CTB)-mediated uterine artery remodeling. Serum PFASs and urinary OPFR metabolites were detected in ~50%-100% of samples. The most prevalent PFASs were perfluorononanoic acid (PFNA), perfluoroctanoic acid (PFOA), and perfluoroctane sulfonic acid (PFOS), with geometric mean (GM) levels of ~1.3-2.8 (95% confidence limits from 1.2-3.1) ng/ml compared to ≤0.5 ng/ml for other PFASs. Diphenyl phosphate (DPhP) and bis(1,3-dichloro-2-propyl) phosphate (BDCIPP) were the most prevalent OPFR metabolites, with GMs of 2.9 (95% CI: 2.5-3.4) and 3.6 (95% CI: 2.2-3.1) ng/ml, respectively, compared to <1 ng/ml for bis(2-chloroethyl) phosphate (BCEP) and bis(1-chloro-2-propyl) phosphate (BCIPP). We found inverse associations of PFASs or OPFRs with ITGA1 or CDH5 immunoreactivity and positive associations with indicators of placental stress in multiple basal plate regions, indicating these chemicals may contribute to abnormal placentation and future health risks. Associations with blood pressure and lipid concentrations warrant further examination. This is the first study of these chemicals with placental biomarkers measured directly in human tissues and suggests specific biomarkers are sensitive indicators of exposure during a vulnerable developmental period.			В
D687	ヒト(生 殖発生毒 性)	Gardener, Hannah; Sun, Qi; Grandjean, Philippe	PFAS concentration during pregnancy in relation to cardiometabolic health and birth outcomes	2021	Environ Res. 2021 Jan;192:110287. doi: 10.1016/j.envres.2020.110287. Epub 2020 Oct 8.	INTRODUCTION: Poly- and perfluoroalkyl substances (PFAS) are persistent organic pollutants with pervasive exposure and suspected associations with metabolic abnormalities and adverse pregnancy outcomes. The goal of the present study was to examine the relationship between serum-PFAS concentrations measured in late pregnancy with relevant outcomes. METHODS: The study sample included 433 pregnant women enrolled in the Vanguard Pilot Study of the National Children's Study. Six PFAS were measured in primarily third trimester serum, as well as fasting insulin, total cholesterol, and triglycerides. The PFAS were examined in quartiles in relation to serum biomarkers, gestational age at birth and birth weight standardized for gestational age using multivariable-adjusted regression models. RESULTS: Over 98% of the study population had detectable concentrations of four of the PFAS, and concentrations varied by race/ethnicity. Total cholesterol was positively associated with PFDA, PFNA, and PFOS, and triglycerides with PFDA, PFNA, PFOS, and PFOA, but PFAS were not associated with fasting insulin in adjusted models. Only PFNA was associated with an increased odds of birth at <37 weeks gestation. PFAS were generally not associated with birth weight, though PFHxS was associated with the first quartile of birth weight among males only. CONCLUSIONS: This study of pregnant U.S. women supports the ubiquitous exposure to PFAS and positive associations between PFAS exposure with serum-lipid concentrations. PFAS were largely unassociated with gestational age at birth and birth weight, though PFNA was associated with evaluated with gestational age at birth and birth weight, though PFNA was associated with gestational age at birth and birth weight, though PFNA was associated with gestational age at birth and birth weight, though PFNA was associated with gestational age at birth and birth weight, though PFNA was associated with gestational age at birth and birth weight, though PFNA was associated with gestational age at birth and birt			В

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 情 対	ン 文 ン 文 ク 献 ク 献 ① ラ ② ラ
D688	ヒト(生 殖発生毒 性)	Braun, Joseph M; Papandonatos, George D; Li, Nan; Sears, Clara G; Buckley, Jessie P; Cecil, Kim M; Chen, Aimin; Eaton, Charles B; Kalkwarf, Heidi J; Kelsey, Karl T; Lanphear, Bruce P; Yolton, Kimberly	Physical activity modifies the relation between gestational perfluorooctanoic acid exposure and adolescent cardiometabolic risk	2022	Environ Res. 2022 Nov;214(Pt 3):114021. doi: 10.1016/j.envres.2022.114021. Epub 2022 Aug 8.	OBJECTIVE: Exposure to per- and polyfluoroalkyl substances (PFAS) - endocrine disrupting chemicals - may increase cardiometabolic risk. We evaluated whether adolescent lifestyle factors modified associations between gestational PFAS exposure and cardiometabolic risk using a prospective cohort study. METHODS: In 166 mother-child pairs (HOME Study), we measured concentrations of four PFAS in maternal serum collected during pregnancy. When children were age 12 years, we calculated cardiometabolic risk scores from visceral adiposity area, blood pressure, and fasting serum biomarkers. We assessed adolescent physical activity and Healthy Eating Index scores using the Physical Activity Questionnaire for Older Children (PAQ-C), actigraphy, and 24-h diet recalls. Using multivariable linear regression and weighted quantile sum regression, we examined whether physical activity or diet modified covariate-adjusted associations of PFAS and their mixture with cardiometabolic risk scores. RESULTS: Physical activity modified associations between perfluorooctanoic acid (PFOA) and cardiometabolic risk scores. Each doubling of PFOA was associated with worse cardiometabolic risk scores among children with PAQ-C scores < median (β : 1.4; 95% CI:0.5, 2.2, n = 82), but not among those with PAQ-C scores \geq median (β : 0.2; 95% CI: 1.2, 0.7, n = 84) (interaction p-value = 0.01). Associations were most prominent for insulin resistance, leptin-adiponectin ratio, and visceral fat area. We observed results suggesting that physical activity modified the association of PFAS mixture with cardiometabolic risk scores, insulin resistance, and visceral fat area (interaction p-values = 0.17, 0.07, and 0.10, respectively); however, the 95% CIs of the interaction terms included the null value. We observed similar, but attenuated patterns for PFOA and actigraphy-based measures of physical activity. Diet did not modify any associations. Physical activity or diet did not modify associations for other PFAS. CONCLUSIONS: Childhood physical activity mo			В
D689	ビト (生 殖毒性)	Gao, Xuping; Ni, Wanze; Zhu, Sui; Wu, Yanxin; Cui, Yunfeng; Ma, Junrong; Liu, Yanhua; Qiao, Jinlong; Ye, Yanbin; Yang, Pan; Liu, Chaoqun; Zeng, Fangfang	Per- and polyfluoroalkyl substances exposure during pregnancy and adverse pregnancy and birth outcomes: A systematic review and meta-analysis	2021	Environ Res. 2021 Oct;201:111632. doi: 10.1016/j.envres.2021.111632. Epub 2021 Jul 6.	BACKGROUND: Exposure to per- and polyfluoroalkyl substances (PFAS) during pregnancy has been suggested to be associated with adverse pregnancy and birth outcomes; however, the findings have been inconsistent. We aimed to conduct a systematic review and meta-analysis to provide an overview of these associations. METHODS: The online databases PubMed, EMBASE and Web of Science were searched comprehensively for eligible studies from inception to February 2021. Odds ratios (ORs) and 95% confidence intervals (CIs) were pooled using random- or fixed-effects models, and dose-response meta-analyses were also conducted when possible. FINDINGS: A total of 29 studies (32,905 participants) were included. The pooled results demonstrated that perfluorooctane sulfonate (PFOS) exposure during pregnancy was linearly associated with increased preterm birth risk (pooled OR per 1-ng/ml increase: 1.01, 95% CIs: 1.00-1.02, P = 0.009) and perfluorononanoate (PFNA) and perfluorooctanoate (PFOA) exposure showed inverted U-shaped associations with preterm birth risk (P values for the nonlinear trend: 0.025 and 0.030). Positive associations were also observed for exposure to perfluorodecanoate (PFDA) and miscarriage (pooled OR per 1-ng/ml increase: 1.87, 95% CIs: 1.15-3.03) and PFOS and precelampsia (pooled OR per 1-log increase: 1.27, 95% CIs: 1.0-30). Positive associations were to perfluoroundecanoate (PFUDA) was inversely associated with preclampsia risk (pooled OR per 1-log increase: 0.81, 95% CIs: 0.71-0.93). Based on individual evidence, detrimental effects were observed between PFDA exposure and small for gestational age and between PFOA and PFOS and intrauterine growth restriction. No significant associations were found between pregnancy PFAS exposure and small for gestational age). INTERPRETATION: Our findings indicated that PFOS, PFOA and PFNA exposure during pregnancy might be associated with increased preterm birth risk and that PFAS exposure might be associated with the risk of miscarriage and preeclampsia. Due to the limited		1	A
D690	ヒト (生 殖毒性)	Wang, Huanqiang; Wei, Kai; Wu, Zhixin; Liu, Fucun; Wang, Danhua; Peng, Xianzheng; Liu, Yongyou; Xu, Jida; Jiang, A'pei; Zhang, Yan	Association between per- and polyfluoroalkyl substances and semen quality	2022	Environ Sci Pollut Res Int. 2022 Nov 17. doi: 10.1007/s11356-022-24182-3. Online ahead of print.	Some studies have suggested that perfluoroalkyl and polyfluoroalkyl substance (PFAS) exposure may be associated with semen quality in the general population, but with inconsistent results. To identify a more precise relationship between them, a meta- analysis was performed. We searched Embase, the PubMed, The Cochrane Library, Ovid databases, and Web of Science databases (before March 2022) for appropriate studies on the correlations of PFAS exposure with semen parameters. We extracted β value and 95% confidence intervals (CIs) to conduct meta-analysis. Subgroup analyses was performed by sample size, geographic location, and sample type. A total of seven articles involving 2190 participants were included in this study. The concentrations of perfluorooctanoic acid (PFOA) (β value = -1.38; 95% CI: -2.44, -0.32) and perfluorononanoic acid (PFNA) (β value = -1.31, 95% CI: -2.35, -0.26) were negatively associated with sperm progressive motility. Subgroup analysis revealed that PFNA exposure was related to sperm morphology in studies with the sample size exceeding 200 people (β value = -0.14; 95% CI: -0.26, -0.01). Our study supports that exposure to some PFASs (e.g., PFNA, PFOA) may be associated with semen quality, such as lower sperm progressive motility. Therefore, it is of great significance for the prevention of male infertility by control the use of PFASs.		1	A

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D691	ヒト(生 殖発生毒 性)	Zhu, Yachen; Shin, Hyeong- Moo; Jiang, Luohua; Bartell, Scott M	Retrospective exposure reconstruction using approximate Bayesian computation: A case study on perfluorooctanoic acid and preeclampsia	2022	Environ Res. 2022 Jun;209:112892. doi: 10.1016/j.envres.2022.112892. Epub 2022 Feb 8.	BACKGROUND: In environmental epidemiology, measurements of toxicants in biological samples are often used as individual exposure assignments. It is common to obtain only one or a few exposure biomarkers per person and use those measurements to represent each person's relevant toxicant exposure for a given health outcome, even though most exposure biomarkers can fluctuate over time. When the timing of the exposure reflected by the biomarker measurement is misaligned with disease development especially if it occurs after the disease outcome, results could be subject to reverse causality or exposure measurement error. OBJECTIVE: This study aimed to use an approximate Bayesian computation (ABC) method to improve PFOA exposure estimates and characterize the effects of PFOA on preeclampsia in the C8 Studies. METHODS: Serum PFOA concentrations were measured in blood samples collected during 2005-2006 in West Virginia and Ohio (the C8 Studies), and residential and water use histories and pregnancy outcomes were obtained from self-reports. Our previous results may have been influenced by the choice of methods for characterizing PFOA exposures. Here we use an ABC method to combine measured PFOA serum concentrations and environmentally modeled PFOA concentrations to reconstruct historical PFOA exposure and pharmacokinetic models. RESULTS: Compared to using fixed values of model parameters and Monte Carlo simulations, ABC produced similar Spearman correlations between estimated and measured serum PFOA concentrations, yet substantially reduced the mean squared error by over 50%. Based on ABC, compared to previous studies, we found a similar adjusted odds ratio (AOR) for the association between PFOA and preeclampsia. CONCLUSIONS: Bayesian combination of modeled exposure and measured biomarker serum PFOA and preeclampsia. CONCLUSIONS: Bayesian combination of modeled exposure.			с
D692	ヒト(生 殖発生毒 性)	Wikström, Sverre; Hussein, Ghada; Lingroth Karlsson, Annika; Lindh, Christian H; Bornehag, Carl-Gustaf	Exposure to perfluoroalkyl substances in early pregnancy and risk of sporadic first trimester miscarriage	2021	Sci Rep. 2021 Feb 11;11(1):3568. doi: 10.1038/s41598-021- 82748-6.	Many first trimester sporadic miscarriages are unexplained and the role of environmental exposures is unknown. The present aim was to study if levels of Perfluoroalkyl substances (PFASs) in early pregnancy are associated with unexplained, sporadic first trimester miscarriage. The study was performed within the Swedish SELMA pregnancy cohort. Seventy-eight women with non-recurrent first trimester miscarriage were included and 1449 women were available as live birth controls. Eight PFASs were measured in first trimester serum. A doubling of perfluorooctanoic acid (PFOA) exposure, corresponding to an inter-quartile increase, was associated with an odds ratio (95%CI) for miscarriage of 1.48 (1.09-2.01) when adjusting for parity, age and smoking. Analyses per quartiles of PFOA exposure indicated a monotonic dose response association with miscarriage. A similar, but not significant, pattern was observed for perfluoronanoic acid (PFNA). For other PFAS, there were no associations with miscarriage. We have previously shown associations between early pregnancy PFAS exposures and preeclampsia, as well as lower birth weight. Now we report an association between PFOA and miscarriage within the same cohort, which may suggest shared but unknown mechanisms. The study can only represent a period of early placentation and clinical pregnancy loss during the second half of the first trimester.			В
D693	ヒト(生 殖発生毒 性)	Ma, Xueqian; Cui, Long; Chen, Lin; Zhang, Jun; Zhang, Xiaohui; Kang, Quanmin; Jin, Fan; Ye, Yinghui	Parental plasma concentrations of perfluoroalkyl substances and In Vitro fertilization outcomes	2021	Environ Pollut. 2021 Jan 15;269:116159. doi: 10.1016/j.envpol.2020.116159. Epub 2020 Nov 27.	Perfluoroalkyl substances (PFAS) are known to be endocrine-disrupting compounds, but are nevertheless widely used in consumer and industrial products and have been detected globally in human and wildlife. Data from animal and epidemiological studies suggest that PFAS may affect human fertility. This led us to consider whether maternal or paternal plasma PFAS had effects on in vitro fertilization (IVF) outcomes. The study population consisted of 96 couples who underwent IVF treatment in 2017 due to tubal factor infertility. The concentrations of 10 PFAS in blood samples from both male and female partners were measured. Poisson regression with log link was performed to evaluate the association between the tertiles of PFAS concentrations and numbers of retrieved oocytes, mature oocytes, two-pronuclei (2 PN) zygotes, and good-quality embryos, while multiple linear regression models were used to investigate the correlation between plasma PFAS and semen parameters. Multivariable logistic regression was used to evaluate the association between the tertiles of PFAS concentrations and clinical outcomes. It was found that maternal plasma concentrations of perfluorooctanoic acid (PFOA) were negatively associated with the numbers of retrieved oocytes (p(trend) = 0.023), mature oocytes (p(trend) = 0.015), 2 PN zygotes (p(trend) = 0.014), and good-quality embryos (p(trend) = 0.012). Higher paternal plasma PFOA concentrations were found to be significantly associated with reduced numbers of 2 PN zygotes (p(trend) = 0.047). None of the maternal or paternal PFAS were significantly associated with the probability of implantation, clinical pregnancy, or live birth. To our knowledge, the present study is the first to assess the association between parental exposure to PFAS and IVF outcomes. Our results suggest the potential reproductive effects of PFAS on both men and women, and that exposure to PFAS may negatively affect IVF outcomes. Future studies, particularly with large sample size cohorts, are needed to confirm these finding			В

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D694	ヒト(生 殖発生毒 性)	Eick, Stephanie M; Goin, Dana E; Cushing, Lara; DeMicco, Erin; Smith, Sabrina; Park, June-Soo; Padula, Amy M; Woodruff, Tracey J; Morello- Frosch, Rachel	Joint effects of prenatal exposure to per- and poly- fluoroalkyl substances and psychosocial stressors on corticotropin-releasing hormone during pregnancy	2022	J Expo Sci Environ Epidemiol. 2022 Jan;32(1):27-36. doi: 10.1038/s41370-021-00322-8. Epub 2021 Apr 6.	BACKGROUND: Prenatal exposure to per- and poly-fluoroalkyl substances (PFAS) and psychosocial stressors has been associated with adverse pregnancy outcomes, including preterm birth. Previous studies have suggested that joint exposure to environmental chemical and social stressors may be contributing to disparities observed in preterm birth. Elevated corticotropin- releasing hormone (CRH) during mid-gestation may represent one biologic mechanism linking chemical and nonchemical stress exposures to preterm birth. METHODS: Using data from a prospective birth cohort (N = 497), we examined the cross-sectional associations between five individual PFAS (ng/mL; PFNA, PFOA, PFOS, PFHxS, and Me-PFOSA-AcOH) and CRH (pg/mL) using linear regression. PFAS and CRH were measured during the second trimester in serum and plasma, respectively. Coefficients were standardized to reflect change in CRH associated with an interquartile range (IQR) increase in natural log-transformed PFAS. We additionally examined if the relationship between PFAS and CRH was modified by psychosocial stress using stratified models. Self-reported depression, stressful life events, perceived stress, food insecurity, and financial strain were assessed using validated questionnaires during the second trimester and included as binary indicators of psychosocial stress. RESULTS: An IQR increase in PFNA was associated with elevated CRH (β = 5.17, 95% confidence interval [CI] = 1.79, 8.55). Increased concentrations of PFOA were also moderately associated with CRH (β = 3.62, 95% CI = -0.42, 7.66). The relationship between PFNA and CRH was stronger among women who experienced stressful life events, depression, food insecurity, and financial strain compared to women who did not experience these stressors. CONCLUSIONS: This cross-sectional study is the first to examine the relationship between PFAS exposure and CRH levels in mid-gestation. We found that these associations were stronger among women who experienced stress, which aligns with previous findings that		В
D695	ヒト(生 殖発生毒 性)	Preston, Emma V; Hivert, Marie- France; Fleisch, Abby F; Calafat, Antonia M; Sagiv, Sharon K; Perng, Wei; Rifas- Shiman, Sheryl L; Chavarro, Jorge E; Oken, Emily; Zota, Ami R; James-Todd, Tamarra	Early-pregnancy plasma per- and polyfluoroalkyl substance (PFAS) concentrations and hypertensive disorders of pregnancy in the Project Viva cohort	2022	Environ Int. 2022 Jul;165:107335. doi: 10.1016/j.envint.2022.107335. Epub 2022 Jun 6.	BACKGROUND: Hypertensive disorders of pregnancy (HDP), defined here as hypertensive disorders with onset in pregnancy (i.e., gestational hypertension, preeclampsia, and preeclampsia superimposed on chronic hypertension), affect up to 10% of pregnancies in the United States and are associated with substantial maternal and neonatal morbidity and mortality. Per- and polyfluoroalkyl substances (PFAS) are associated with adverse cardiometabolic outcomes during pregnancy, but associations between PFAS and HDP are inconsistent and joint effects of PFAS mixtures have not been evaluated. METHODS: We studied 1,558 pregnant individuals from the Project Viva cohort, recruited during 1999-2002. We quantified concentrations of eight PFAS in plasma samples (median 9.7 weeks of gestation). Using clinical records, we calculated trimester-specific mean systolic (SBP) and diastolic (DBP) blood pressure and categorized HDP status [no HDP (normotensive & chronic hypertension), gestational hypertension, preeclampsia]. We estimated associations of individual PFAS with HDP using multinomial logistic regression and estimated associations with blood pressure using linear regression. We used Bayesian kernel machine regression (BKMR) and quantile g-computation to assess joint effects of the PFAS mixture on HDP and blood pressure measures. RESULTS: Four percent of participants developed preeclampsia, per doubling of perfluorooctanoate (PFOA) [OR = 1.51 (95% confidence interval: 1.12, 2.03)], perfluorooctane sulfonate (PFOS) [OR = 1.38 (1.04, 1.82)], and perfluorohexane sulfonate [OR = 1.28 (1.06, 1.54)] concentrations. We observed higher mean DBP per doubling of PFOA [2nd trimester (T2): 0.39 mmHg (-0.01, 0.78); 3rd trimester (T3): 0.56 mmHg (0.14, 0.98)] and PFOS [T2: 0.46 mmHg (0.11, 0.82); T3: 0.43 mmHg (0.05, 0.80)]. The PFAS mixture was positively associated with odds of gestational hypertension [75th vs. 50th percentile: OR = 1.14 (95% credible interval:1.03, 1.25), BKMR] and mean DBP [T2 = 0.17 mmHg (-0.06, 0.40); T3 = 0.22 mmHg (-0		В

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D696	ヒト(内 分泌系)	Nishimura, Yoko; Moriya, Kimihiko; Kobayashi, Sumitaka; Ikeda- Araki, Atsuko; Sata, Fumihiro; Mitsui, Takahiko; Itoh, Sachiko; Miyashita, Chihiro; Cho, Kazutoshi; Kon, Masafumi; Nakamura, Michiko; Kitta, Takeya; Murai, Sachiyo; Kishi, Reiko; Shinohara, Nobuo	Association of exposure to prenatal perfluoroalkyl substances and estrogen receptor 1 polymorphisms with the second to fourth digit ratio in school-aged children: The Hokkaido study	2022	Reprod Toxicol. 2022 Apr;109:10-18. doi: 10.1016/j.reprotox.2022.02.002. Epub 2022 Feb 22.	Per- and Polyfluoroalkyl substances (PFAS) have endocrine-disrupting effects. The ratio of the lengths of the second and fourth digits (2D:4D) is a noninvasive retrospective index of prenatal exposure to sex hormones, and estrogen receptor 1 (ESR1) polymorphisms may contribute to 2D:4D determination. We investigated whether ESR1 polymorphisms modify the effects of prenatal PFAS exposure on 2D:4D. Participants (n = 1024) with complete data in a prospective birth cohort study (the Hokkaido Study) were included, and maternal plasma in the third trimester was used to examine PFAS concentrations. 2D:4D was determined from photocopies of palms of children using Vernier calipers. ESR1 polymorphisms (rs2234693, rs9340799, and rs2077647) were genotyped by TaqMan polymerase chain reaction. PFAS and 2D:4D association with ESR1 polymorphisms was assessed by multiple linear regression adjusted for potential confounding factors. A 10-fold increase in maternal perfluoroctanoic acid (PFOA) concentration was associated with a 1.54% [95% CI: 0.57, 3.92) increase in children with an AA genotype at rs2077647. A 10-fold increase in perfluorododecanoic acid (PFDOA) was associated with a significant increase in 2D:4D in children with the AA genotype [rs9340799, 1.18% (95% CI: 0.02, 2.34); and rs2077647, 1.67% (95% CI: 0.05, 3.28)]. These associations were apparent among males. A significant gene-environment interaction between PFOA or PFDoDA and ESR1 polymorphism was detected. These findings suggest that ESR1 polymorphisms modify the effects of prenatal exposure to PFAS on sex differentiation.		1 A
D697	ヒト(生 殖発生毒 性)	Marchese, Melissa J; Li, Shuman; Liu, Bin; Zhang, Jun J; Feng, Liping	Perfluoroalkyl Substance Exposure and the BDNF Pathway in the Placental Trophoblast	2021	Front Endocrinol (Lausanne). 2021 Jul 28;12:694885. doi: 10.3389/fendo.2021.694885. eCollection 2021.	BACKGROUND: Per- and polyfluoroalkyl substances (PFAS) are persistent organic pollutants that have become globally ubiquitous in humans and the environment. In utero PFAS exposure is associated with neurodevelopmental effects; however, the mechanism is poorly understood. Brain-derived neurotrophic factor (BDNF) signaling is critical to fetal neurodevelopment during pregnancy and maintains important regulatory roles later in life. This study aims to characterize placental BDNF signaling and investigate whether PFAS exposure disrupts the signaling pathway in placental trophoblast cells. METHODS: The expression and localization of BDNF receptors-p75(NTR) and TrkB-in first trimester and term human placentas and trophoblast cells were investigated by immunofluorescence staining. To assess the effects of PFAS exposure on the BDNF pathway, BeWo cells were treated with PFAS mixtures that mimicked blood levels in a highly exposed population and major PFAS compounds in the mixture at 0.01, 0.1, 1, and 10 μ M concentrations. Changes in pro-BDNF levels and phosphorylation of TrkB receptors were examined by Western blot. RESULTS: In first trimester human placentas, TrkB and p75(NTR) receptors were primarily localized to syncytiotrophoblast and cytotrophoblast cells. At term, TrkB and p75(NTR) receptors were primarily observed in the placental villous stroma. TrkB receptor staining in trophoblasts was reduced at term, while p75(NTR) receptor staining was negative. TrkB receptors were confined to the nuclear and perinuclear spaces, and phosphorylation occurred at the Tyr816 residue in BeWo cells. Exposure to PFOS, PFOA, PFBS, and the six-PFAS mixture did not significantly affect BDNF levels or activation (phosphorylation) of TrkB. Treating cells with 1 μ M and 10 μ M of PFNA resulted in increased TrkB phosphorylation compared to unexposed controls, but BDNF levels were unchanged. CONCLUSIONS: BDNF receptors are present in different regions of human placental villi, indicating diverse functions of BDNF signaling in place		С

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D698	ヒト(内 分泌系)	Yu, Guoqi; Jin, Minfei; Huang, Ying; Aimuzi, Ruxianguli; Zheng, Tao; Nian, Min; Tian, Ying; Wang, Weiye; Luo, Zhongcheng; Shen, Lisong; Wang, Xipeng; Du, Qing; Xu, Weiping; Zhang, Jun	Environmental exposure to perfluoroalkyl substances in early pregnancy, maternal glucose homeostasis and the risk of gestational diabetes: A prospective cohort study	2021	Environ Int. 2021 Nov;156:106621. doi: 10.1016/j.envint.2021.106621. Epub 2021 May 11.	BACKGROUND: Humans are widely exposed to environmental perfluoroalkyl substances (PFAS), which may affect glucose homeostasis. However, research linking PFAS exposure to glucose homeostasis during pregnancy is limited and the results were inconsistent. We aimed to investigate the association between PFAS exposure and glucose homeostasis in pregnancy in a large prospective cohort. METHODS: A total of 2747 pregnant women who participated in the Shanghai Birth Cohort, had blood samples in early pregnancy and completed a 75 g oral glucose tolerance test (OGTT) at 24-28 gestational weeks were included. 10 PFAS were determined by high-performance liquid chromatography/tandem mass spectrometry (HPLC/MS-MS) in the plasma samples in early pregnancy. Logistic regression was used to explore the associations between PFAS concentrations and gestational diabetes mellitus (GDM), while multiple linear regression was used to model the associations between PFAS and OGTT fasting, 1- h and 2-h glucose levels. Potential confounders were adjusted. Bayesian kernel machine regression (BKMR) and a quantile-based g-computation approach (qgcomp) were employed to explore the joint and independent effects of PFAS on glucose homeostasis. RESULTS: The incidence of GDM was 11.8%. One log-unit increment in plasma concentrations in early pregnancy was associated with an increased risk of GDM for perfluorobutane sulfonate (PFBS) (adjusted odd ratio (aOR) = 1.23, 95% confidence interval (95% CI): 1.05, 1.44) and perfluoroheptanoic acid (PFHpA) (aOR = 1.25, 95% CI: 1.07, 1.46). Perfluorooctane sulfonic acid (PFOS), perfluorononanoic acid (PFNA), perfluorohezanesulfonate (PFHS) and PFHpA were positively correlated with 1-h and 2-h glucose levels. Results of the mixed exposure model showed that the joint effects of PFAS were significantly associated with abnormal glucose homeostasis; In the BKMR model, PFAS mixture exposure was positively associated with the GDM incidence, 1-h and 2-h glucose levels and negatively correlated with FBG and 2-h glucos		1	A
D699	ヒト(生殖毒性)	Yang, Ze; Liu, Huan-Yu; Yang, Qiao-Yun; Chen, Xi; Li, Weiqin; Leng, Junhong; Tang, Nai-Jun	Associations between exposure to perfluoroalkyl substances and birth outcomes: A meta-analysis	2022	Chemosphere. 2022 Mar;291(Pt 2):132909. doi: 10.1016/j.chemosphere.2021.132909. Epub 2021 Nov 13.	Although previous meta-analyses have shown that prenatal PFASs exposure is associated with reduction in birth weight, effects of prenatal PFASs exposure on birth outcomes have not been fully explored. We conducted a meta-analysis of 23 eligible studies searched from Embase, PubMed, and Web of Science before March 21, 2021 to analyze the association between prenatal PFASs exposure and birth outcomes, including premature birth (PTB), low birth weight (LBW), small for gestational age (SGA) and miscarriage. Odds ratio (OR) and corresponding confidence intervals were extracted for analysis. According to the heterogeneity of the included studies, fixed-effects (I(2) \leq 50%) and random-effects (I(2) $>$ 50%) models were applied respectively. The significant associations between PFOS and PTB (pooled OR = 1.54, 95% CI: 1.20-1.98), PFOA and miscarriage (pooled OR = 1.40, 95% CI: 1.15-1.70), and PFOS and LBW (pooled OR = 1.52, 95% CI: 1.19-1.94) were obtained. There were differences between included studies with different study regions, sampling time, and samples type used for PFASs assessment. These findings may provide insight in risk assessment and decision-making in producing products that contain PFASs.		1	A
D700	ヒト(生殖発生毒性)	Bloom, Michael S; Commodore, Sarah; Ferguson, Pamela L; Neelon, Brian; Pearce, John L; Baumer, Anna; Newman, Roger B; Grobman, William; Tita, Alan; Roberts, James; Skupski, Daniel; Palomares, Kristy; Nageotte, Michael; Kannan, Kurunthachalam; Zhang, Cuilin; Wapner, Ronald; Vena, John E; Hunt, Kelly J	Association between gestational PFAS exposure and Children's adiposity in a diverse population	2022	Environ Res. 2022 Jan;203:111820. doi: 10.1016/j.envres.2021.111820. Epub 2021 Jul 31.	Perfluoroalkyl substances (PFAS) are widely distributed suspected obesogens that cross the placenta. However, few data are available to assess potential fetal effects of PFAS exposure on children's adiposity in diverse populations. To address the data gap, we estimated associations between gestational PFAS concentrations and childhood adiposity in a diverse mother-child cohort. We considered 6 PFAS in first trimester blood plasma, measured using ultra-high-performance liquid chromatography with tandem mass spectrometry, collected from non-smoking women with low-risk singleton pregnancies (n = 803). Body mass index (BMI), waist circumference (WC), fat mass, fat-free mass, and % body fat were ascertained in 4-8 year old children as measures of adiposity. We estimated associations of individual gestational PFAS with children's adiposity and overweight/obesity, adjusted for confounders. There were more non-Hispanic Black (31.7 %) and Hispanic (42.6 %) children with overweight/obesity, than non-Hispanic white (18.2 %) and Asian/Pacific Islander (16.4 %) children (p < 0.0001). Perfluorooctane sulfonate (PFOS; 5.3 ng/mL) and perfluorooctanoic acid (2.0 ng/mL) had the highest median concentrations in maternal blood. Among women without obesity (n = 667), greater perfluoroundecanoic acid (PFUnDA) was associated with their children having higher WC z-score (β = 0.08, 95%CI: 0.01, 0.14; p = 0.02), fat mass (β = 0.55 kg, 95%CI: 0.21, 0.90; p = 0.002), and % body fat (β = 0.01 %; 95%CI: 0.003, 0.01; p = 0.004), although the association of PFUnDA with fat mass attenuated at the highest concentrations. Among women without obesity, the associations of PFAS and their children's adiposity varied significantly by self-reported race-ethnicity, although the direction of the associations was inconsistent. In contrast, among the children of women with obesity, (n = 136). Our results suggest that specific PFAS may be developmental obesogens, and that maternal race-ethnicity may be an important modifier of the associations among			В

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D701	 ヒト(生 殖発生毒 性) 	Engström, Karin; Axmon, Anna; Nielsen, Christel; Rignell-Hydbom, Anna	High in Utero Exposure to Perfluoroalkyl Substances from Drinking Water and Birth Weight: A Cohort Study among Infants in Ronneby, Sweden	2022 Int J Environ Res Public Health. 2022 Feb 18;19(4):2385. doi 10.3390/ijerph19042385.	In 2013, the drinking water for one-third of the households in Ronneby, Sweden, was found to be contaminated by perfluorinated alkyl substances (PFAS, >10,000 ng/L) from Aqueous Film Forming Foam (AFFF). In utero PFAS exposure can influence birth weight, but little is known about the effects at very high levels. This study aimed to examine the association between in utero PFAS exposure and birth weight. Infants with mothers from Ronneby exposed to contaminated water at home (high exposure) and infants with mothers from Ronneby not exposed to contaminated water at home (low exposure) were compared to infants with mothers from Blekinge county excluding Ronneby (referents). All infants born in Blekinge county 1995-2013 were included (n = 30,360). Differences in birth weight were only seen among infants born after 2005. For boys, Ronneby high exposure had a lower mean birth weight than referents (-54 g, 95% CI -97; -11). For girls, Ronneby high exposure had a higher mean birth weight than referents (47 g, 95% CI 4; 90). There were no differences in birth weight in a sex-specific way, although the effect estimates were relatively small.			в
D702	ヒト(生 殖発生毒 性)	Deji, Zhuoma; Liu, Peng; Wang, Xin; Zhang, Xin; Luo, Yuehua; Huang, Zhenzhen	Association between maternal exposure to perfluoroalkyl and polyfluoroalkyl substances and risks of adverse pregnancy outcomes: A systematic review and meta-analysis	2021 Sci Total Environ. 2021 Aug 20;783:146984. doi: 10.1016/j.scitotenv.2021.146984. Epub 2021 Apr 9.	remultionly and polyhubidatky substances (FFAS), a class of persistent endocrine-distributing chemicals, are widely used in consumer products due to their unique amphiphilic properties. Previous epidemiological studies suggest association of maternal PFASs exposure and adverse pregnancy outcomes, while evidences about the association are inconsistent. The aim of this systematic review and meta-analysis is to assess the relationship of maternal PFASs exposure and adverse pregnancy outcomes. Twenty-one relevant studies were identified from three databases before 2020. The quality, heterogeneity and possibility of publication bias of included studies were evaluated by Newcastle-Ottawa Scale, Q-statistic and Begg's test, respectively. The pooled odds ratios (ORs) with 95% confidence intervals (CIs) were obtained by means of random-effects meta-analysis models. Meta-analysis results revealed that maternal exposure to perfluorooctane sulfonic acid (PFOS) may have a positive association with preterm birth (OR = 1.20, 95% CI: 1.04, 1.38). The pooled estimates also showed limited evidence of association between maternal perfluorononanoic acid (PFNA) exposure and miscarriage (OR = 1.48, 95% CI: 0.92, 2.38) with obvious heterogeneity (I(2) = 93.9, p < 0.01). However, no such significant associations were found between the other PFASs and miscarriage, stillbirth and preterm birth. In addition, the subgroup analyses showed that studies on the relationship of maternal PFASs exposure and miscarriage were mainly contributed by developed countries. The meta-analysis results indicated maternal exposure to PFOS can increase the risk of preterm birth. The results of the included studies are inconsistent and the effects of PFASs on human health are complex. Further studies with enough samples are required to verify these findings.			В
D703	ヒト(生 殖発生毒 性)	Luo, Dan; Wu, Weixiang; Pan, Yanan; Du, Bibai; Shen, Mingjie; Zeng, Lixi	Response to Comment on "Associations of Prenatal Exposure to Per- and Polyfluoroalkyl Substances with the Neonatal Birth Size and Hormones in the Growth Hormone/Insulin-Like Growth Factor Axis": What Is the Origin of PFHxS Found in the Human Body?	2022 Environ Sci Technol. 2022 Apr 19;56(8):5285-5286. doi: 10.1021/acs.est.2c01324. Epub 2022 Apr 4.	No abstract available			В
D704	ヒト(生 殖発生毒 性)	Bach, Cathrine Carlsen; Liew, Zeyan; Matthiesen, Niels Bjerregård; Henriksen, Tine Brink; Bech, Bodil Hammer; N øhr, Ellen Aagaard; Bonefeld-Jø rgensen, Eva Cecilie; Olsen, Jø rn	In utero exposure to perfluoroalkyl and polyfluoroalkyl substances and attention and executive function in the offspring: A study in the Danish National Birth Cohort	2022 Environ Res. 2022 Sep;212(Pt B):113262. doi: 10.1016/j.envres.2022.113262. Epub 2022 Apr 8.	BACKGROUND: Perfluoroalkyl and polyfluoroalkyl substances (PFAS) are ubiquitous in the environment and accumulate in humans. PFAS are suspected to affect the neuropsychological function of children, but only few studies have evaluated the association with childhood attention and executive function. OBJECTIVES: To investigate the association between intrauterine exposure to PFAS and offspring attention and executive function. METHODS: A total of 1593 children from the Danish National Birth Cohort, born 1996-2003, were included. The levels of 16 PFAS were measured in maternal plasma during pregnancy. At 5 years of age, the Test of Everyday Attention for Children at Five (TEACh-5) and the Behavior Rating Inventory of Executive Function (BRIEF) were performed. TEACh-5 scores were standardized to a mean of 0 and standard deviation (SD) of 1. BRIEF scores were standardized to a mean of 50 and a SD of 10. The associations between levels of seven PFAS and TEACh-5 and BRIEF were examined by multivariable linear regression adjusted for potential confounders. RESULTS: Perfluorooctane sulfonamide (PFOSA) was associated with poorer selective attention. For parent rated executive function, and we found no clear associations between PFAS exposure and sustained attention. For parent rated executive function, perfluorooctanoate (PFOA) was associated with poorer scores, standardized mean difference 3.8 (95% confidence interval 1.6, 6.0), highest versus lowest quartile. Regarding other PFAS, the associations were less clear. We found no clear associations between any PFAS and executive function rated by preschool teachers. CONCLUSION: Intrauterine exposure to PFOSA was associated with poorer selective attention. Given the widespread nature of PFAS exposure, these findings may have public health implications, warranting further investigation.			В
D705	ヒト(生 殖発生毒 性)	Fujii, Yukiko; Harada, Kouji H; Trzcinski, Antoine P	Comment on "Associations of Prenatal Exposure to Per- and Polyfluoroalkyl Substances with the Neonatal Birth Size and Hormones in the Growth Hormone/Insulin-Like Growth Factor Axis": What Is the Origin of PFHxS Found in the Human Body?	2022 Environ Sci Technol. 2022 Apr 19;56(8):5283-5284. doi: 10.1021/acs.est.1c08190. Epub 2022 Apr 5.	No abstract available			С

分野 タイトル 発行年 書誌情報 要旨(原文) No 著者 (参考) BACKGROUND/OBJECTIVES: Multiple studies have examined the relationship between PFA explored the associations of PFAS mixture that includes emerging alternatives and branche including 10 linear legacy PFAS, 7 branched isomers, 3 short chain alternatives and 2 compo polyfluorinated ether sulfonate (CI-PFESA)] were quantified in blood plasma among 740 hea Luo, Kai; Huang parameters (i.e., volume, count, concentration, total motility and progressive rate) were asse Wei; Zhang, three multiple pollutant models (i.e., adaptive elastic net regression, quantile based g-comp Qianlong; Liu, used to assess the associations of individual PFAS and PFAS mixture with semen quality an Xiaotu; Nian, among congeners. RESULTS: After adjusting for selected confounders, perfluorobutane sulf ヒト (生 Environmental exposure to legacy poly/perfluoroalky Sci Total Environ. 2022 Aug 10;833:155158. doi: Min; Wei, sulfonate (PFHxS) presented significant and negative associations with sperm count [eta (AE D706 殖発生毒 substances, emerging alternatives and isomers and 2022 Mengdan; Wang, 10.1016/j.scitotenv.2022.155158. Epub 2022 Apr 11. PFBS, and -0.16 (95%CI: -0.25, -0.07) for PFHxS] and sperm concentration [-0.04 (95%CI: -0 semen quality in men: A mixture analysis 性) Yuging; Chen, (95%CI: -0.17, -0.04) for PFHxS]. 6:2 CI-PFESA showed negative associations with total mot Da; Chen, progressive rate (-1.46, 95%CI: -2.79, -0.12). But perfluoroheptanesulfonic acid (PFHpS) was Xiangfeng; count and concentration. These associations were supported by the importance assessmen Zhang, Jun analyses. However, no associations were found between PFAS mixture or branched isomers significant interactions among PFAS congeners. CONCLUSIONS: In the current cross-section PFAS replacements (i.e., 6:2 CI-PFESA and PFBS) and PFHxS exposure were associated wi sperm count and motility in men. Meanwhile, significant positive associations between PFH were also observed. But there were no consistent associations between PFAS mixture, brand BACKGROUND: Accumulating evidence suggests that environmental pollutants may contribu neart defects (CHDs). However, no previous studies have evaluated the impact of perfluoro environmental pollutants, on CHDs. This exploratory study aimed to generate testable hypot gestational PFAS and the risk of CHDs. METHODS: A nested case-control study was conduc Ou. Yangiu: Zeng, Xiaowen; Exposure odds ratios were compared between 158 CHD cases and 158 non-malformed cont Lin, Shao; Bloom individually matched by maternal age $(\pm 5$ years) and parity. Concentrations of 27 PFAS, incl Michael S; Han were determined in maternal peripheral blood and cord blood plasma collected before and d Fengzhen; Xiao performance liquid chromatography coupled to mass spectrometry. Conditional logistic regre Xiaohua; Wang, Gestational exposure to perfluoroalkyl substances and associations between individual PFAS and the risk of CHDs, adjusted for confounding variab ヒト (生 Environ Int. 2021 Sep;154:106567. doi: D707 Hui: Matala. congenital heart defects: A nested case-control pilot exposure to the highly branched perfluorooctanesulfonate (PFOS) isomer potassium 6-triflu 2021 殖毒性) 10.1016/j.envint.2021.106567. Epub 2021 Apr 23. Rosemary; Li, studv m-PFOS, adjusted odds ratio (aOR) (95% CI) = 2.47(1.05,5.83)] and perfluorodecanoic acid Xiaohong; Qu, 2.33(1.00,5.45)] were associated with increased odds of septal defects with statistical signif Yanji; Nie, CI) = 3.65(1.09,12.16)] and perfluoro-n-dodecanoic acid [PFDoA, aOR (95% CI) = 6.82(1.75, Zhiqiang; Dong, conotruncal defects. Effect estimates also suggested associations for higher maternal 6 m-l Guanghui; Liu, ventricular septal defect. However, we did not observe these associations in cord blood. CO Xiaoqing suggested that gestational exposure to most PFAS, especially linear PFOS, 6 m-PFOS, PFD/ greater risks for septal and conotruncal defects. However, a larger, adequately powered stud and to more comprehensively investigate the potential teratogenic effects of other more rec associations with individual CHD subtypes. Per- and polyfluoroalkyl substances (PFAS) are environmentally persistent, potential metabolic Mothers participating in the New Hampshire Birth Cohort Study (NHBCS) provided a plasma Romano, Megar concentrations of seven PFAS, and infant weight and length were abstracted from well-child E; Heggeseth, Sex-specific growth patterns of child body mass index (BMI) were fit using a growth mixture Brianna C; ratios (RRR) and 95% Confidence Intervals (95% CI) for the association of maternal plasma Gallagher, Lisa nfancy were estimated by using multinomial logistic model for the group probabilities in the ヒト (生 G; Botelho, identified: Group 1) a steep increase in BMI during the first 6 months, then a leveling off; Gr Gestational per- and polyfluoroalkyl substances Environ Res. 2022 Dec;215(Pt 3):114418. doi: 2022 10.1016/j.envres.2022.114418. Epub 2022 Sep 23. D708 殖発生毒 Julianne Cook; exposure and infant body mass index trajectory in the across the year; Group 3) a steep increase in BMI during months 1-3, then stable BMI; and 性) Calafat, Antonia New Hampshire Birth Cohort Study with plateau around 3 months (reference group). For boys, higher maternal pregnancy perflu M; Gilbertassociated with a 60% decreased chance of being in group 3 as compared to group 4, after a Diamond, Diane variables (RRR = 0.4; 95% CI: 0.1, 0.9). For girls, higher maternal perfluorooctane sulfonate Karagas, pregnancy were associated with a higher likelihood of following the growth pattern of group (RRR = 2.8; 95% CI: 1.0, 7.6) as compared to group 4, adjusting for potential confounding va Margaret R associations of maternal plasma PFAS concentrations during pregnancy with growth patter observed, with greater BMI growth observed among infant girls born to mothers with higher

	備考	出 情 対 報 抽	ン 文 ク 献 ① ラ	ン 文 ク 献 ② ラ
AS and semen quality, but none has d isomers. METHODS: 22 PFAS, onents of F53B [e.g., 6:2 chlorinated althy men. Five semen quality essed. Multiple linear regression and utation, and XGBoost method) were d the potential interactive effects onate (PFBS) and perfluorohexane NET) = -0.09 (95%CI: -0.14, -0.03) for 0.08, -0.001) for PFBS and -0.11 ility (-2.33, 95%CI: -3.80, -0.86) and s positively associated with sperm t of these four congeners in XGBoost and semen quality; nor were there nal study, we found that two emerging th reduced semen concentration, total pS and sperm count and concentration ched isomers and semen quality.			В	
ute to the occurrence of congenital alkyl substances (PFAS), persistent theses of the association between cted in a cohort of 11,578 newborns. rols delivered at the same hospital, luding linear and branched isomers, during delivery using a ultra- ession was utilized to evaluate oles. RESULTS: Maternal gestational oromethyperfluoroheptanesulfonate [6 [PFDA, aOR (95% CI) = icance, while linear PFOS [aOR (95% 26.61)] were associated with PFOS and PFDA concentrations with NCLUSION: These exploratory findings A, and PFDoA, was associated with dy is needed to confirm our findings, ently introduced PFAS, and on		1	A	
olic disruptors of concern for infants. a sample during pregnancy to measure d visits between birth and 12 months. e model (GMM) and the relative risk PFAS with BMI growth patterns during GMM. Four growth patterns were oup 2) a gradual increase in BMI Group 4) a gradual increase in BMI corooctanoate concentrations were adjusting for potential confounding (PFOS) concentrations during s 2 (RRR = 2.5; 95% CI: 1.0, 6.1) and 3 riables. In this cohort, sex-specific as during the first year of life were pregnancy concentrations of PFOS.			В	

パーフルオロ化合物に係る国際機関等の評価及び科学的知見の情報収集並びに整理

別添-2 文献データベース文献リスト

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン文ン文 ク献 りず ② ラ
D709	ヒト (生 殖発生毒 性)	Stratakis, Nikos; Rock, Sarah; La Merrill, Michele A; Saez, Marc; Robinson, Oliver; Fecht, Daniela; Vrijheid, Martine; Valvi, Damaskini; Conti, David V; McConnell, Rob; Chatzi, Vaia Lida	Prenatal exposure to persistent organic pollutants and childhood obesity: A systematic review and meta- analysis of human studies	2022	Obes Rev. 2022 Jan;23 Suppl 1(Suppl 1):e13383. doi: 10.1111/obr.13383. Epub 2021 Nov 12.	We conducted a systematic review and meta-analysis of the associations between prenatal exposure to persistent organic pollutants (POPs) and childhood obesity. We focused on organochlorines (dichlorodiphenyltrichloroethane [DDT], dichlorodiphenyldichloroethylene [DDE], hexachlorobenzene [HCB], and polychlorinated biphenyls [PCBs]), perfluoroalkyl and polyfluoroalkyl substances (PFAS), and polybrominated diphenyl ethers (PBDEs) that are the POPs more widely studied in environmental birth cohorts so far. We search two databases (PubMed and Embase) through July/09/2021 and identified 33 studies reporting associations with prenatal organochlorine exposure, 21 studies reporting associations with prenatal PBDEs. We conducted a qualitative review. Additionally, we performed random-effects meta-analyses of POP exposures, with data estimates from at least three prospective studies, and BMI-z. Prenatal DDE and HCB levels were associated with higher BMI z-score in childhood (beta: 0.12, 95% CI: 0.03, 0.21; I(2) : 28.1% per study-specific log increase of DDE and beta: 0.31, 95% CI: 0.09, 0.53; I(2) : 31.9% per study-specific log increase of HCB). No significant associations between PCB-153, PFOA, PFOS, or pentaPBDEs with childhood BMI were found in meta-analyses. In individual studies, there was inconclusive evidence that POP levels were positively associated with other obesity indicators (e.g., waist circumference).			в
D710	ヒト(生 殖発生毒 性)	Liu, Hongxiu; Pan, Yitao; Jin, Shuna; Sun, Xiaojie; Jiang, Yangqian; Wang, Yuyan; Ghassabian, Akhgar; Li, Yuanyuan; Xia, Wei; Cui, Qianqian; Zhang, Bin; Zhou, Aifen; Dai, Jiayin; Xu, Shunqing	Associations between six common per- and polyfluoroalkyl substances and estrogens in neonates of China	2021	J Hazard Mater. 2021 Apr 5;407:124378. doi: 10.1016/j.jhazmat.2020.124378. Epub 2020 Oct 27.	Experimental studies suggested per- and polyfluoroalkyl substances (PFASs) may disrupt estrogens in animals, however, the epidemiological evidence on the associations of PFASs with estrogens is sparse. We investigated the associations of legacy PFASs and their alternatives, including F-53B, the perfluorooctane sulfonate (PFOS) replacement that is specifically and commonly used in China, with estrogen concentrations in newborns. We quantified six PFASs and three estrogens in the cord sera of 942 newborns from a birth cohort in Wuhan, China, between 2013 and 2014. After adjusting for confounders and correcting for multiple comparisons, we observed that both legacy PFASs and their alternatives were associated with higher serum levels of estradiol (E2). Some of the PFASs were associated with increasing levels of estrone (E1) and estriol (E3). Analysis of PFASs in mixture using weighted quantile sum regressions showed that F-53B contributed 20.1% and 48.5% to the associations between PFASs and E1 and E2, respectively. This study provided epidemiological data on the associations between common PFAS exposures and estrogens in newborns. Additional toxicology studies are needed to fully understand the effects of PFASs on estrogens and the mechanisms.			В
D711	ヒト(生 殖発生毒 性)	Umar Ijaz, Muhammad; Rauf, Ayesha; Mustafa, Shama; Ahmed, Hussain; Ashraf, Asma; Al- Ghanim, Khalid; Swamy Mruthinti, Satyanarayana; Mahboob, S	Pachypodol attenuates Perfluorooctane sulphonate- induced testicular damage by reducing oxidative stress	2022	Saudi J Biol Sci. 2022 Mar;29(3):1380-1385. doi: 10.1016/j.sjbs.2021.12.012. Epub 2021 Dec 11.	Perfluorooctane sulfonate (PFOS) is an endocrine disruptor chemical (EDC) with potentially adverse effects on the male reproductive system. Pachypodol (5,4'-dihydroxy-3,7,3'-trimethoxyflavone) is a promising flavonoid isolated from Pogostemon cablin (Blanco) Benth that shows a broad range of pharmacological properties. However, the potential curative effects of pachypodol on testicular toxicity are not available until now. Therefore, this research was proposed to examine the efficiency of pachypodol against PFOS-induced testicular toxicity in adult male rats. The experiments were conducted on Sprague-Dawley rats (n = 48), which were equally distributed into four groups: control, PFOS (20 mg/kg), PFOS + Pachypodol (20 mg/kg + 10 mg/kg respectively), and Pachypodol (10 mg/kg). After 56 days of treatment, testes were excised by slaughtering rats, weighed, and stored till further analysis. The estimated parameters include biochemical markers, spermatogenic indices, hormonal and histopathological profiles. PFOS exposure disturbed the biochemical profile by altering the antioxidant/oxidant balance. For instance, it decreased the activities of catalase (CAT), superoxide dismutase (SOD), glutathione peroxidase (GPx), and glutathione reductase (GSR) while increasing the concentration of reactive oxygen species (ROS) and level of thiobarbituric acid reactive substances (TBARS). PFOS intoxication also led to a notable decline in viability, motility, epididymal sperm count, and the number of HOS coiled-tail sperms, whereas the higher level of abnormality in the head, mid-piece, and tail of sperms were observed. Besides, it lowered luteinizing hormone (LH), follicle-stimulating hormone (FSH), and plasma testosterone. In addition, PFOS exposure led to histopathological damages in testicles. However, pachypodol treatment potently alleviated all the illustrated impairments in testes. Conclusively, our results demonstrate the promising free-radical scavenging activity of pachypodol, a novel phytochemical, against the PFOS-insti			D

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 村 報 抽	ン 文 ク 献 ① ラ ② ラ
D712	ヒト(生 殖発生毒 性)	Yao, Qian; Vinturache, Angela; Lei, Xiaoning; Wang, Zixia; Pan, Chengyu; Shi, Rong; Yuan, Tao; Gao, Yu; Tian, Ying	Prenatal exposure to per- and polyfluoroalkyl substances, fetal thyroid hormones, and infant neurodevelopment	2022	Environ Res. 2022 Apr 15;206:112561. doi: 10.1016/j.envres.2021.112561. Epub 2021 Dec 24.	BACKGROUND: Per- and polyfluoroalkyl substances (PFAS) are believed to impair early neurodevelopment and disrupt thyroid hormone (TH) levels. However, there are limited epidemiological data on the neurodevelopmental effects in infancy of prenatal PFAS exposure and the potential mediating effects of TH. OBJECTIVES: To evaluate potential associations between prenatal PFAS exposure and early neurodevelopmental deficiencies, and assess mediator effects of TH. METHODS: From 2010 to 2013, 274 mother-infant pairs were recruited to the Laizhou Wan Birth Cohort in China. Ten PFAS and five TH were measured in cord serum. Developmental quotient (DQ) from 5 domains (adaptive, social, language, gross and fine motor) was assessed using Gesell Developmental Schedules for each child at 1 year of age. The associations between PFAS and DQs were evaluated using multivariable linear regressions. TH-mediated effects of PFAS on DQs were calculated by mediation analyses. RESULTS: Among our study population, PFAS exposures were common and associated with DQ decrement in infants. For each 10-fold increase in PFBS concentrations, gross motor and adaptive DQ decreased by 8.56 (95%CI: -15.15, -1.97) and 5.87 (95%CI: -8.07, -3.67) points, respectively. TSH mediated 12.90% of the association of PFBS with gross motor DQ and FT4 explained 19.63% of the association of PFBS with adaptive DQ. The negative association was also found between PFHxS exposure and gross motor DQ (β = 8.14, 95%CI: -15.39, -0.98). CONCLUSIONS: PFBS and PFHxS were negatively associated with early neurodevelopment, especially consistent in gross motor domain. The associations were partly explained by TSH and FT4.			В
D713	ヒト (代 謝)	Taibl, Kaitlin R; Schantz, Susan; Aung, Max T; Padula, Amy; Geiger, Sarah; Smith, Sabrina; Park, June-Soo; Milne, Ginger L; Robinson, Joshua F; Woodruff, Tracey J; Morello-Frosch, Rachel; Eick, Stephanie M	Associations of per- and polyfluoroalkyl substances (PFAS) and their mixture with oxidative stress biomarkers during pregnancy	2022	Environ Int. 2022 Nov;169:107541. doi: 10.1016/j.envint.2022.107541. Epub 2022 Sep 27.	BACKGROUND: Oxidative stress from excess reactive oxygen species (ROS) is a hypothesized contributor to preterm birth. Per- and polyfluoroalkyl substances (PFAS) exposure is reported to generate ROS in laboratory settings, and is linked to adverse birth outcomes globally. However, to our knowledge, the relationship between PFAS and oxidative stress has not been examined in the context of human pregnancy. OBJECTIVE: To investigate the associations between prenatal PFAS exposure and oxidative stress biomarkers among pregnant people. METHODS: Our analytic sample included 428 participants enrolled in the Illinois Kids Development Study and Chemicals In Our Bodies prospective birth cohorts between 2014 and 2019. Twelve PFAS were measured in second trimester serum. We focused on seven PFAS that were detected in >65 % of participants. Urinary levels of 8- isoprostane-prostaglandin-F(2α), prostaglandin-F(2α), 2,3-dinor-8-iso-PGF(2α), and 2,3-dinor-5,6-dihydro-8-iso-PGF(2α) were measured in the second and third trimesters as biomarkers of oxidative stress. We fit linear mixed-effects models to estimate individual associations between PFAS and oxidative stress biomarkers. We used quantile g-computation and Bayesian kernel machine regression (BKMR) to assess associations between the PFAS mixture and averaged oxidative stress biomarkers. RESULTS: Linear mixed-effects models showed that an interquartile range increase in perfluorooctane sulfonic acid (PFOS) was associated with an increase in 8-isoprostane-prostaglandin-F(2α) ($\beta = 0.10$, 95 % confidence interval = 0, 0.20). In both quantile g-computation and BKMR, and across all oxidative stress biomarkers, PFOS contributed the most to the overall mixture effect. The six remaining PFAS were not significantly associated with changes in oxidative stress biomarkers. CONCLUSIONS: Our study is the first to investigate the relationship between PFAS exposure and biomarkers of oxidative stress may affect fetal development.		1	A
D714	ヒト(生 殖発生毒 性)	Cao, Zhongqiang; Li, Junwei; Yang, Meng; Gong, Hongjian; Xiang, Feiyan; Zheng, Hao; Cai, Xiaonan; Xu, Shunqing; Zhou, Aifen; Xiao, Han	Prenatal exposure to perfluorooctane sulfonate alternatives and associations with neonatal thyroid stimulating hormone concentration: A birth cohort study	2023	Chemosphere. 2023 Jan;311(Pt 1):136940. doi: 10.1016/j.chemosphere.2022.136940. Epub 2022 Oct 20.	BACKGROUND: Chlorinated polyfluorinated ether sulfonic acids (CI-PFESA) and perfluorobutane sulfonate (PFBS), used as perfluorooctanesulfonate (PFOS) alternatives, were indicated as thyroid hormone disruptive toxicants in experimental studies. However, it is unclear whether prenatal exposure to CI-PFESA and PFBS affects neonatal thyroid stimulating hormone (TSH) in human. OBJECTIVE: To disclose the relationships between prenatal CI-PFESAs and PFBS exposure and neonatal thyroid- stimulating hormone (TSH) levels based on a perspective cohort study. METHODS: A total of 1015 pairs of mother and newborn were included from an ongoing birth cohort study in Wuhan, China, between 2013 and 2014. Six PFASs in cord blood sera and TSH concentration in neonatal postpartum heel sticks blood were quantified. Mixed linear and weighted quantile sum (WQS) regression models were applied to assess the individual and combination effects of PFASs exposure on neonatal TSH levels with multiple covariates adjustments. RESULTS: After adjusting for potential confounders and other five PFASs, for each 1-ng/mL increase of PFBS or 8:2 CI-PFESA, was negatively associated with 25.90% (95%CI: 37.37%, -12.32%; P < 0.001) and 27.19% (95%CI: 46.15%, -1.55%; P = 0.033) change in TSH in male but not female infants, respectively. No significant association was found between other PFASs exposure and neonatal TSH. Higher PFAS mixture in cord blood was significantly associated with decrease TSH concentration in all newborns (β = -0.36; 95%CI: 0.58, -0.13; P = 0.001) identified by WQS regression model. PFBS, PFOS and 6:2 CI-PFESA were the major contributors to the neonatal TSH decrement with the weights of 56.50%, 18.71%, 12.81% among PFAS mixture, respectively. CONCLUSIONS: our prospective cohort study suggested a negative association of cord serum PFBS and 8:2 CI-PFESA with TSH concentration in newborns, especially for boys. Additional studies are required to elaborate on the underlying biological mechanisms, especially for PFBS.			В

No.	分野 (参考)	著者	タイトル	発行年 書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン 文 ン 文 ク 献 ク 献 ① ラ ② ラ
D715	ヒト (生 殖発生毒 性)	Lin, Mengrui; Liao, Qian; Tang, Peng; Song, Yanye; Liang, Jun; Li, Jinxiu; Mu, Changhui; Liu, Shun; Qiu, Xiaoqiang; Yi, Rui; Pang, Qiang; Pan, Dongxiang; Zeng, Xiaoyun; Huang, Dongping	Association of maternal perfluoroalkyl substance exposure with postpartum haemorrhage in Guangxi, China	2022 Ecotoxicol Environ Saf. 2022 Oct 15;245:114078. doi: 10.1016/j.ecoenv.2022.114078. Epub 2022 Sep 19.	Postpartum haemorrhage (PPH) is the leading cause of maternal death worldwide, and it may be caused by environmental endocrine disruptors. Prenatal exposure to perfluoroalkyl substances (PFASs) in women has been linked to pregnancy disorders and adverse birth outcomes, but no data are available on the relationship between PFAS exposure during pregnancy and postpartum haemorrhage. This study aimed to explore the associations of maternal PFAS exposure with the postpartum haemorrhage risk and total blood loss. A total of 1496 mother-infant pairs in the Guangxi Zhuang birth cohort were included between June 2015 and May 2018. The concentration of PFASs in serum was detected using ultrahigh liquid chromatography- tandem mass spectrometry. Multiple binomial regression and linear regression models were used to analyse individual PFAS exposures. The mixture of PFASs was analysed using Bayesian Kernel Machine Regression (BKMR). In single substance exposure models, exposure to perfluorohexanesulfonic acid (PFHxS) increased the risk of postpartum haemorrhage (OR: 3.42, 95 % CI: 1.45, 8.07), while exposure to perfluorododecanoic acid (PFDoA) was inversely associated with the risk of postpartum haemorrhage (OR: 0.42, 95 % CI: 0.22, 0.80). The concentrations of perfluoroundecanoic acid (PFUnA) (β : 0.06, 95 % CI: 1.23, 108.82) and perfluorononanoic acid (PFNA) (β : 0.05, 95 % CI: 0.40, 88.95) exposure were positively correlated with the amount of postpartum haemorrhage; this result occurred only in the absence of covariate adjustment. In BKMR models, the risk of postpartum haemorrhage increased with increasing exposure to a PFAS mixture. In conclusion, our study suggested that maternal serum PFAS exposure during pregnancy was associated with the risk of postpartum haemorrhage.			В
D716	ヒト(内 分泌系)	Shih, Yu-Hsuan; Blomberg, Annelise J; Jø rgensen, Louise Helskov; Weihe, Pál; Grandjean, Philippe	Early-life exposure to perfluoroalkyl substances in relation to serum adipokines in a longitudinal birth cohort	2022 Environ Res. 2022 Mar;204(Pt A):111905. doi: 10.1016/j.envres.2021.111905. Epub 2021 Aug 19.	BACKGROUND: Per- and polyfluoroalkyl substances (PFAS) exposure has been linked to metabolic health outcomes such as obesity, and changes in adipokine hormones may be one of the underlying biological mechanisms. We prospectively evaluated the associations between prenatal and early childhood exposures to PFASs and adipokines in children. MATERIAL AND METHODS: PFAS concentrations were measured in serum samples collected at birth, 18 months, and 5 and 9 years, and adiponectin, leptin, leptin receptor, and resistin were measured in serum samples collected at birth and 9 years. We used multivariable linear regression models to estimate the percent change in serum-adipokine concentrations for a doubling in serum-PFAS concentrations. The potential sex-specific effect of PFAS was assessed by including an interaction term between PFAS and sex in each model. Bayesian kernel machine regression (BKMR) was implemented to evaluate the overall effect of PFAS mixtures. RESULTS: Significant associations with leptin, leptin receptor, and resistin at age 9 years were observed for serum-PFAS concentrations at 18 months and 5 and 9 years, whereas associations for PFAS concentrations at birth were mostly null. However, we observed a positive association between serum-PFHxS at birth and leptin receptor at birth. We found limited evidence regarding modification effect of sex on serum-PFAS concentrations. BKMR findings were consistent and suggested some significant effects of the overall PFAS mixtures at 18 months and 5 and 9 years. CONCLUSIONS: Given the associations of PFAS exposure with both adipokine hormones and metabolic functions, future studies should include assessment of adipokine hormones when examining PFAS-associated metabolic alterations.		1	. A
D717	 ヒト(生 殖発生毒 性) 	Gennings, Chris; Wolk, Alicja; Hakansson, Niclas; Lindh, Christian; Bornehag, Carl- Gustaf	Contrasting prenatal nutrition and environmental exposures in association with birth weight and cognitive function in children at 7 years	2020 BMJ Nutr Prev Health. 2020 Jul 26;3(2):162-171. doi: 10.1136/bmjnph-2020-000099. eCollection 2020 Dec.	BACKGROUND: Good nutrition is essential for individual health, a notion that is particularly true during pregnancy. We have used a nutrition index that measures the adequacy of one's diet relative to the unique nutritional needs of individuals due to, for example, their activity level, dietary restrictions, lifestyle and body size. The use of this personalised metric of dietary nutritiousness in the analysis of prenatal environmental exposures and developmental outcomes permits testing for potential mitigating effects of good nutrition. We also provide an analysis strategy for investigating the balance in beneficial food sources which are also the source of environmental toxicants. METHODS: A holistic measure of nutrition, My Nutrition Index (MNI), measures the nutrient quality (ie, 'nutritiousness') of a specified daily diet. MNI is calculated based on quantification of dozens of macronutrients and micronutrients that are specific to an individual's nutritional needs by incorporating dietary restrictions, subject characteristics, activity level and health behaviours. The Swedish Environmental, Longitudinal, Mother and child, Asthma and allergy Study is a Swedish pregnancy cohort, with prenatal endocrine disrupting chemicals (EDCs) exposure and dietary data available. This makes it possible to test for the potential mitigating effects of good nutrition on health and development effects in offspring from EDCs. RESULTS: Using prenatal Food Frequency Questionnaire data to construct an individual's MNI, the index was significantly and positively associated with important metabolic outcome (as measured by birth weight) and cognitive function at age 7 years (as measured by WISC IQ) in children when adjusted for covariates and prenatal concentrations of an EDC. In a stratified analysis of 'low' and 'high' fish consumption, a potential source of perfluoro-octanesulfonic acid (PFOS), the association between PFOS and birth weight was diminished in the high consumption group compared with the low consumption group. CONCLU			C

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 タ献 の す で 、 フ マ フ 、 フ マ フ マ フ マ フ マ フ マ フ マ フ マ フ
D718	ヒト(生 殖発生毒 性)	Starling, Anne P; Liu, Cuining; Shen, Guannan; Yang, Ivana V; Kechris, Katerina; Borengasser, Sarah J; Boyle, Kristen E; Zhang, Weiming; Smith, Harry A; Calafat, Antonia M; Hamman, Richard F; Adgate, John L; Dabelea, Dana	Prenatal Exposure to Per- and Polyfluoroalkyl Substances, Umbilical Cord Blood DNA Methylation, and Cardio-Metabolic Indicators in Newborns: The Healthy Start Study	2020	Environ Health Perspect. 2020 Dec;128(12):127014. doi: 10.1289/EHP6888. Epub 2020 Dec 24.	BACKGROUND: Per- and polyfluoroalkyl substances (PFAS) are environmentally persistent chemicals widely detected in women of reproductive age. Prenatal PFAS exposure is associated with adverse health outcomes in children. We hypothesized that DNA methylation changes may result from prenatal PFAS exposure and may be linked to offspring cardio-metabolic phenotype. OBJECTIVES: We estimated associations of prenatal PFAS with DNA methylation in umbilical cord blood. We evaluated associations of methylation at selected sites with neonatal cardio-metabolic indicators. METHODS: Among 583 mother-infant pairs in a prospective cohort, five PFAS were quantified in maternal serum (median 27 wk of gestation). Umbilical cord blood DNA methylation was evaluated using the Illumina HumanMethylation450 array. Differentially methylated positions (DMPs) were evaluated at a false discovery rate (FDR) < 0.05 and differentially methylated regions (DMRs) were identified using comb-p (Šidá k-adjusted $p < 0.05$). We estimated associations between methylation at candidate DMPs and DMR sites and the following outcomes: newborn weight, adiposity, and cord blood glucose, insulin, lipids, and leptin. RESULTS: Maternal serum PFAS concentrations were below the median for females in the U.S. general population. Moderate to high pairwise correlations were observed between PFAS concentrations ($\rho = 0.28 - 0.76$). Methylation at one DMP (cg18587484), annotated to the gene TJAP1, was associated with perfluorooctanoate (PFOA) at FDR < 0.05. Comb-p detected between 4 and 15 DMRs for each PFAS. Associated genes, some common across multiple PFAS, were implicated in growth (RPTOR), lipid homeostasis (PON1, PON3, CIDEB, NR1H2), inflammation and immune activity (RASL11B, RNF39), among other functions. There was suggestive evidence that two PFAS-associated loci (cg09093485, cg09637273) were associated with cord blood triglycerides and birth weight, respectively (FDR < 0.1). DISCUSSION: DNA methylation in umbilical cord blood was associated with maternal se		в
D719	ヒト (生 殖発生毒 性)	Eick, Stephanie M; Enright, Elizabeth A; Geiger, Sarah D; Dzwilewski, Kelsey L C; DeMicco, Erin; Smith, Sabrina; Park, June-Soo; Aguiar, Andrea; Woodruff, Tracey J; Morello- Frosch, Rachel; Schantz, Susan L	Associations of Maternal Stress, Prenatal Exposure to Per- and Polyfluoroalkyl Substances (PFAS), and Demographic Risk Factors with Birth Outcomes and Offspring Neurodevelopment: An Overview of the ECHO.CA.IL Prospective Birth Cohorts	2021	Int J Environ Res Public Health. 2021 Jan 16;18(2):742. doi: 10.3390/ijerph18020742.	BACKGROUND: Infants whose mothers experience greater psychosocial stress and environmental chemical exposures during pregnancy may face greater rates of preterm birth, lower birth weight, and impaired neurodevelopment. METHODS: ECHO.CA.IL is composed of two cohorts, Chemicals in Our Bodies (CIOB; n = 822 pregnant women and n = 286 infants) and Illinois Kids Development Study (IKIDS; n = 565 mother-infant pairs), which recruit pregnant women from San Francisco, CA and Urbana-Champaign, IL, respectively. We examined associations between demographic characteristics and gestational age, birth weight z-scores, and cognition at 7.5 months across these two cohorts using linear models. We also examined differences in biomarkers of exposure to per- and polyfluoroalkyl substances (PFAS), measured in second-trimester serum, and psychosocial stressors by cohort and participant demographics. RESULTS: To date, these cohorts have recruited over 1300 pregnant women combined. IKIDS has mothers who are majority white (80%), whereas CIOB mothers are racially and ethnically diverse (38% white, 34% Hispanic, 17% Asian/Pacific Islander). Compared to CIOB, median levels of PFOS, a specific PFAS congener, are higher in IKIDS (2.45 ng/mL versus 1.94 ng/mL), while psychosocial stressors are higher among CIOB. Across both cohorts, women who were non-white and single had lower birth weight z-scores relative to white women and married women, respectively. Demographic characteristics are not associated with cognitive outcomes at 7.5 months. CONCLUSIONS: This profile of the ECHO.CA.IL cohort found that mothers and their infants who vary in terms of socioeconomic status, race/ethnicity, and geographic location are similar in many of our measures of exposures and cognitive outcomes. Similar to past work, we found that non-white and single women had lower birth weight infants than white and married women. We also found differences in levels of PFOS and psychosocial stressors based on geographic location.		В
D720	ヒト(生 殖発生毒 性)	Mi, Xin; Lin, Shi Qi; Zhang, Xiao Fen; Li, Jia Jia; Pei, Li Jun; Jin, Feng; Liao, Qi; Xie, Li Min; Wei, Li Cong; Hao, Chan Juan; Zhang, Ya Wei; Li, Wei	Maternal Perfluorinated Compound Exposure and Risk of Early Pregnancy Loss: A Nested Case-control Study	2022	Biomed Environ Sci. 2022 Feb 20;35(2):174-179. doi: 10.3967/bes2022.026.	No abstract available		D

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D721	ヒト(生 殖発生毒 性)	Bellavia, Andrea; Zou, Runyu; Bjö rvang, Richelle D; Roos, Kristine; Sjunnesson, Ylva; Hallberg, Ida; Holte, Jan; Pikki, Anne; Lenters, Virissa; Portengen, Lü tzen; Koekkoek, Jacco; Lamoree, Marja; Van Duursen, Majorie; Vermeulen, Roel; Salumets, Andres; Velthut- Meikas, Agne; Damdimopoulou, Pauliina	Association between chemical mixtures and female fertility in women undergoing assisted reproduction in Sweden and Estonia	2022	Environ Res. 2022 Sep 28;216(Pt 1):114447. doi: 10.1016/j.envres.2022.114447. Online ahead of print.	OBJECTIVE: Women of reproductive age are exposed to ubiquitous chemicals such as phthalates, parabens, and per- and polyfluoroalkyl substances (PFAS), which have potential endocrine disrupting properties and might affect fertility. Our objective was to investigate associations between potential endocrine-disrupting chemicals (EDCs) and female fertility in two cohorts of women attending fertility clinics. METHODS: In a total population of 333 women in Sweden and Estonia, we studied the associations between chemicals and female fertility, evaluating ovarian sensitivity index (OSI) as an indicator of ovarian response, as well as clinical pregnancy and live birth from fresh and frozen embryo transfers. We measured 59 chemicals in follicular fluid samples and detected 3 phthalate metabolites, di-2-ethylhexyl phthalate (DEHP) metabolites, 1 paraben, and 6 PFAS in >90% of the women. Associations were evaluated using multivariable-adjusted linear or logistic regression, categorizing EDCs into quartiles of their distributions, as well as with Bayesian Kernel Machine Regression. RESULTS: We observed statistically significant lower OSI at higher concentrations of the sum of DEHP metabolites in the Swedish cohort (Q4 vs Q1, β = -0.21, 95% CI -0.34, -0.01). Signals of potential associations were also observed at higher concentrations of PFUnDA in both the combined population (Q2 vs. Q1, β = -0.16, 95% CI -0.31, -0.02) and the Estonian population (Q2 vs. Q1, β = -0.27, 95% CI -0.45, -0.08), and for PFOA in the Estonian population (Q4 vs. Q1, β = -0.31, 95% CI -0.61, -0.01). Associations of chemicals with clinical pregnancy and live birth presented wide confidence intervals. CONCLUSIONS: Within a large chemical mixture, we observed significant inverse associations levels of DEHP metabolites and methylparaben, and possibly PFUnDA and PFOA, with OSI, suggesting that these chemicals may contribute to altered ovarian function and infertility in women.			В
D722	ヒト (生 殖発生毒 性)	Jedynak, Paulina; Maitre, Léa; Guxens, Mónica; Gützkow, Kristine B; Julvez, Jordi; Ló pez-Vicente, Mó nica; Sunyer, Jordi; Casas, Maribel; Chatzi, Leda; Gražulevič ienė, Regina; Kampouri, Mariza; McEachan, Rosie; Mon- Williams, Mark; Tamayo, Ibon; Thomsen, Cathrine; Urquiza, José; Vafeiadi, Marina:	Prenatal exposure to a wide range of environmental chemicals and child behaviour between 3 and 7 years of age - An exposome-based approach in 5 European cohorts	2021	Sci Total Environ. 2021 Apr 1;763:144115. doi: 10.1016/j.scitotenv.2020.144115. Epub 2020 Dec 15.	BACKGROUND: Studies looking at associations between environmental chemicals and child behaviour usually consider only one exposure or family of exposures. OBJECTIVE: This study explores associations between prenatal exposure to a wide range of environmental chemicals and child behaviour. METHODS: We studied 708 mother-child pairs from five European cohorts recruited in 2003-2009. We assessed 47 exposure biomarkers from eight chemical exposure families in maternal blood or urine collected during pregnancy. We used the Strengths and Difficulties Questionnaire (SDQ) to evaluate child behaviour between three and seven years of age. We assessed associations of SDQ scores with exposures using an adjusted least absolute shrinkage and selection operator (LASSO) considering all exposures simultaneously and an adjusted exposome-wide association study (ExWAS) considering each exposure independently. RESULTS: LASSO selected only copper (Cu) as associated with externalizing behaviour. In the ExWAS, bisphenol A [BPA, incidence rate ratio (IRR): 1.06, 95% confidence interval (95%CI): 1.01; 1.12] and mono-n-butyl phthalate (MnBP, IRR: 1.06, 95%CI: 1.00; 1.13) were associated with greater risk of externalizing behaviour problems. Cu (IRR: 0.90, 95%CI: 0.82; 0.98), perfluoroundecanoate (PFUnDA, IRR: 0.92, 95%CI: 0.84; 0.99) and organochlorine compounds (OCS) were associated with lower risk of externalizing behaviour problems, however the association with exposure to diethyl thiophosphate (DETP, IRR: 1.11, 95%CI: 1.00; 1.24) but the effect was driven by the smallest cohort. Internalizing score improved with increased concentration of perfluorooctane sulfonate (PFOS, IRR: 0.92, 95%CI: 0.85; 1.00), however the association was driven by the two smallest cohorts with the lowest PFOS concentrations. DISCUSSION: This study added evidence on deleterious effects of prenatal exposure to BPA and MnBP on child behaviour. Other associations should be interpreted cautiously since they were not consistent with previous studies or they have not			в

分野 タイトル 発行年 書誌情報 要旨 (原文) No. 著者 (参考) BACKGROUND: Prenatal exposure to perfluoroalkyl substances (PFAS) has been previously although findings are mixed with respect to the direction and magnitude of effect. To our know associations between PFAS and preeclampsia subtypes, which may have distinct etiologies. associations between PFAS, any preeclampsia diagnosis, and early- and late-onset preeclan associations between PFAS and the angiogenic biomarkers soluble fms-like tyrosine kinase-Bommarito, factor (PIGF), which provide an estimate of pro- and anti-angiogenic activity within the place Paige A; study (n = 75 cases, n = 75 controls) was sampled from the LIFECODES birth cohort. Nine le Ferguson, Kelly ヒト (生 Maternal Levels of Perfluoroalkyl Substances (PFAS) naternal plasma from early pregnancy (median = 10 wk) and angiogenic biomarkers were q Environ Health Perspect. 2021 Oct;129(10):107004. doi: Meeker, John D723 殖発生毒 during Early Pregnancy in Relation to Preeclampsia 2021 four study visits (median = 10, 18, 26, and 35 wk). Logistic regression was used to estimate 10.1289/EHP9091. Epub 2021 Oct 12. D; McElrath, 性) Subtypes and Biomarkers of Preeclampsia Risk confidence intervals (CIs) of the association between an interquartile range (IQR)-increase i Thomas F: Linear regression was used to estimate associations between an IQR-increase in PFAS and Cantonwine biomarkers. RESULTS: Both perfluorodecanoic acid (OR = 1.64, 95% CI: 1.08, 2.47) and perf David E 95% CI: 1.06, 2.43) were associated with higher odds of late-onset preeclampsia. Association early-onset preeclampsia, although findings were imprecise. Few associations were noted b biomarkers. DISCUSSION: Maternal PFAS concentrations were associated with higher odds Heterogeneity of preeclampsia should be considered in future studies because populations r disease subtypes Findings from epidemiological studies on the associations between prenatal perfluoroalkyl st children's neurodevelopment were inconclusive, and most studies did not account for the co Xie, Zhenzhen; strong inter-correlations. The present study aimed to assess the effects of prenatal multiple Tan, Jing; Fang, neurobehavioral development based on 614 mother-infant pairs in the Shanghai-Minhang Bi Guanghong; Ji, concentrations were measured in maternal plasma at 12-16 weeks of gestation. Children's n Associations between prenatal exposure to ヒト (生 Honglei; Miao, 4 years of age was assessed by the Child Behavior Checklist for Ages 1.5-5. In Bayesian kerr perfluoroalkyl substances and neurobehavioral Ecotoxicol Environ Saf. 2022 Aug;241:113818. doi: 2022 10.1016/j.ecoenv.2022.113818. Epub 2022 Jun 28. D724 殖発生毒 Maohua; Tian analyses that could address the inter-correlations between multiple PFASs, PFAS mixture a development in early childhood: A prospective cohort 性) Yuan; Hu, Hui; Somatic Complaints and more Externalizing Problems in boys, but more Somatic Complaints studv Cao, Wencheng; were suggestive associations of PFNA and PFOS with decreased risk of Somatic Complaints Liang, Hong; increased risk of Externalizing Problems in boys; trends of increased risk in girls were observ Yuan, Wei Complaints and between PFTrDA and Sleep Problems. Overall, we found no clear evidence t negative effects on neurobehavioral development in children. However, the modest associat developmental neurotoxicity of prenatal PFAS exposure. Gundacker, Claudia; Graf-Rohrmeister, Prenatal exposure to perfluoroalkyl substances (PFAS), bisphenol A (BPA), lead (Pb), total n Klaudia; Gencik, (MeHg) can affect fetal development. Factors influencing placental transfer rate of these tox Martin; prenatal exposure to pollutants has an effect on birth weight is incompletely understood. We Hengstschläger placental transfer rates of PFAS, BPA, Pb, THg, and MeHg, (2) to analyze relationships betw Markus; and (3) to analyze gene variants as mediators of placental transfer rates and birth outcome. Holoman, Karol; women and their newborns participated in the study. BPA, 16 PFAS, THg, MeHg, and Pb we Rosa, Petra: (BPA, PFAS), HPLC-CV-ICPMS (MeHg), CV-AFS (THg), and GF-AAS (Pb). Questionnaires a Gene Variants Determine Placental Transfer of Kroismavr. ヒト (生 survey exposure sources and birth outcome. 20 single nucleotide polymorphisms and two de Perfluoroalkyl Substances (PFAS), Mercury (Hg) and Front Genet. 2021 Jun 16;12:664946. doi: Renate: D725 殖発生毒 2021 determined by real-time PCR from both maternal and newborn blood. Genotype-phenotype 10.3389/fgene.2021.664946. eCollection 2021. Lead (Pb), and Birth Outcome: Findings From the Offenthaler, Ivo; 性) categorical regression and logistic regression analysis. Specific gene variants were associate Plichta. UmMuKi Bratislava-Vienna Study PFAS (ALAD Lys59Asn, ABCG2 GIn141Lys), THg (UGT Tyr85Asp, GSTT1del, ABCC1 rs24622 Veronika; certain combination of three gene polymorphisms (ABCC1 rs246221, GCLM rs41303970, HF Reischer, newborns small for gestational age. 36% of Austrian and 75% of Slovakian mothers had level Theresa: Teufl (2 μ g/L) of the German HBM Commission for PFOA. 13% of newborns and 39% of women h Isabella; approximation for the BMDL(01) of 12 μ g/L set by the European Food Safety Authority (EF Raffesberg, minimize perinatal exposures to protect fetal health, especially those genetically predispose Wolfgang; exposure. Scharf, Sigrid; Kö hler-Vallant, Birgit; Delissen,

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associated with preeclampsia, owledge, no studies have examined OBJECTIVE: We examined npsia. In addition, we estimated -1 (sFLT-1) and placental growth enta. METHODS: This case-control egacy PFAS were quantified in quantified in maternal plasma from the odds ratios (ORs) and 95% in PFAS and preeclampsia outcomes. concentrations of angiogenic fluorooctanesulfonic acid (OR = 1.60, ns tended to be below the null for etween PFAS and angiogenic of late-onset preeclampsia. may have different distributions of			В	
ubstances (PFASs) exposure and -exposure to multiple PFASs with PFAS exposure on children's inth Cohort Study. Eight PFAS reurobehavioral development at 2 and nel machine regression (BKMR) ppeared to be associated with fewer and Sleep Problems in girls. There and of PFUdA and PFTrDA with wed between PFUdA and Somatic that prenatal exposure to PFASs had ions still suggested the potential			В	
nercury (THg), and methylmercury kins are poorly investigated. Whether the therefore aimed (1) to determine reen fetal exposure and birth outcome Two hundred healthy pregnant re determined using HPLCMS/MS and medical records were used to eletion polymorphisms were associations were analyzed by ed with altered placental transfer of 21) and Pb (GSTP1 Ala114Val). A E His63Asp) was over-represented in Is exceeding the HBM guidance value I and Ery-Pb levels above 24μ g/kg, an SA). Our findings point to the need to d to increased transplacental			В	

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No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン 文 ン 文 ク 献 ク 献 ① ラ ② ラ
D726	ヒト(生 殖発生毒 性)	Timmermann, Clara Amalie Gade; Andersen, Marianne Skovsager; Budtz-Jørgensen, Esben; Boye, Henriette; Nielsen, Flemming; Jensen, Richard Christian; Bruun, Signe; Husby, Steffen; Grandjean, Philippe; Jensen, Tina Kold	Pregnancy Exposure to Perfluoroalkyl Substances and Associations With Prolactin Concentrations and Breastfeeding in the Odense Child Cohort	2022	2 J Clin Endocrinol Metab. 2022 Jan 18;107(2):e631-e642. doi: 10.1210/clinem/dgab638.	CONTEXT: Human exposure to perfluoroalkyl substances (PFAS) has been associated with reduced duration of breastfeeding, although not consistently so, and mechanisms by which PFAS might affect breastfeeding are unknown. OBJECTIVE: To examine the association between early pregnancy serum-PFAS concentrations and breastfeeding termination and to elucidate the potential role of serum-prolactin concentrations in pregnancy. MATERIALS AND METHODS: Pregnant women from the Odense Child Cohort provided blood samples for analysis of 5 major PFAS (n = 1300) and prolactin concentrations (n = 924). They subsequently provided information about the duration of breastfeeding in questionnaires at 3 and 18 months postpartum, and a subgroup also provided breastfeeding termination wie weekly cell phone text messages. Associations between serum-PFAS concentrations and breastfeeding termination were analyzed using Cox regressions, while linear regression was used to assess associations between serum-PFAS and prolactin concentrations. RESULTS: Increased serum concentrations of perfluorooctane sulfonic acid, perfluorooctanoic acid, perfluoronnanoic acid, and Σ PFAS were associated with a 16% (95% CI: 4%-30%), 14% (95% CI: 2%-26%), 14% (95% CI: 3%-27%), and 20% (95% CI: 6%-36%), respectively, increased risk of terminating breastfeeding at any given time after childbirth. Serum-PFAS concentrations were not associated with serum-prolactin concentrations. CONCLUSIONS: These findings are of public health importance due to the global exposures to PFAS. Because breastfeeding is crucial to promote both child health and maternal health, adverse PFAS effects on the ability to breastfeed may have long-term health consequences.			С
D727	ヒト(生 殖発生毒 性)	Bao, Jia; Shao, Li-Xin; Liu, Yang; Cui, Shi-Wei; Wang, Xin; Lu, Gui-Lin; Wang, Xue; Jin, Yi-He	Target analysis and suspect screening of per- and polyfluoroalkyl substances in paired samples of maternal serum, umbilical cord serum, and placenta near fluorochemical plants in Fuxin, China	2022	2 2 10.1016/j.chemosphere.2022.135731. Epub 2022 Jul 14.	The levels of legacy per- and polyfluoroalkyl substances (PFASs) have been growing in the environmental matrices and blood of residents living around the fluorochemical industrial park (FIP) in Fuxin of China over the past decade. Although some recent studies have reported occurrence of novel PFAS alternatives in biotic and abiotic matrices near fluorochemical facilities worldwide, little is known about novel PFAS congeners in maternal sera, umbilical cord sera, and placentas from the female residents close to the FIP and their related health risks. In this study, 50 paired samples of maternal and cord serum as well as placenta were derived from Fuxin pregnant women at delivery, and 21 target analytes of legacy PFASs in all the samples were analyzed via high-performance liquid chromatography-tandem mass spectrometry (HPLC-MS/MS), revealing that PFBS, PFBA, and PFOA were the dominant PFAS contaminants observed in the whole samples. Based upon the suspect screening through high-resolution mass spectrometry (HRMS), 49 novel PFASs assigned to 11 classes were further identified in the Fuxin samples, of which, 20 novel congeners in 4 classes were reported in human blood and placentas for the first time. Moreover, the coefficients for mother-placenta transfer (R(m/p)), placenta-newborn transfer (R(p/n)), and mother-newborn transfer (R(m/n)) of legacy PFASs could be calculated with median values of 1.7, 1.1, and 2.0, respectively, and R(m/p), R(p/n), and R(m/n) for each novel PFAS identified were also estimated with the median values of 0.9, 1.2, and 0.8 individually. Accordingly, novel PFASs contributed 90% of all the legacy and novel PFASs in maternal sera and even occupied 96% of the whole PFASs in both placentas and cord sera. In addition, significant associations were determined among the neonate birth outcomes and serum concentrations of thyroid hormone, sex hormone, and glucocorticoid, together with the levels of certain legacy and novel PFASs in cord sera.			В
D728	ヒト(生 殖発生毒 性)	Wang, Zixia; Luo, Jiajun; Zhang, Yan; Li, Jiong; Zhang, Jun; Tian, Ying; Gao, Yu	High maternal glucose exacerbates the association between prenatal per- and polyfluoroalkyl substance exposure and reduced birth weight	2022	2 2 2 10.1016/j.scitotenv.2022.160130. Online ahead of print.	BACKGROUND: Per- and polyfluoroalkyl substances (PFAS) exposure has been associated with reduced birth weight. However, the association may be complicated by glucose status due to PFAS impact on fetal growth and placental transport. OBJECTIVES: To examine whether maternal glucose status modifies the association between prenatal PFAS exposure and birth weight z-score. METHODS: We analyzed data of 1405 mother-child pairs from the prospective Shanghai Birth Cohort. Plasma concentrations of six PFAS were quantified in the first trimester. Fasting plasma glucose (FPG) was collected at 24-28 gestation weeks. A range of FPG cutoffs (4.9-5.4 mmol/L) covering current recommendations for gestational diabetes mellitus were used to define high and low FPG groups. Association between PFAS concentration and birth weight z-score was evaluated using multivariate linear regression in two FPG groups respectively, and the dose-response relationship was estimated with cutoffs ranging from low to high. We then used propensity score to counterbalance the effects of different PFAS concentrations of several PFAS was inversely associated with birth weight z-score. The association was observed for PFOA, with the magnitude increased from -0.34 (95 % CI: -0.66, -0.03) for 5.0 mmol/L cutoff, to -0.41 (95 % CI: -0.77, -0.05) for 5.1 mmol/L cutoff, and further to -0.51 (95 % CI: -0.88, -0.03) for 5.3 mmol/L. Propensity score matching yielded similar results. CONCLUSIONS: High maternal glucose level may increase the risk of reduced birth weight z-score related to prenatal PFAS exposure.			В

別添-2 文献データベース文献リスト

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン 文 ン 文 ク 献 ク 献 ① ラ ② ラ
D729	ヒト (発 達神経 性)	Julvez, Jordi; Ló pez-Vicente, Mó nica; Warembourg, Charline; Maitre, Lea; Philippat, Claire; Gützkow, Kristine B; Guxens, Monica; Evandt, Jorunn; Andrusaityte, Sandra; Burgaleta, Miguel; Casas, Maribel; Chatzi, Leda; de Castro, Montserrat; Donaire-Gonzá lez, David; Graž ulevičienė, Regina; Hernandez-	Early life multiple exposures and child cognitive function: A multi-centric birth cohort study in six European countries	2021	Environ Pollut. 2021 Sep 1;284:117404. doi: 10.1016/j.envpol.2021.117404. Epub 2021 May 24.	Epidemiological studies mostly focus on single environmental exposures. This study aims to systematically assess associations between a wide range of prenatal and childhood environmental exposures and cognition. The study sample included data of 1298 mother-child pairs, children were 6-11 years-old, from six European birth cohorts. We measured 87 exposures during pregnancy and 122 cross-sectionally during childhood, including air pollution, built environment, meteorology, natural spaces, traffic, noise, chemicals and life styles. The measured cognitive domains were fluid intelligence (Raven's Coloured Progressive Matrices test, CPM), attention (Attention Network Test, ANT) and working memory (N-Back task). We used two statistical approaches to assess associations between exposure and child cognition: the exposome-wide association study (ExWAS) considering each exposure independently, and the deletion-substitution-addition algorithm (DSA) considering all exposures simultaneously to build a final multiexposure model. Based on this multiexposure model that included the exposure variables selected by ExWAS and DSA models, child organic food intake was associated with higher fluid intelligence (CPM) scores (beta = 1.18; 95% CI = 0.50, 1.87) and higher working memory (N-Back) scores (0.23; 0.05, 0.41), and child fast food intake (-1.25; -2.10, -0.40), house crowding (-0.39; -0.62, -0.16), and child environmental tobacco smoke (ETS) (-0.89; -1.42, -0.35), were all associations in the unexpected direction were found: Higher prenatal mercury levels, maternal alcohol consumption and child higher perfluorooctane sulfonic acid (PFOS) levels were associated with better cognitive performance; and higher green exposure during pregnancy with lower cognitive performance. This first comprehensive and systematic study of many prenatal and childhood environmental risk factors suggests that unfavourable child nutrition, family crowdedness and child indoor air pollution and ETS exposures adversely and cross-sectionally associate wit		1	A
D730	ヒト(生 殖発生毒 性)	Chen, Lin; Tong, Chuanliang; Huo, Xiaona; Zhang, Jun; Tian, Ying	Corrigendum to "Prenatal exposure to perfluoroalkyl and polyfluoroalkyl substances and birth outcomes: A longitudinal cohort with repeated measurements" [Chemosphere volume 267 (2021) /128899]	2023	Chemosphere. 2023 Jan;311(Pt 1):137062. doi: 10.1016/j.chemosphere.2022.137062. Epub 2022 Oct 31.	Erratum for Prenatal exposure to perfluoroalkyl and polyfluoroalkyl substances and birth outcomes: A longitudinal cohort with repeated measurements.			С
D731	ヒト(生 殖発生毒 性)	Luo, Kai; Liu, Xiaotu; Zhou, Wei; Nian, Min; Qiu, Wei; Yang, Yan; Zhang, Jun	Preconception exposure to perfluoroalkyl and polyfluoroalkyl substances and couple fecundity: A couple-based exploration	2022	Environ Int. 2022 Oct 5;170:107567. doi: 10.1016/j.envint.2022.107567. Online ahead of print.	Numerous studies have examined the adverse health effects of perfluoroalkyl and polyfluoroalkyl substances (PFAS) but it remains unclear whether preconception exposure to PFAS affects couple fecundity. This prospective preconception cohort study with 936 Chinese couples aimed to comprehensively assess the effects of PFAS on couple fecundity [measured by the time to pregnancy (TTP)] and infertility (i.e., TTP > 12 menstrual cycles) with a focus on the effects of partner-specific exposure and joint-effects of couple-based exposure. Twenty-five PFAS were quantified in plasma from each partner, including seven branched isomers, two chlorinated polyfluoroalkyl ether sulfonic acids, four emerging PFAS replacements [i.e., 6:2 fluorotelomer phosphate diester (6:2 diPAP) and three short-chain alternatives: perfluoro-n-butanoicacid, perfluorobutane sulfonate and perfluoroheptanoic acid (PFHpA)]. Using a two-phase regression approach composed of elastic net regression and principal component analysis, we found that exposure to 6:2 diPAP and PFHpA rather than legacy PFAS in women and the couple-based exposure patterns characterized by high level of female 6:2 diPAP were significantly associated with reduced couple fecundity, which was independent of the adjustment of co-exposed PFAS homogenous from both partners. For example, a ln unit increase in female 6:2 diPAP was associated with 15 % [fecundity odds ratio (FOR) = 0.85, 95 %CI: 0.76, 0.96)] lower odds of couple fecundability (i.e., longer TTP) and 45 % increased risk of infertility [OR = 1.45 (95 %CI: 1.16, 1.81)], respectively. While most PFAS in men were not associated with couple fecundity, certain PFAS (e.g., perfluorohexane sulfonic acid) in men were negatively associated with infertility risk. However, the combined effects of PFAS mixture in couples were nonsignificant. Our findings suggest that PFAS in men and women may exert different impacts on couple fecundity. Preconception exposure to 6:2 diPAP and PFHpA in women may have the potential to impair couple fecu			В
D732	ヒト(生 殖発生毒 性)	Li, Aijing; Hou, Jian; Fu, Jianjie; Wang, Yinan; Hu, Yifei; Zhuang, Taifeng; Li, Menglong; Song, Maoyong; Jiang, Guibin	Association between serum levels of TSH and free T4 and per- and polyfluoroalkyl compounds concentrations in pregnant women	2023	J Environ Sci (China). 2023 Feb;124:11-18. doi: 10.1016/j.jes.2021.10.026. Epub 2022 Feb 1.	Many per- and polyfluoralkyl substances (PFASs) may disrupt maternal thyroid hormone homeostasis in pregnancy. Concerns should be raised regarding the PFASs exposure in pregnant women because thyroid hormones are involved in the early development of the fetus. In this study, we measured the concentrations of 13 PFASs, including five novel short-chain PFASs, in serum from 123 pregnant women in Beijing, China. Linear regression models were used to investigate the association between thyroid-stimulating hormone (TSH) or free thyroxine (FT4) levels and PFASs concentrations under consideration of the impacts of pregnancy-induced physiological factors. We found that perfluorobutanoic acid (PFBA) (β =0.189, 95%CI=-0.039, 0.417, p=0.10) and perfluorodecanoic acid (PFDA) (β =-0.554, 95%CI=-1.16, 0.049, p=0.071) were suggestive of significant association with TSH in thyroid peroxidase antibody (TPOAb) negative women. No association was observed between all PFASs and FT4 levels after controlling for these confounding factors, such as BMI, gestational weight gain and maternal age. These findings suggest that it should pay more attention to the association between thyroid hormone levels and short-chain PFASs concentrations. Future studies could consider a greater sample and the inclusion of other clinical indicators of thyroid function, such as free T3 and total T3.			В

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D733	ヒト(生 殖発生毒 性)	Marks, Kristin J; Howards, Penelope P; Smarr, Melissa M; Flanders, W Dana; Northstone, Kate; Daniel, Johnni H; Sjödin, Andreas; Calafat, Antonia M; Hartman, Terryl J	Prenatal Exposure to Mixtures of Persistent Endocrine-disrupting Chemicals and Birth Size in a Population-based Cohort of British Girls	2021	Epidemiology. 2021 Jul 1;32(4):573-582. doi: 10.1097/EDE.000000000001351.	BACKGROUND: Previous studies of endocrine-disrupting chemicals have examined one of these chemicals at a time in association with an outcome; studying mixtures better approximates human experience. We investigated the association of prenatal exposure to mixtures of persistent endocrine disruptors (perfluoroalkyl and polyfluoroalkyl substances [PFAS], polychlorinated biphenyls [PCBs], and organochlorine pesticides) with birth size among female offspring in the Avon Longitudinal Study of Parents and Children (ALSPAC), based in the United Kingdom in 1991-1992. METHODS: We quantified concentrations of 52 endocrine-disrupting chemicals in maternal serum collected during pregnancy at median 15-week gestation. Birth weight, crown-to-heel length, and head circumference were measured at birth; ponderal index and small for gestational age were calculated from these. We used repeated holdout Weighted Quantile Sum (WQS) regression and Bayesian kernel machine regression to examine mixtures in 313 mothers. RESULTS: Using WQS regression, all mixtures (each chemical class separately and all three together) were inversely associated with birth weight. A one-unit increase in WQS index (a one-decile increase in chemical concentrations) for all three classes combined was associated with 55 g (β = -55 g, 95% confidence interval [CI] = -89, -22 g) lower birth weight. Associations were weaker but still inverse using Bayesian kernel machine regression. Under both methods, PFAS were the most important contributors to the association with birth weight. We also observed inverse associations for crown-to-heel length. CONCLUSIONS: These results are consistent with the hypothesis that prenatal exposure to mixtures of persistent endocrine-disrupting chemicals affects birth size.		В
D734	ヒト(生 殖発生毒 性)	Kahn, Linda G; Harley, Kim G; Siegel, Eva L; Zhu, Yeyi; Factor-Litvak, Pam; Porucznik, Christina A; Klein-Fedyshin, Michele; Hipwell, Alison E	Persistent organic pollutants and couple fecundability: a systematic review	2021	Hum Reprod Update. 2021 Feb 19;27(2):339-366. doi: 10.1093/humupd/dmaa037.	BACKGROUND: Despite increasing regulation, exposure to persistent organic pollutants (POPs) remains a serious public health concern due to their accumulation in the environment and ability to biomagnify up the food chain. POPs are associated with endocrine-disrupting effects including adverse reproductive outcomes that could affect fecundability, i.e. the capacity to conceive a pregnancy, quantified as time to pregnancy (TTP). OBJECTIVE AND RATIONALE: Results of epidemiologic studies that examine the impact of various chemical classes of POPs on TTP have not been synthesised. We undertook a systematic review to summarise the strength of evidence for associations of four common groups of POPs with couple fecundability and to identify gaps and limitations in the literature in order to inform policy decisions and future research. SEARCH METHODS: We performed an electronic search of literature published between 1 January 2007 and 6 August 2019 in MEDLINE, EMBASE.com, Global Health, DART/TOXLINE and POPLINE. We included empirical research papers that examined human exposure to organochlorine (OC) pesticides, brominated flame retardants, polychlorinated organic compounds and/or per- and polyfluoroalkyl substances (PFAS) and considered TTP or fecundability as an outcome. Standardised forms for screening, data extraction and study quality were developed using DistillerSR software, and all reviews were completed in duplicate. We used the Newcastle-Ottawa Scale to assess risk of bias and devised additional quality metrics based on specific methodological features of fecundability studies. OUTCOMES: The search returned 4573 articles, and 28 papers from 19 different studies met inclusion criteria. Among them, four studies measured TTP prospectively, three had data on participants' prenatal exposure to polychorinated biphenyls with TTP, with some additional support for associations of female exposure to OC pesticides or male and female partners and one focused exclusively on males. Analyses varied widely in terms of exposur		В

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D735	ヒト (生 殖発生毒 性)	Criswell, Rachel; Romano, Megan E	Unpacking the Relationship Between Perfluoroalkyl Substances and Placental Hormones in Lactation	2022	J Clin Endocrinol Metab. 2022 Feb 17;107(3):e1312-e1314. doi: 10.1210/clinem/dgab702.	Perfluoroalkyl substances (PFAS) are a class of degradation-resistant chemicals found in fire-fighting foams, industrial surfactants, and oil- and water-resistant consumer items. They persist in the environment and have been shown to have endocrine-disrupting activity in the human body. In particular, exposure to elevated levels of PFAS has been fairly consistently linked to shorter breastfeeding duration across sociodemographically and geographically diverse populations, although the exact mechanisms are unclear (1-5). Prior work has speculated that PFAS may interfere with initiation of lactation or adversely impact either the quality or quantity of milk produced (1). Because placental hormones are critical in lactation (6), it is important to understand the influence that endocrine-disrupting chemicals such as PFAS have on these hormones as they support lactation. Animal studies indicate that PFAS suppress prolactin and placental lactogen signaling, interfering with mammary epithelial cell growth and differentiation and milk production (1). Mice exposed to perfluorooctanoic acid (PFOA), one of the hallmark chemicals of the class, during pregnancy showed reduced mammary gland differentiation and delayed epithelial involution (1). These associations are consistent throughout the life course: among mice treated with PFOA in utero and as juveniles, greater exposure levels are associated with diminished mammary gland development (1). PFOA also affects lactogenesis because mice exposed to PFOA during pregnancy did not have milk-filled alveoli just before giving birth (1). Recent research by Timmerman et al, Pregnancy exposure to perfluoroalkyl substances, prolactin concentrations and breastfeeding in the Odense Child Cohort (7), is timely and novel in that it explores these questions of mechanism among humans in a large and well-characterized cohort. Although the current study does not provide strong evidence that PFAS interfere with lactation via an influence on prolactin, it does lay a foundation for further eluc			С
D736	ヒト (生 殖発生毒 性)	Upson, Kristen; Shearston, Jenni A; Kioumourtzoglou, Marianthi-Anna	An Epidemiologic Review of Menstrual Blood Loss as an Excretion Route for Per- and Polyfluoroalkyl Substances	2022	Curr Environ Health Rep. 2022 Mar;9(1):29-37. doi: 10.1007/s40572-022-00332-0. Epub 2022 Mar 10.	PURPOSE OF REVIEW: Menstrual blood loss, a common physiologic occurrence, provides an excretion route for per- and polyfluoroalkyl substances (PFAS) since these chemicals are bound to proteins in blood. To increase awareness of this relationship in environmental epidemiology, we reviewed the available epidemiologic data on menstrual bleeding and PFAS concentrations. RECENT FINDINGS: Initial epidemiologic studies reported generally higher PFAS concentrations in men, menopausal women, and those with a history of hysterectomy compared to premenopausal women. Although subsequent studies investigating menstrual cycle characteristics observed somewhat discrepant results for menstrual irregularity and cycle length, consistent associations have been observed between heavy menstrual bleeding and lower PFAS concentrations. This review highlights the important role of menstrual bleeding on the excretion of PFAS. Given the high prevalence of menstrual bleeding in the population and the implications for environmental epidemiology, we provide recommendations to move this field forward.			D
D737	ヒト(生 殖発生毒 性)	C	Erratum: Per- and Polyfluoroalkyl Substances in Drinking Water and Birthweight in the US: A County- level Study: Erratum	2021	Environ Epidemiol. 2021 Feb 4;5(1):e138. doi: 10.1097/EE9.000000000000138. eCollection 2021 Feb.	[This corrects the article DOI: 10.1097/EE9.00000000000107.].			D
D738	ヒト(生 殖発生毒 性)	Eick, Stephanie M; Hom Thepaksorn, Elizabeth K; Izano, Monika A; Cushing, Lara J; Wang, Yunzhu; Smith, Sabrina Crispo; Gao, Songmei; Park, June-Soo; Padula, Amy M; DeMicco, Erin; Valeri, Linda; Woodruff, Tracey J; Morello- Frosch, Rachel	Associations between prenatal maternal exposure to per- and polyfluoroalkyl substances (PFAS) and polybrominated diphenyl ethers (PBDEs) and birth outcomes among pregnant women in San Francisco	2020	Environ Health. 2020 Sep 16;19(1):100. doi: 10.1186/s12940- 020-00654-2.	BACKGROUND: Perfluoroalkyl substances (PFAS) and polybrominated diphenyl ethers (PBDEs) are used in consumer products for their water repellent and flame retardant properties, respectively. However, there is widespread prenatal exposure and concern about their potential harm to the developing fetus. Here, we utilized data from a demographically diverse cohort of women in San Francisco, CA to examine associations between prenatal exposure to PFAS and PBDEs with gestational age and birth weight for gestational age z-scores. METHODS: Women included in this analysis were enrolled in the Chemicals in our Bodies (CIOB) cohort study (N = 506). PFAS and PBDEs were measured in serum obtained during the second trimester of pregnancy. Linear regression models were used to calculate crude and adjusted β coefficients for the association between PFAS and PBDE concentrations in tertiles and gestational age and birth weight z-scores. Individual PFAS and PBDE concentrations, as well as their sums, were examined in separate models. RESULTS: The highest compared to lowest tertile of BDE-47 was associated with shorter gestational age (β = - 0.49, 95% confidence interval [CI] = - 0.95, - 0.02). Additionally, exposure to BDE-47 and BDE-99 in the middle tertile was also associated with a reduction in birth weight z-scores (β = - 0.26, 95% CI = - 0.48, - 0.04; β = - 0.25, 95% CI = -0.47, - 0.04, respectively) compared to those in the lowest tertile of exposure. No consistent associations were observed between increasing PFAS concentrations and gestational age or birth weight z-scores. DISCUSSION: Among a diverse group of pregnant women in the San Francisco Bay Area, we found non-linear associations between prenatal exposure to PBDEs during the second trimester of pregnancy and birth weight z-scores. However, most PFAS congeners were not associated with adverse birth outcomes. PFAS and PBDE concentrations were lower in our cohort relative to other studies. Future research should assess the effects of emerging and persistent PF			В

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D739	ヒト (生 殖発生毒 性)	Perng, Wei; Nakiwala, Dorothy; Goodrich, Jaclyn M	What Happens In Utero Does Not Stay In Utero: a Review of Evidence for Prenatal Epigenetic Programming by Per- and Polyfluoroalkyl Substances (PFAS) in Infants, Children, and Adolescents	2022	Curr Environ Health Rep. 2022 Nov 22. doi: 10.1007/s40572- 022-00387-z. Online ahead of print.	PURPOSE OF REVIEW: Review human literature on the relationship between prenatal exposure to per- and polyfluoroalkyl substances (PFAS) and epigenetic modifications in infants, children, and adolescents < 18 years of age. RECENT FINDINGS: Eleven studies were identified, with study populations located in the U.S., Taiwan, Japan, and the Kingdom of Denmark. Many studies (n = 5) were cross-sectional, with PFAS exposure and epigenetic outcomes measured in the same tissue collected at delivery via cord blood or dried newborn blood spots. The other six studies were prospective, with prenatal PFAS measured on maternal blood during pregnancy and DNA methylation (DNAm) assessed in cord blood and childhood peripheral leukocytes (n = 1 study). Epigenetic marks of interest included global DNAm measures (LINE-1, Alu, and an ELISA-based method), candidate genes (IFG2, H19, and MEST), and epigenome-wide DNA methylation via array-based methods (Infinium 450 K and EPIC). Two studies using array-based methods employed discovery and validation paradigms, in which a small subset of loci (n = 6 and n = 4) were replicated in the discovery population. One site (TNXB) was a hit in two independent studies. Collectively, loci associated with PFAS were in regions involved in growth and development, lipid metabolism, and nutrient metabolism. There is moderate human evidence supporting associations of prenatal PFAS exposure on DNAm at birth, with one study suggesting sustained effects into childhood. Future studies are warranted to link PFAS-associated DNAm to health outcomes, as well as to investigate the role of other epigenetic marks such as hydroxymethylation, miRNA expression, and histone modifications.			В
D740	ヒト(生 殖発生毒 性)	Liao, Qian; Tang, Peng; Pan, Dongxiang; Song, Yanye; Lei, Lei; Liang, Jun; Liu, Bihu; Lin, Mengrui; Huang, Huishen; Mo, Meile; Huang, Chengtuo; Wei, Ming; Liu, Shun; Huang, Dongping; Qiu, Xiaoqiang	Association of serum per- and polyfluoroalkyl substances and gestational anemia during different trimesters in Zhuang ethnic pregnancy women of Guangxi, China	2022	Chemosphere. 2022 Dec;309(Pt 2):136798. doi: 10.1016/j.chemosphere.2022.136798. Epub 2022 Oct 8.	BACKGROUND: Gestational anemia is a complication of pregnancy, and a low level of hemoglobin (Hb) has been linked to adverse pregnancy outcomes. Previous studies reported that PFASs were more strongly associated with Hb than red blood cells, indicating that Hb is more susceptible to the effect of PFASs. However, the evidences regarding the effects of per- and polyfluoroalkyl substances (PFASs) on gestational anemia are currently limited. Therefore, it is important to explore the effects of PFASs on anemia in Chinese pregnant women. METHODS: A total of 821 pregnant women were recruited between June 2015 and April 2019 in the Guangxi Zhuang Birth Cohort. The concentrations of PFASs were assessed in maternal serum before 12 gestational weeks. To determine both individual and combined associations of PFASs exposure with anemia in the three stages of pregnancy, binary logistic regression, Bayesian kernel machine regression (BKMR), and weighted quantile sum (WQS) regression models were employed. RESULTS: In single-pollutant analysis, maternal exposure to perfluorododecanoic acid (PFDA) and perfluoroheptanoic acid (PFHpA) were associated with anemia in the first trimester, exposure to PFHpA and perfluorobutanesulfonic acid (PFBS) were associated with anemia in the second trimester. Notably, perfluoroundecanoic acid (PFDA) and perfluoronanoic acid (PFNA) were associated with anemia in the third trimester. Notably, perfluoroundecanoic acid (PFDA) and perfluoronanoic acid (PFNA) were associated with anemia in the third trimester. Notably, perfluoroundecanoic acid (PFDA) had a nonlinear association with anemia in the third trimester. In multiple-pollutant analysis, a positive association of PFDOA with anemia in the first trimester and a negative association of PFBS with anemia in the second trimester were confirmed by BKMR. Exposure to PFASs mixture was not associated with anemia in all three trimesters. In WQS, there was a significantly negative association between the PFAS mixture and anemia in the second trimester. CON			В
D741	ヒト(生 殖発生毒 性)	Aceti, Arianna; Barbarossa, Andrea; Gazzotti, Teresa; Zironi, Elisa; Pagliuca, Giampiero; Vitali, Francesca; Beghetti, Isadora; Corvaglia, Luigi	Exposure to perfluoroalkyl substances through human milk in preterm infants	2021	Eur J Pediatr. 2021 Sep;180(9):3047-3051. doi: 10.1007/s00431-021-04073-4. Epub 2021 Apr 10.	Perfluoroalkyl substances (PFASs) are environmental contaminants that have been shown to exert toxic effects, which are dependent upon concentration, in animals and humans. No specific data on the exposure of preterm infants to PFASs are available. We aimed to quantify the potential exposure of preterm infants to PFASs through human milk (HM), to be compared to the exposure data recently reported for infants by EFSA. The amount of PFASs in ten preterm (PHM) and ten donor HM (DHM) samples was evaluated, and the expected daily intake (EDI) at full enteral feeding was calculated. This EDI was compared to the mean and the 95(th) centile dietary exposure ranges at the lower bound for infants issued by EFSA. The calculated median EDI for total PFASs was 20.72 ng/kg/day (range 10.72-107.84) for PHM and 17.92 ng/kg/day (range 6.4-28.96) for DHM, which were both higher than mean exposure ranges reported for infants (2.4-12.2 ng/kg/day). The calculated EDI for DHM was far more similar to the 95(th) centile (4.5-27.9 ng/kg/day) dietary exposure ranges. For PHM samples, higher EDI values were obtained, with 4 out of 10 samples exceeding the upper limit of the 95(th) centile range.Conclusion: The exposure of preterm infants to PFASs through HM feeding might exceed reference values reported for older and healthier infants. Given the immunological and developmental vulnerability of preterm infants, the risks related to their exposure to PFASs should be further investigated, also focusing on how maternal exposure and subsequent transfer through HM feeding can be reduced. What is Known: • Perfluoroalkyl substances (PFASs) are environmental contaminants that have been shown to exert toxic effects, which are dependent upon concentration, in animals and humans. The EFSA has recently issued reference values for PFASs exposure for different age groups. • Infants might be exposed to PFASs through HM feeding might exceed reference values reported for older and healthier infants. • Given the immunological and developmental vulnerabilit			В

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D742	ヒト(内 分泌系)	Zhang, Shanyu; Lei, Xiaoning; Zhang, Yan; Shi, Rong; Zhang, Qianlong; Gao, Yu; Yuan, Tao; Li, Jiong; Tian, Ying	Prenatal exposure to per- and polyfluoroalkyl substances and childhood adiposity at 7 years of age	2022	Chemosphere. 2022 Nov;307(Pt 4):136077. doi: 10.1016/j.chemosphere.2022.136077. Epub 2022 Aug 21.	BACKGROUND: An increasing number of studies have reported that prenatal per- and polyfluoroalkyl substances (PFAS) exposure may increase childhood adiposity. However, limited data is available in China, and the overall effects of PFAS mixture remain unclear. OBJECTIVE: To examine the association of prenatal exposure to individual PFAS and their mixture with childhood adiposity at 7 years of age. METHODS: A total of 206 mother-infant pairs were recruited from the Laizhou Wan (Bay) Birth Cohort in China between 2010 and 2013. Ten PFAS were measured in maternal serum. The measurements of fat mass, body fat percentage, body mass index, waist circumference, waist-to-height ratio and overweight/obesity were used to assess adiposity in children aged 7. We fitted logistic regression, linear regression and weighted quantile sum (WQS) regression models to estimate the association of prenatal exposure to individual PFAS and their mixture with childhood adiposity. RESULTS: We found negative associations of perfluoroheptanoic acid (PFHpA) and perfluorooctane sulfonamide (PFOSA) exposure with adiposity measurements. Each quartile increase of the PFAS mixture was associated with a 1.14 kg decrease (95% CI: -2.27, -0.02) in fat mass and a 2.32% decrease (95% CI: -4.51, -0.14) in body fat. Moreover, significant sex differences were found. PFAS mixture was negatively associated with five adiposity measurements in boys, but positively associated with all adiposity measurements except body fat percentage in girls. PFOSA, PFHpA and perfluorobutanesulfonate (PFBS) with weights >0.300 were the main contributors to the overall effects observed among all children, boys and girls, respectively. CONCLUSION: This study suggests potential sex-specific associations of prenatal exposure to individual PFAS and their mixture with childhood adiposity, with the observed relationship being negative for boys but positive for girls.		1 A
D743	ヒト(生 殖発生毒 性)	Huang, Yun; Nian, Min; Yu, Guoqi; Tian, Ying; Zhang, Jingsong; Jiang, Fan; Zhang, Jun	Environmental exposure to per- and polyfluoroalkyl substances and sleep disturbance in pregnant women: A prospective cohort study	2022	, Sci Total Environ. 2022 Oct 10;842:156869. doi: 10.1016/j.scitotenv.2022.156869. Epub 2022 Jun 22.	Previous studies on the association between exposure to per- and polyfluoroalkyl substances (PFAS) and sleep patterns in pregnant women are limited. This cohort study aims to assess the associations between PFAS and sleep quality in pregnant women. Of the 4127 women who participated in the Shanghai Birth Cohort, 3174, 3070, and 2887 women in their first, second, and third trimesters of gestation, respectively, were included in our analysis. Sleep measures were taken using the Pittsburgh Sleep Quality Index questionnaire. Ten PFAS were measured in blood samples collected in early pregnancy. We first evaluate the associations between individual PFAS and sleep quality in the three trimesters. Weighted quantile sum (WQS) regression models were performed to test the overall effect of the PFAS mixture on sleep quality during the three trimesters. Longitudinal analyses throughout pregnancy were performed with generalized estimating equation models. Furthermore, the effect of the PFAS mixture on longitudinal sleep patterns was examined using longitudinal latent class analyses combined with WQS models. The single pollutant analysis suggested that most PFAS were associated with increased sleep disturbance risk, lower sleep efficiency, and shorter sleep duration in the three trimesters. Similarly, the WQS models revealed a significant association between the PFAS mixtures and elevated sleep disturbance risk in pregnant women, with perfluorobutane sulfonate acting as the predominant risk factor. Additionally, the longitudinal analysis confirmed the effects of PFAS exposure on increased sleep disturbance over time. The PFAS mixture was positively associated with higher risks of poor sleep quality and sleep medicine use [adjusted odds ratio (aOR) = 1.10; 95 % confidence interval (95%CI): 1.01, 1.20; and aOR = 1.25 (95%CI: 1.04, 1.50) respectively] throughout the three trimesters. Our study suggests that PFAS may increase the risk of sleep disturbance in pregnant women. Further studies are needed to confirm our results and el		В

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No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン文 ン文 ク献 ① ラ ② ラ
D744	ヒト (肝 毒性)	Stratakis, Nikos; V Conti, David; Jin, Ran; Margetaki, Katerina; Valvi, Damaskini; Siskos, Alexandros P; Maitre, Léa; Garcia, Erika; Varo, Nerea; Zhao, Yinqi; Roumeliotaki, Theano; Vafeiadi, Marina; Urquiza, Jose; Fernández-Barré s, Silvia; Heude, Barbara; Basagana, Xavier; Casas, Maribel; Fossati,	Prenatal Exposure to Perfluoroalkyl Substances Associated With Increased Susceptibility to Liver Injury in Children	2020	Hepatology. 2020 Nov;72(5):1758-1770. doi: 10.1002/hep.31483. Epub 2020 Oct 19.	BACKGROUND AND AIMS: Per- and polyfluoroalkyl substances (PFAS) are widespread and persistent pollutants that have been shown to have hepatotoxic effects in animal models. However, human evidence is scarce. We evaluated how prenatal exposure to PFAS associates with established serum biomarkers of liver injury and alterations in serum metabolome in children. APPROACH AND RESULTS: We used data from 1,105 mothers and their children (median age, 8.2 years; interquartile range, 6.6-9.1) from the European Human Early-Life Exposome cohort (consisting of six existing population-based birth cohorts in France, Greece, Lithuania, Norway, Spain, and the United Kingdom). We measured concentrations of perfluorooctane sulfonate, perfluorooctanoate, perfluorononanoate, perfluorohexane sulfonate, and perfluoroundecanoate in maternal blood. We assessed concentrations of alanine aminotransferase, aspartate aminotransferase, and gamma-glutamyltransferase in child serum. Using Bayesian kernel machine regression, we found that higher exposure to PFAS during pregnancy was associated with higher liver enzyme levels in children. We also measured child serum metabolomics through a targeted assay and found significant perturbations in amino acid and glycerophospholipid metabolism associated with prenatal PFAS. A latent variable analysis identified a profile of children at high risk of liver injury (odds ratio, 1.56; 95% confidence interval, 1.21-1.92) that was characterized by high prenatal exposure to PFAS and increased serum levels of branched-chain amino acids (valine, leucine, and isoleucine), aromatic amino acids (tryptophan and phenylalanine), and glycerophospholipids (phosphatidylcholine [PC] aa C36:1 and Lyso-PC a C18:1). CONCLUSIONS: Developmental exposure to PFAS can contribute to pediatric liver injury.		1	A
D745	ヒト(内 分泌系)	ltoh, Sachiko; Yamazaki, Keiko; Suyama, Satoshi; Ikeda-Araki, Atsuko; Miyashita, Chihiro; Ait Bamai, Yu; Kobayashi, Sumitaka; Masuda, Hideyuki; Yamaguchi, Takeshi; Goudarzi, Houman; Okada, Emiko; Kashino, Ikuko; Saito, Takuya; Kishi, Reiko	The association between prenatal perfluoroalkyl substance exposure and symptoms of attention- deficit/hyperactivity disorder in 8-year-old children and the mediating role of thyroid hormones in the Hokkaido study	2022	Environ Int. 2022 Jan 15;159:107026. doi: 10.1016/j.envint.2021.107026. Epub 2021 Dec 7.	BACKGROUND: Disruption of thyroid hormone (TH) levels during pregnancy contributes to attention deficit hyperactivity disorder (ADHD). Exposure to perfluoroalkyl substances (PFAS) during gestation may affect levels of maternal and neonatal TH; however, little is known about the effect of PFAS on ADHD mediated by TH. OBJECTIVES: We investigated the impact of maternal PFAS exposure on children's ADHD symptoms with the mediating effect of TH. METHODS: In a prospective birth cohort (the Hokkaido study), we included 770 mother-child pairs recruited between 2002 and 2005 for whom both prenatal maternal and cord blood samples were available. Eleven PFAS were measured in maternal serum obtained at 28-32 weeks of gestation using ultra-performance liquid chromatography coupled with triple quadrupole tandem mass spectrometry. TH and thyroid antibody, including thyroid-stimulating hormone (TSH), free triiodothyronine (FT3), free thyroxine (FT4), thyroid peroxidase antibody (TPOAb), and thyroglobulin antibody (TgAb) were measured in maternal blood during early pregnancy (median 11 gestational weeks) and in cord blood at birth. ADHD symptoms in the children at 8 years of age were rated by their parents using the ADHD-Rating Scale (ADHD-RS). The cut-off value was set at the 80th percentile for each sex. RESULTS: Significant inverse associations were found between some PFAS in maternal FT4 mediated 17.6% of the estimated effect of perfluoroundecanoic acid exposure on hyperactivity-impulsivity among first-born children. DISCUSSION: Higher PFAS levels in maternal serum during pregnancy were associated with lower risks of ADHD symptoms at 8 years of age. The association was stronger among first-born children in relation to hyperactivity-impulsivity than with regard to inattention. There was little mediating role of TH during pregnancy in the association between maternal exposure to PFAS and reduced ADHD symptoms at 8 years of age.		1	A

No.	分野 (参考)	著者	タイトル	発行年 書誌情報	要旨 (原文)	備考	出 情 対 報 象 抽	ン 文 ン 文 ク 献 ク 献 ① ラ ② ラ
D746	ヒト(生 殖発生毒 性)	Zhuang, Liheng H; Chen, Aimin; Braun, Joseph M; Lanphear, Bruce P; Hu, Janice M Y; Yolton, Kimberly; McCandless, Lawrence C	Effects of gestational exposures to chemical mixtures on birth weight using Bayesian factor analysis in the Health Outcome and Measures of Environment (HOME) Study	2021 2021 Environ Epidemiol. 2021 Jun 8;5(3):e159. doi: 10.1097/EE9.0000000000000159. eCollection 2021 Jun.	Studying the effects of gestational exposures to chemical mixtures on infant birth weight is inconclusive due to several challenges. One of the challenges is which statistical methods to rely on. Bayesian factor analysis (BFA), which has not been utilized for chemical mixtures, has advantages in variance reduction and model interpretation. METHODS: We analyzed data from a cohort of 384 pregnant women and their newborns using urinary biomarkers of phthalates, phenols, and organophosphate pesticides (OPs) and serum biomarkers of polychlorinated biphenyls (PCBs), polybrominated diphenyl ethers (PBDEs), perfluoroalkyl substances (PFAS), and organochlorine pesticides (OCPs). We examined the association between exposure to chemical mixtures and birth weight using BFA and compared with multiple linear regression (MLR) and Bayesian kernel regression models (BKMR). RESULTS: For BFA, a 10-fold increase in the concentrations of PCB and PFAS mixtures was associated with an 81 g (95% confidence intervals [CI] = -132 to -31 g) and 57 g (95% CI = -105 to -10 g) reduction in birth weight, respectively. BKMR results confirmed the direction of effect. However, the 95% credible intervals all contained the null. For single-pollutant MLR, a 10-fold increases in the concentrations of multiple chemicals were associated with reduced birth weight, yet the 95% CI all contained the null. Variance inflation from MLR was apparent for models that adjusted for copollutants, resulting in less precise confidence intervals. CONCLUSION: We demonstrated the merits of BFA on mixture analysis in terms of precision and interpretation compared with MLR and BKMR. We also identified the association between exposure to PCBs and PFAS and lower birth weight.			В
D747	ヒト (生 殖発生毒 性)	Zhang, Yan; Pan, Chengyu; Ren, Yunjie; Wang, Zixia; Luo, Jiajun; Ding, Guodong; Vinturache, Angela; Wang, Xiaojin; Shi, Rong; Ouyang, Fengxiu; Zhang, Jun; Li, Jiong; Gao, Yu; Tian, Ying	Association of maternal exposure to perfluoroalkyl and polyfluroalkyl substances with infant growth from birth to 12 months: A prospective cohort study	2022 Sci Total Environ. 2022 Feb 1;806(Pt 3):151303. doi: 10.1016/j.scitotenv.2021.151303. Epub 2021 Oct 29.	BACKGROUND: Although maternal perfluoroalkyl and polyfluroalkyl substances (PFASs) were associated with adverse birth outcomes, much less is known about their impact on infant growth during early infancy. OBJECTIVES: We investigated the association between maternal PFASs exposure and infant growth during the first 12 months of life. METHODS: Participating 2395 pregnancies were recruited from Shanghai Birth Cohort between 2013 and 2016. Ten PFASs were quantified from maternal plasma collected during early pregnancy (median, 15 gestational weeks). We measured infant length, weight, and head circumference at birth, 42 days, 6 months, and 12 months. Linear mixed regression model was used to estimate the associations between PFAS concentrations and repeated measurements of infant growth. Effect modification by infant sex was estimated. RESULTS: Elevated perfluoroheptanoic acid (PFHpA) concentration was negatively associated with infant length-for-age Z score (LAZ) (β = -0.06, 95% confidence interval (CI): -0.11, -0.01) during the first year. Adverse associations were also observed for perfluorobutane sulfonate (PFBS) and weight-for-length Z score (WFL) (β = -0.02, 95% CI: -0.04, -0.00) and BMI-for-age Z score (BAZ) (β = -0.02, 95% CI: -0.04, -0.00). However, perfluorododecanoic acid (PFDoA) was positively associated with WFL (β = 0.03, 95% CI: 0.00, 0.06) and BAZ (β = 0.03, 95% CI: 0.00, 0.06). The adverse association of PFHpA and LAZ was more pronounced among males (β = -0.06; 95% CI: -0.11, -0.00) than females (β = 0.06; 95% CI: 0.01, 0.12). CONCLUSIONS: In our study, negative associations were found for maternal PFHpA exposure and infant LAZ, PFBS and WFL and BAZ. Meanwhile, maternal PFDoA exposure was positively related with WFL and BAZ. The adverse association of maternal PFHpA exposure and infant LAZ was more pronounced among males. The results should be interpreted with caution, further prospective cohort studies with longitudinal and detailed measures are warranted to confirm these findings.			В
D748	ヒト(生 殖発生毒 性)	Luo, Jiajun; Xiao, Jingyuan; Gao, Yu; Ramlau- Hansen, Cecilia Høst; Toft, Gunnar; Li, Jiong; Obel, Carsten; Andersen, Stine Linding; Deziel, Nicole C; Tseng, Wan-Ling; Inoue, Kosuke; Bonefeld-Jø rgensen, Eva Cecilie; Olsen, Jø rn; Liew, Zeyan	Prenatal exposure to perfluoroalkyl substances and behavioral difficulties in childhood at 7 and 11 years	2020 Environ Res. 2020 Dec;191:110111. doi: 10.1016/j.envres.2020.110111. Epub 2020 Aug 23.	BACKGROUND: Perfluoroalkyl substances (PFAS) are suggested to interfere with thyroid hormone during pregnancy and influence fetal neurodevelopment. Epidemiological evidence regarding behavioral difficulties in childhood associated with prenatal PFAS exposure has been inconclusive. OBJECTIVE: We evaluated the association between prenatal PFAS exposure and behavioral difficulties at 7 and 11 years, and investigated the potential mediating role of maternal thyroid hormones. METHODS: Using pooled samples in the Danish National Birth Cohort established between 1996 and 2002, we estimated the associations between concentrations of six types of PFAS in maternal plasma (median, 8 gestational weeks) and child behavioral assessments from the Strength and Difficulties Questionnaire (SDQ), reported by parents at 7 years (n = 2421), and by parents (n = 2070) and children at 11 years (n = 2071). Behavioral difficulties were defined as having a composite SDQ score above the 90th percentile for total difficulties and externalizing or internalizing behaviors. We used logistic regression to estimate the adjusted Odds Ratio (OR) by doubling increase of prenatal PFAS (ng/ml). The possible mediating effect of maternal thyroid function classified based on thyroid stimulating hormone (TSH) and free thyroxine (fT4) levels were evaluated. RESULTS: Prenatal perfluoronanoic acid (PFNA) was consistently associated with total and externalizing behavioral difficulties in all three SDQ measures reported by parents (OR = 1.40, 95% CI: 1.14-1.73 for age 7; OR = 1.27, 95% CI: 1.05-1.53 for age 11) or children (OR = 1.32, 95% CI: 1.11-1.58) while no consistent associations were observed for other types of PFAS. A small magnitude of natural indirect effects via maternal thyroid dysfunction (ORs ranged from 1.01 to 1.03) of several PFAS were observed for parent-reported total and externalizing behaviors at 7 years only. DISCUSSION: Prenatal PFNA exposure was associated with externalizing behavioral difficulties in childhood in repeated SDQ measure			в

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 村 報 抽	ン 文 ク 献 ① ラ ② ラ
D749	ヒト (生 殖発生毒 性)	Tian, Youping; Miao, Maohua; Ji, Honglei; Zhang, Xiaotian; Chen, Aimin; Wang, Ziliang; Yuan, Wei; Liang, Hong	Prenatal exposure to perfluoroalkyl substances and cord plasma lipid concentrations	2021	Environ Pollut. 2021 Jan 1;268(Pt A):115426. doi: 10.1016/j.envpol.2020.115426. Epub 2020 Aug 21.	The effect of prenatal exposure to perfluoroalkyl substances (PFAS) on lipid concentrations in newborns is unknown. Using data from the Shanghai-Minhang Birth Cohort Study, we prospectively assessed the health effects of prenatal exposure to individual and multiple PFAS on cord lipid concentrations. Maternal plasma samples collected at 12-16 weeks of gestation were analyzed for eleven PFAS, and cord blood samples were analyzed for lipids: total cholesterol (TC), triglycerides (TG), high-density lipoprotein cholesterol (LDL-C). We used multiple linear regression models to evaluate the associations of each individual PFAS with each lipid parameter, and used Bayesian Kernel Machine Regression (BKMR) models to assess the overall and single-exposure effects of eight PFAS with the detection rate above 80% on cord lipid concentrations. In multiple linear regression models, for each unit increase in In-transformed maternal concentrations of perfluorononanoic acid (PFNA), perfluorodecanoic acid (PFDA), perfluoroundecanoic acid (PFUAA), and perfluorotridecanoic acid (PFTrDA), In-transformed TC concentration decreased by 0.15 mg/dL (95% CI: -0.09, -0.01), respectively, and In-transformed HDL-C concentration decreased by 0.17 mg/dL (95% CI: -0.29, -0.05), 0.12 mg/dL (95% CI: -0.20, -0.03), and 0.06 mg/dL (95% CI: -0.11, -0.00), respectively. Statistically significant inverse associations were also observed between In-transformed concentrations of PFDA, PFUdA, or PFTrDA and In-transformed concentrations of TG and LDL-C. In BKMR models, the mixture of eight PFAS showed suggestively inverse association with all In-transformed lipid concentrations, such that In-transformed TC concentration of exposure to the 75th percentile of the mixture was 0.11 units (95% credible interval, -0.21, -0.01) lower than the 25th percentile exposure. Our findings indicated that prenatal exposure to PFAS may disrupt lipid metabolism in newborns.			в
D750	ヒト (生 殖発生毒 性)	Eick, Stephanie M; Barr, Dana Boyd; Brennan, Patricia A; Taibl, Kaitlin R; Tan, Youran; Robinson, Morgan; Kannan, Kurunthachalam; Panuwet, Parinya; Yakimavets, Volha; Ryan, P Barry; Liang, Donghai; Dunlop, Anne L	Per- and polyfluoroalkyl substances and psychosocial stressors have a joint effect on adverse pregnancy outcomes in the Atlanta African American Maternal- Child cohort	2022	Sci Total Environ. 2022 Oct 14;857(Pt 2):159450. doi: 10.1016/j.scitotenv.2022.159450. Online ahead of print.	BACKGROUND: African Americans (AAs) experience high rates of adverse pregnancy outcomes relative to Whites. Differential in utero exposure to environmental chemicals and psychosocial stressors may explain some of the observed health disparities, as exposures to per- and polyfluoroalkyl substances (PFAS) and experiences of discrimination have been linked to adverse birth outcomes. Few studies have examined chemicals and non-chemical stressors together as an exposure mixture, which may better reflect real-life exposure patterns. Here, we adapted methods designed for the analysis of exposure mixtures to examine joint effects of PFAS and psychosocial stress on birth outcomes among AAs. METHODS: 348 participants from the Atlanta African American Maternal-Child cohort were included in this study. Four PFAS were measured in first trimester serum samples. Self-report questionnaires were administered during the first trimester and were used to assess psychosocial stress (perceived stress, depression, anxiety, gendered racial stress). Quantile g-computation and Bayesian kernel machine regression (BKMR) were used to estimate the joint effects between PFAS and psychosocial stressors on gestational age at delivery and birthweight for gestational age z-scores. All models were adjusted for maternal education, maternal age, parity, and any alcohol, tobacco and marijuana use. RESULTS: Our analytic sample included a socioeconomically diverse group of pregnant women, with 79 % receiving public health insurance. In quantile g-computation models, a simultaneous one-quartile increase in all PFAS, perceived stress, depression, anxiety, and gendered racial stress was associated with a reduction in birthweight z-scores (mean %change per quartile increase = -0.24, 95 % confidence interval = -0.43, -0.06). BKMR similarly showed that increasing all exposures in the mixture was associated with a modest decrease in birthweight z-scores, but not a reduced length of gestation. DISCUSSION: Using methods designed for analyzing exposure mixtures			в
D751	ヒト(生 殖発生毒 性)	Marks, Kristin J; Howards, Penelope P; Smarr, Melissa M; Flanders, W Dana; Northstone, Kate; Daniel, Johnni H; Sjödin, Andreas; Calafat, Antonia M; Hartman, Terryl J	Prenatal exposure to mixtures of persistent endocrine disrupting chemicals and postnatal body size in British girls	2021	Early Hum Dev. 2021 Oct;161:105450. doi: 10.1016/j.earlhumdev.2021.105450. Epub 2021 Aug 14.	BACKGROUND: Endocrine disrupting chemical (EDC) exposure is ubiquitous. EDC exposure during critical windows of development may interfere with the body's endocrine system, affecting growth. Previous human studies have examined one EDC at a time in relation to infant growth. By studying mixtures, the human experience can be better approximated. AIMS: We investigated the association of prenatal exposure to persistent EDCs (per- and polyfluoroalkyl substances (PFAS), polychlorinated biphenyls (PCBs), and organochlorine pesticides (OCPs)) as mixtures with postnatal body size among female offspring. SUBJECTS: We used a sub-sample of the Avon Longitudinal Study of Parents and Children (N = 425), based in the United Kingdom. STUDY DESIGN: We quantified 52 EDCs in maternal serum collected during pregnancy. We used Bayesian kernel machine regression with a random intercept to examine the association of prenatal concentrations of EDC mixtures with longitudinal postnatal body size measures for each EDC class separately (PFAS, PCBs, and OCPs) and for all three classes combined. OUTCOME MEASURES: Weight and height measures at 0, 2, 9, and 19 months were obtained by health professionals as part of routine child health surveillance. RESULTS: The mixture representing all three classes combined (31 chemicals) (n = 301) was inversely associated with postnatal body size. Holding all EDCs in the 31-chemical mixture at the 75th percentile compared to the 50th percentile was associated with 0.15 lower weight-for-age z-score (95% credible interval -0.26, -0.03). Weak inverse associations were also seen for height-for-age and body mass index-for-age scores. CONCLUSIONS: These results suggest that prenatal exposure to mixtures of persistent EDCs may affect postnatal body size.			В

分野 タイトル 発行年 書誌情報 要旨(原文) No 著者 (参考) BACKGROUND: Toxicology studies have identified pregnancy as a window of susceptibility (EDCs) and cardiometabolic indices in women. No study in humans, however, has examined ndices during pregnancy. METHODS: We used the Health Outcomes and Measures of the E whether bisphenol A (BPA), polybrominated diphenyl ethers (PBDEs), per- and polyfluoroalk Vuong, Ann M; are associated with blood pressure, glucose, and lipids in 388 pregnant women. We measur Braun, Joseph M weeks gestation, while BPA and phthalate metabolites were quantified in urine at 16 and 26 Sjödin, Andreas regression and Bayesian Kernel Machine Regression (BKMR) to estimate covariate-adjuste ヒト (生 Exposure to endocrine disrupting chemicals (EDCs) Calafat, Antonia Environ Int. 2021 Nov;156:106747. doi: their mixtures with cardiometabolic indices during pregnancy. RESULTS: A 10-fold increase D752 殖発生毒 2021 and cardiometabolic indices during pregnancy: The M: Yolton, 10.1016/j.envint.2021.106747. Epub 2021 Jul 19. mg/dL increase in glucose (95% Confidence Interval [CI] 2.9, 23.2) in linear regression. The HOME Study 性) Kimberly; as having a positive association with glucose. BDE-28, BDE-47, and BDE-99 were positively Lanphear, Bruce both single- and multi-pollutant models, whereas a suggestive negative association was not P; Chen, Aimin phthalate (MBP) (β = -7.9 mg/dL, 95% CI -12.9, -3.0) and monobenzyl phthalate (MBzP) (β were both associated with significant decreases in cholesterol in linear regression, but only contributor in the BKMR model. CONCLUSION: Overall, we observed positive associations b cholesterol levels during pregnancy, while negative associations were found between some No relationship was noted for BPA or PFAS with cardiometabolic indices during pregnancy a The composition of human breast milk is highly variable inter- and intra-individually. Enviror contribute to such compositional variation, however, their impact on breast milk compositior sought to (1) define the impact of maternal exposure to per- and polyfluoroalkyl substances Lamichhane breast milk, and (2) to study the combined impact of maternal PFAS exposure and breast mi the infants.In a mother-infant study (n = 44) we measured the levels of PFAS and lipids in m Santosh: Siljander, Heli; lipidomics analysis of breast milk collect 2-4 days after the delivery and at 3 months of infan ヒト (生 Duberg, Daniel; Exposure to per- and polyfluoroalkyl substances liquid chromatography combined with quadrupole-time-of-flight mass spectrometry. Gastroi Environ Int. 2021 Dec:157:106855. doi: D753 殖発生毒 Honkanen, Jarno; associates with an altered lipid composition of breast 2021 and human beta defensin 2 were measured in the stool samples at the age of 3, 6, 9, and 12 10.1016/j.envint.2021.106855. Epub 2021 Sep 6. 性) Virtanen, Suvi M; milk a validated food frequency questionnaire. PFAS levels were inversely associated with total Orešič, Matej; after the delivery. In the high exposure group, the ratio of acylated saturated and polyunsatu Knip, Mikael; Hy was increased. Moreover, high exposure to PFAS associated with the altered phospholipid c unfavorable increase in the size of milk fat globules. These changes in the milk lipid compos ötyläinen, Tuulia slower infant growth and with elevated intestinal inflammatory markers. Our data suggest th mpacts the nutritional quality of the breast milk, which, in turn, may have detrimental impact children later in life. Exposure to endocrine disrupting chemicals (EDCs) is ubiquitous. EDC exposure, especially like the prenatal window, may interfere with the body's endocrine system, which can affect Marks, Kristin J; such as puberty. Most studies have examined one EDC at a time in relation to disease; how Howards, EDCs. By studying mixtures, the human experience can be more closely replicated. We invest Penelope P; exposure to persistent EDCs (poly- and perfluoroalkyl substances (PFAS), polychlorinated b Smarr, Melissa pesticides (OCPs)) as mixtures with early menarche among female offspring in a nested cas M: Flanders, W ongitudinal Study of Parents and Children (ALSPAC) recruited in the United Kingdom in 19-Dana; Prenatal exposure to mixtures of persistent endocrine were quantified in maternal serum samples collected during pregnancy. Daughter's age at m ヒト (生 Northstone Environ Pollut. 2021 May 1;276:116705. doi: D754 disrupting chemicals and early menarche in a 2021 mailed questionnaires sent annually. We used repeated holdout weighted quantile sum (WQ 殖毒性) Kate; Daniel, 10.1016/j.envpol.2021.116705. Epub 2021 Feb 9. population-based cohort of British girls machine regression (BKMR) to examine the association between prenatal exposure to multi Johnni H; (n = 218) vs. ≥ 11.5 years (n = 230)) for each chemical class separately (PFAS, PCBs, and O Calafat, Antonia combined. Models adjusted for maternal age at menarche, maternal education, parity, pre-p M; Sjödin, age, prenatal smoking, and gestational week at sample collection. Mixture models showed r Andreas; exposure to EDC mixtures and early menarche. Using WQS regression, the odds ratio for ea Marcus, Michele in chemical concentrations for all three classes combined was 0.89 (95% CI: 0.76, 1.05); usir Hartman, Terryl exposures were at the 60th percentile compared to the median was 0.98 (95% CI: 0.91, 1.05) prenatal exposure to persistent EDC mixtures is not associated with early menarche

	備考	出	ン 文 ク 献 ① ラ	ン 文 ク 献 ② ラ
for endocrine disrupting chemicals EDC mixtures and cardiometabolic Invironment (HOME) Study to examine kyl substances (PFAS), and phthalates ed PBDEs and PFAS in serum at 16 weeks gestation. We used linear d associations of individual EDCs and in BDE-28 was associated with a 13.1 BKMR model also identified BDE-28 associated with total cholesterol in red with BDE-153. Mono-n-butyl B = -6.3 mg/dL, 95% CI -10.6, -2.0) MBzP was identified as an important etween PBDEs with glucose and phthalate biomarkers and cholesterol. across both models.			В	
mental factors are suspected to is currently poorly understood. We (PFAS) on lipid composition of human ilk lipid composition on the growth of naternal serum and conducted at age, by using ultra high performance intestinal biomarkers fecal calprotectin months. Maternal diet was studied by ipid levels in the breast milk collected arated fatty acids in triacylglycerols omposition, which was indicative of ition were further associated with nat the maternal exposure to PFAS et on the health and growth of the			В	
during critical periods of development growth and developmental outcomes ever, humans are exposed to many stigated the association of prenatal iphenyls (PCBs), and organochlorine se-control study within the Avon 91-1992. Concentrations of 52 EDCs menarche was ascertained through (S) regression and Bayesian kernel ple EDCs and early menarche (<11.5 CPs) and for all three classes regnancy body mass index, maternal null associations between prenatal rly menarche for a one-decile increase ng BKMR, the odds ratio when all 0. Results suggest the overall effect of		1	A	

別添-2 文献データベース文献リスト

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン文 ク献 ① ラ ② ラ
D755	ヒト(生 殖発生毒 性)	McGlinchey, Aidan; Sinioja, Tim; Lamichhane, Santosh; Sen, Partho; Bodin, Johanna; Siljander, Heli; Dickens, Alex M; Geng, Dawei; Carlsson, Cecilia; Duberg, Daniel; Ilonen, Jorma; Virtanen, Suvi M; Dirven, Hubert; Berntsen, Hanne Friis; Zimmer, Karin; Nygaard, Unni C; Orešič, Matej; Knip, Mikael; Hyötylä inen, Tuulia	Prenatal exposure to perfluoroalkyl substances modulates neonatal serum phospholipids, increasing risk of type 1 diabetes	2020	Environ Int. 2020 Oct;143:105935. doi: 10.1016/j.envint.2020.105935. Epub 2020 Jul 4.	In the last decade, increasing incidence of type 1 diabetes (T1D) stabilized in Finland, a phenomenon that coincides with tighter regulation of perfluoroalkyl substances (PFAS). Here, we quantified PFAS to examine their effects, during pregnancy, on lipid and immune-related markers of T1D risk in children. In a mother-infant cohort (264 dyads), high PFAS exposure during pregnancy associated with decreased cord serum phospholipids and progression to T1D-associated islet autoantibodies in the offspring. This PFAS-lipid association appears exacerbated by increased human leukocyte antigen-conferred risk of T1D in infants. Exposure to a single PFAS compound or a mixture of organic pollutants in non-obese diabetic mice resulted in a lipid profile characterized by a similar decrease in phospholipids, a marked increase of lithocholic acid, and accelerated insulitis. Our findings suggest that PFAS exposure during pregnancy contributes to risk and pathogenesis of T1D in offspring.			в
D756	ヒト(生 殖発生毒 性)	Hærvig, Katia Keglberg; Petersen, Kajsa Ugelvig; Hougaard, Karin Sørig; Lindh, Christian; Ramlau-Hansen, Cecilia Høst; Toft, Gunnar; Giwercman, Aleksander; Hø yer, Birgit Bjerre; Flachs, Esben Meulengracht; Bonde, Jens Peter; Tø ttenborg, Sandra Søgaard	Maternal Exposure to Per- and Polyfluoroalkyl Substances (PFAS) and Male Reproductive Function in Young Adulthood: Combined Exposure to Seven PFAS	2022	Environ Health Perspect. 2022 Oct;130(10):107001. doi: 10.1289/EHP10285. Epub 2022 Oct 5.	BACKGROUND: Concerns remain about the human reproductive toxicity of the widespread per- and polyfluoroalkyl substances (PFAS) during early stages of development. OBJECTIVES: We examined associations between maternal plasma PFAS levels during early pregnancy and male offspring reproductive function in adulthood. METHODS: The study included 864 young men (age range:18.9-21.2 y) from the Fetal Programming of Semen Quality (FEPOS) cohort established between 2017 and 2019. Plasma samples from their mothers, primarily from the first trimester, were retrieved from the Danish National Biobank and levels of 15 PFAS were measured. Seven PFAS had detectable levels above the limit of detection in > 80% of the samples and were included in analyses. Semen quality, testicular volume, and levels of reproductive hormones and PFAS were assessed in the young men. We used weighted quantile sum (WQS) regression to estimate the associations between combined exposure to maternal PFAS and reproductive function, and negative binomial regression to estimate the associations of single substances, while adjusting for a range of a priori-defined fetal and postnatal risk factors. RESULTS: By a 1-unit increase in the WQS index, combined maternal PFAS exposure was associated with lower sperm concentration (- 8%; 95% Cl: - 16%, - 1%), total sperm count (- 10%; 95% Cl: - 17%, - 2%), and a higher proportion of nonprogressive and immotile sperm (5%; 95% Cl: 1%, 8%) in the young men. Different PFAS contributed to the associations with varying strengths; however, perfluoroheptanoic acid was identified as the main contributor in the analyses of all three outcomes despite the low concentration. We saw no clear association between exposure to maternal PFAS and testicular volume or reproductive hormones. DISCUSSION: In a sample of young men from the general Danish population, we observed consistent inverse associations between exposure to maternal PFAS, into consideration.			В

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D757	ヒト (生 殖発生毒 性)	Gao, Yu; Luo, Jiajun; Zhang, Yan; Pan, Chengyu; Ren, Yunjie; Zhang, Jun; Tian, Ying	Prenatal Exposure to Per- and Polyfluoroalkyl Substances and Child Growth Trajectories in the First Two Years	2022	Environ Health Perspect. 2022 Mar;130(3):37006. doi: 10.1289/EHP9875. Epub 2022 Mar 14.	BACKGROUND: Pregnant women are ubiquitously exposed to per- and polyfluoroalkyl substances (PFAS). Prenatal exposure to PFAS has been associated with lower birth weight but also with excess adiposity and higher weight in childhood. These mixed findings warrant investigation of the relationship between PFAS and dynamic offspring growth. OBJECTIVES: To investigate the association between prenatal PFAS exposure and early-life growth trajectories during the first 2 y. METHODS: Pregnant women (n = 3,426) were recruited from 2013 to 2016 from the Shanghai Birth Cohort (SBC) Study, and their children were followed up from birth to 2 y of age. Seven PFAS congeners were quantified in pregnant women's serum during the first trimester. Our study population was restricted to 1,350 children who had five repeated measurements for at least one anthropometric measure. Four anthropometric measures, including weight, length/height, weight-for-length, and head circumference, were evaluated at birth, 42 d, 6 months, 12 months, and 24 months, and standardized into z-scores using the World Health Organization reference. Trajectories of each measure were classified into five groups using group-based trajectory modeling. Multinomial logistic regression was used to estimate odds ratio (OR) and 95% confidence interval (CI) for trajectory groups according to log2-transformed PFAS concentrations, and the moderate-stable group was selected as the reference group for all measures. RESULTS: Higher prenatal exposure to PFAS was associated with elevated odds for the low-rising weight-for-age z-score (UAZ) trajectory. Meanwhile, PFAS levels were associated with decreased odds for the low-rising and high-rising weight-for-length z-score (WLZ) trajectories. In addition, the associations of PFAS with growth trajectories of the high-stable, low-stable, and low-rising head-circumference-for-age z-score (HCZ) in relation to most individual PFAS congeners. PFAS mixtures analysis further confirmed the above findings. DISCUSSION: Trajectory analysis app		в
D758	ヒト (生 殖発生毒 性)	Rickard, Brittany P; Rizvi, Imran; Fenton, Suzanne E	Per- and poly-fluoroalkyl substances (PFAS) and female reproductive outcomes: PFAS elimination, endocrine-mediated effects, and disease	2022	Toxicology. 2022 Jan 15;465:153031. doi: 10.1016/j.tox.2021.153031. Epub 2021 Nov 10.	Per- and poly-fluoroalkyl substances (PFAS) are widespread environmental contaminants frequently detected in drinking water supplies worldwide that have been linked to a variety of adverse reproductive health outcomes in women. Compared to men, reproductive health effects in women are generally understudied while global trends in female reproduction rates are declining. Many factors may contribute to the observed decline in female reproduction, one of which is environmental contaminant exposure. PFAS have been used in home, food storage, personal care and industrial products for decades. Despite the phase-out of some legacy PFAS due to their environmental persistence and adverse health effects, alternative, short-chain and legacy PFAS mixtures will continue to pollute water and air and adversely influence women's health. Studies have shown that both long- and short-chain PFAS disrupt normal reproductive function in women through altering hormone secretion, menstrual cyclicity, and fertility. Here, we summarize the role of a variety of PFAS and PFAS mixtures in female reproductive tract dysfunction and disease. Since these chemicals may affect reproductive tissues directly or indirectly through endocrine disruption, the role of PFAS in breast, thyroid, and hypothalamic-pituitary-gonadal axis function are also discussed as the interplay between these tissues may be critical in understanding the long-term reproductive health effects of PFAS in women. A major research gap is the need for mechanism of action data - the targets for PFAS in the female reproductive and endocrine systems are not evident, but the effects are many. Given the global decline in female fecundity and the ability of PFAS to negatively impact female reproductive disorders of women.		В

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D759	ヒト(生 殖発生毒 性)	Luo, Jiajun; Ramlau-Hansen, Cecilia Høst; Kesmodel, Ulrik Schiøler; Xiao, Jingyuan; Vasiliou, Vasilis; Deziel, Nicole C; Zhang, Yawei; Olsen, Jørn; Liew, Zeyan	Prenatal Exposure to Per- and Polyfluoroalkyl Substances and Facial Features at 5 Years of Age: A Study from the Danish National Birth Cohort	2022	Environ Health Perspect. 2022 Jan;130(1):17006. doi: 10.1289/EHP9478. Epub 2022 Jan 26.	BACKGROUND: Per- and polyfluoroalkyl substances (PFAS) are widespread persistent pollutants. Evidence regarding neurodevelopmental effects of PFAS have been mixed. The relation between PFAS exposure and anatomical markers that have been suggested to correlate with fetal brain development have not been studied. OBJECTIVES: We investigated the association between prenatal PFAS exposures and three craniofacial features in children measured at 5 years of age. METHODS: Measures of palpebral fissure length (PFL), philtrum groove, and upper-lip thickness were generated from standardized digital facial photographs from 656 children in the Danish National Birth Cohort. PFL was classified into two groups (shorter; normal), and the philtrum (grooved; smooth; normal) and upper-lip (thick; thin; normal) measures into three groups each. Six PFAS were measured in maternal plasma (median = 8 gestational wk). Multinomial logistic regression was used to estimate the odds ratio (OR) and 95% confidence interval (Cl) for each facial feature using the normal group as the reference according to log2-PFAS concentration (in nanograms per milliliter) or PFAS tertiles, adjusting for potential confounders, including maternal alcohol intake and smoking. Stratified analyses by maternal alcohol intake or child's sex were performed. RESULTS: Prenatal exposure to each PFAS was associated with elevated odds for a shorter PFL, with the strongest association observed for perfluorodecanoic acid (PFDA; per doubling OR = 2.02; 95% Cl: 1.11, 3.70). Some nonlinear associations were found for philtrum measures: the second tertile of PFDA and perfluorononanoic acid were associated with grooved philtrum, whereas the second tertile of perfluoroheptane sulfonate with smooth philtrum. The associations between PFAS exposure and a shorter PFL were stronger among mothers who consumed alcohol in the first trimester, some sex-specific associations were noted for philtrum and upper-lip measures. DISCUSSION: Prenatal PFAS exposures might influence fetal craniofaci		В
D760	ヒト(生 殖発生毒 性)	Kalloo, Geetika; Wellenius, Gregory A; McCandless, Lawrence; Calafat, Antonia M; Sjodin, Andreas; Sullivan, Adam J; Romano, Megan E; Karagas, Margaret R; Chen, Aimin; Yolton, Kimberly; Lanphear, Bruce P; Braun, Joseph M	Chemical mixture exposures during pregnancy and cognitive abilities in school-aged children	2021	Environ Res. 2021 Jun;197:111027. doi: 10.1016/j.envres.2021.111027. Epub 2021 Mar 18.	INTRODUCTION: Gestational exposure to chemical mixtures, which is prevalent among pregnant women, may be associated with adverse childhood neurodevelopment. However, few studies have examined relations between gestational chemical mixture exposure and children's cognitive abilities. METHODS: In a cohort of 253 pregnant women and their children from Cincinnati, OH (enrolled 2003-2006), we quantified biomarker concentrations of 43 metals, phthalates, phenols, polybrominated diphenyl ethers, organophosphate and organochlorine pesticides, polychlorinated biphenyls, perfluoroalkyl substances, and environmental tobacco smoke in blood or urine. Using k-means clustering and principal component (PC) analysis, we characterized chemical mixtures among pregnant women. We assessed children's cognitive abilities using the Wechsler Preschool and Primary Scale of Intelligence-III and Wechsler Intelligence Scale for Children-IV at ages 5 and 8 years, respectively. We estimated covariate-adjusted differences in children's cognitive ability scores]=cross clusters, and with increasing PC scores and individual biomarker concentrations were generally highest, intermediate, and lowest among women in clusters 1, 2, and 3, respectively. Children born to women in clusters 1 and 2 had 5.1 (95% CI: 9.4,-0.8) and 2.0 (95% CI: 5.5, 1,4) lower performance IQ scores compared to children in cluster 3, respectively. PC scores and individual chemical biomarker concentrations were not associated with cognitive abilities. CONCLUSIONS: In this cohort, combined prenatal exposure to phenols, certain phthalates, pesticides, and perfluoroalkyl substances was inversely associated with children's cognition, but some individual chemical biomarker concentrations were not. Additional studies should determine if the aggregate impact of these chemicals on cognition is different from their individual effects.		В

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D761	ヒト (生 殖発生毒 性)	Eick, Stephanie M; Goin, Dana E; Cushing, Lara; DeMicco, Erin; Park, June-Soo; Wang, Yunzhu; Smith, Sabrina; Padula, Amy M; Woodruff, Tracey J; Morello- Frosch, Rachel	Mixture effects of prenatal exposure to per- and polyfluoroalkyl substances and polybrominated diphenyl ethers on maternal and newborn telomere length	2021	Environ Health. 2021 Jun 30;20(1):76. doi: 10.1186/s12940- 021-00765-4.	BACKGROUND: Per- and polyfluoroalkyl substances (PFAS) and polybrominated diphenyl ethers (PBDEs) are endocrine disrupting chemicals with widespread exposures across the U.S. given their abundance in consumer products. PFAS and PBDEs are associated with reproductive toxicity and adverse health outcomes, including certain cancers. PFAS and PBDEs may affect health through alternations in telomere length. In this study, we examined joint associations between prenatal exposure to PFAS, PBDEs, and maternal and newborn telomere length using mixture analyses, to characterize effects of cumulative environmental chemical exposures. METHODS: Study participants were enrolled in the Chemicals in Our Bodies (CIOB) study, a demographically diverse cohort of pregnant people and children in San Francisco, CA. Seven PFAS (ng/mL) and four PBDEs (ng/g lipid) were measured in second trimester maternal serum samples. Telomere length (T/S ratio) was measured in delivery cord blood of 292 newborns and 110 second trimester maternal whole blood samples. Quantile g-computation was used to assess the joint associations between groups of PFAS and PBDEs and newborn and maternal telomere length. Groups considered were: (1) all PFAS and PBDEs combined, (2) PFAS, and (3) PBDEs. Maternal and newborn telomere length were modeled as separate outcomes. RESULTS: T/S ratios in newborn cord and maternal whole blood were moderately correlated (Spearman ρ = 0.31). In mixtures analyses, a simultaneous one quartile increase in all PFAS and PBDEs was associated with a small increase in newborn (mean change per quartile increase = 0.03, 95% confidence interval [CI] = -0.03, 0.08) and maternal telomere length (mean change per quartile increase = 0.16, 95% CI = -0.03, 0.28). These associations were primarily driven by PFAS (mean change per quartile increase = 0.16, 95% CI = 0.03, 0.28). These associations were primarily driven by PFAS (mean change per quartile increase = 0.16, 95% CI = 0.03, 0.28). These associations were primarily driven by PFAS (mean c		В
D762	ヒト (代 謝)	González, Marlene Cervantes	Prenatal exposure to persistent organic pollutants as a risk factor of offspring metabolic syndrome development during childhood	2021	Rev Environ Health. 2021 Apr 15;37(1):61-70. doi: 10.1515/reveh-2020-0113. Print 2022 Mar 28.	Persistent Organic Pollutants (POPs) are exogenous, artificially made chemicals that can disrupt the biological system of individuals and animals. POPs encompass a variety of chemicals including, dioxins, organochlorines (OCs), polychlorinated biphenyl (PCBs), and perfluoroalkyl substances (PFASs) that contain a long half-life and highly resistant to biodegradation. These environmental pollutants accumulate over time in adipose tissues of living organisms and alter various insulin function-related genes. Childhood Metabolic Syndrome (MetS) consists of multiple cardiovascular risk factors, insulin function being one of them. Over the years, the incidence of the syndrome has increased dramatically. It is imperative to explore the role of persistent organic pollutants in the development of Childhood Metabolic Syndrome. Some epidemiological studies have reported an association between prenatal exposure to POPs and offspring MetS development throughout childhood. These findings have been replicated in animal studies in which these pollutants exercise negative health outcomes such as obesity and increased waist circumference. This review discusses the role of prenatal exposure to POPs among offspring who develop MetS in childhood, the latest research on the MetS concept, epidemiological and experimental findings on MetS, and the POPs modes of action. This literature review identified consistent research results on this topic. Even though the studies in this review had many strengths, one major weakness was the usage of different combinations of MetS criteria to measure the outcomes. These findings elucidate the urgent need to solidify the pediatric MetS definition. An accurate definition will permit scientists to measure the MetS as a health outcome properly and allow clinicians to diagnose pediatric MetS and provide individualized treatment appropriately.		A
D763	ヒト(生殖発生毒性)	Hallberg, Ida; Plassmann, Merle; Olovsson, Matts; Holte, Jan; Damdimopoulou, Pauliina; Sjunnesson, Ylva C B; Benskin, Jonathan P; Persson, Sara	Suspect and non-target screening of ovarian follicular fluid and serum - identification of anthropogenic chemicals and investigation of their association to fertility	2021	Environ Sci Process Impacts. 2021 Oct 20;23(10):1578-1588. doi: 10.1039/d1em00211b.	In this work, ultra-high performance liquid chromatography-high resolution (Orbitrap) mass spectrometry-based suspect and non- target screening was applied to follicular fluid (n = 161) and serum (n = 116) from women undergoing in vitro fertilization in order to identify substances that may be associated with decreased fertility. Detected features were prioritized for identification based on (i) hazard/exposure scores in a database of chemicals on the Swedish market and an in-house database on per- and polyfluoroalkyl substances (PFAS); (ii) enrichment in follicular fluid relative to serum; and (iii) association with treatment outcomes. Non-target screening detected 20 644 features in follicular fluid and 13 740 in serum. Two hundred and sixty-two features accumulated in follicular fluid (follicular fluid: serum ratio >20) and another 252 features were associated with embryo quality. Standards were used to confirm the identities of 21 compounds, including 11 PFAS. 6-Hydroxyindole was associated with lower embryo quality and 4-aminophenol was associated with higher embryo quality. Overall, we show the complexity of follicular fluid and the applicability of suspect and non-target screening for discovering both anthropogenic and endogenous substances, which may play a role in fertility in women.		В

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン文ン文 ク献 ① ラ ② ラ
D764	ヒト(生殖発生毒性)	Yu, Jichang; Zhou, Haibo; Cai, Jianwen	Accelerated failure time model for data from outcome- dependent sampling	2021	Lifetime Data Anal. 2021 Jan;27(1):15-37. doi: 10.1007/s10985-020-09508-y. Epub 2020 Oct 12.	Outcome-dependent sampling designs such as the case-control or case-cohort design are widely used in epidemiological studies for their outstanding cost-effectiveness. In this article, we propose and develop a smoothed weighted Gehan estimating equation approach for inference in an accelerated failure time model under a general failure time outcome-dependent sampling scheme. The proposed estimating equation is continuously differentiable and can be solved by the standard numerical methods. In addition to developing asymptotic properties of the proposed estimator, we also propose and investigate a new optimal power-based subsamples allocation criteria in the proposed design by maximizing the power function of a significant test. Simulation results show that the proposed estimator is more efficient than other existing competing estimators and the optimal power-based subsamples allocation will provide an ODS design that yield improved power for the test of exposure effect. We illustrate the proposed method with a data set from the Norwegian Mother and Child Cohort Study to evaluate the relationship between exposure to perfluoroalkyl substances and women's subfecundity.			В
D765	ヒト(生 殖発生毒 性)	Varsi, Kristin; Torsvik, Ingrid Kristin; Huber, Sandra; Averina, Maria; Brox, Jan; Bjørke-Monsen, Anne-Lise	Impaired gross motor development in infants with higher PFAS concentrations	2022	Environ Res. 2022 Mar;204(Pt D):112392. doi: 10.1016/j.envres.2021.112392. Epub 2021 Nov 17.	Industrial produced perfluoroalkyl substances (PFAS) are environmentally persistent and found in humans around the globe. PFAS is transferred from mother to child during pregnancy and lactation and PFAS concentrations are high in infants. PFAS exposure in early life has been linked to a range of negative health effects. In the present study we have investigated PFAS concentrations in mothers (pregnancy week 18, 28 and 36 and six weeks, four and six months postpartum, n = 114) and in infants at six months age (n = 94), and studied the effects of PFAS status on infant gross motor development by Alberta Infant Motor Scale (AIMS) at age six months. PFAS concentrations declined in the mothers during pregnancy and postpartum period, and the highest concentrations were seen in infants aged six months. Parity was a strong negative predictor and fish intake a strong positive predictor of maternal PFAS status, while maternal concentrations of PFAS in pregnancy week 18 and months of exclusive breastfeeding determined the PFAS concentrations in infants at six months. Infants who scored below the median on gross motor development had higher PFAS concentrations than infants with a better gross motor development. Ninety percent of the women reported having fish for dinner at least once a week, with fatty fish as the most popular choice (72%). A higher maternal fish intake in pregnancy week 18 was associated with a poorer gross motor development in the infants at six months. Infant gross motor development is a marker of later cognitive outcome and our findings indicate that higher PFAS concentrations in young infants and maternal fatty fish intake may impair neurodevelopment.			В
D766	ヒト (生 殖発生毒 性)	Naspolini, Nathalia F; Meyer, Armando; Moreira, Josino C; Sun, Haipeng; Froes-Asmus, Carmen I R; Dominguez- Bello, Maria G	Environmental pollutant exposure associated with altered early-life gut microbiome: Results from a birth cohort study	2022	Environ Res. 2022 Apr 1;205:112545. doi: 10.1016/j.envres.2021.112545. Epub 2021 Dec 8.	Emerging evidence shows that the gut microbiota interacts with environmental pollutants, but the effect of early exposure on the neonatal microbiome remains unknown. We investigated the association between maternal exposure to environmental pollutants and changes in early-life gut microbiome development. We surveyed 16S rRNA gene on meconium and fecal samples (at 1, 3, and 6 months) from the Brazilian birth cohort, and associated with levels of metals, perfluoroalkyl chemicals (PFAS), and pesticides in maternal and umbilical cord blood. The results indicate that the magnitude of the microbiome changes associated with increasing pollutant exposure was bigger in cesarean-section (CS) born and CS-born-preterm babies, in relation to vaginally (VG) delivered infants. Breastfeeding was associated with a stronger pollutant-associated effect on the infant feces, suggesting that the exposure source could be maternal milk. Differences in microbiome effects associated with maternal or cord blood pollutant concentrations suggest that fetal exposure time - intrauterine or perinatal - may matter. Finally, despite the high developmental microbiota variability, specific microbionts were consistently affected across all pollutants, with taxa clusters found in samples from infants exposed to the highest toxicant exposure. The results evidence that perinatal exposure to environmental pollutants is associated with alterations in gut microbiome development which may have health significance.			В
D767	ヒト(生 殖発生毒 性)	Liu, Xin; Zhang, Lei; Chen, Liangkai; Li, Jingguang; Wang, Jun; Zhao, Yunfeng; Liu, Liegang; Wu, Yongning	Identification and prioritization of the potent components for combined exposure of multiple persistent organic pollutants associated with gestational diabetes mellitus	2021	J Hazard Mater. 2021 May 5;409:124905. doi: 10.1016/j.jhazmat.2020.124905. Epub 2021 Jan 4.	Persistent organic pollutants (POPs) remain a major point of concern worldwide, and surveillance monitoring of these contaminants presents a significant challenge. Here, we conducted an assessment of combined exposure to multiple POPs components [10 perfluoroalkyl acids (PFAAs), seven polybrominated diphenyl ethers (PBDEs), six polychlorinated biphenyls (PCBs) and 29 dioxin-like compounds (DLCs)] in relation to gestational diabetes mellitus (GDM) risk, and determined the identification and prioritization of potent components in these POPs mixtures. The results indicated a significant mixture effect and the combined exposure index estimated from multiple POPs components was associated with GDM and glucose homeostasis (P < 0.001). Based on the mixture effects on GDM, the procedure of prioritization identified DLCs as the components of the greatest concern, although at the lowest body burden in the population compared with PBDEs, PFAAs, and PCBs. For glucose homeostasis, BDE-153 was the chemical of top-ranked priority of concern. The final effect-based prioritized list of POPs was DLCs > PBDEs >PFAAs > PCBs. This prioritization is important for developing a more cost-effective regulation framework focusing on the POPs components of the greatest concern to human health.			В

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨 (原文)	備考	出 情 対 報 象 抽	ン文 ン文 ク献 ① ラ ② ラ
D768	ヒト (肝 毒性)	Midya, Vishal; Colicino, Elena; Conti, David V; Berhane, Kiros; Garcia, Erika; Stratakis, Nikos; Andrusaityte, Sandra; Basagañ a, Xavier; Casas, Maribel; Fossati, Serena; Graž uleviciene, Regina; Haug, Line Småstuen; Heude, Barbara; Maitre, Léa; McEachan, Rosemary; Papadopoulou, Eleni; Roumeliotaki, Theano;	Association of Prenatal Exposure to Endocrine- Disrupting Chemicals With Liver Injury in Children	2022	JAMA Netw Open. 2022 Jul 1;5(7):e2220176. doi: 10.1001/jamanetworkopen.2022.20176.	IMPORTANCE: Prenatal exposures to endocrine-disrupting chemicals (EDCs) may increase the risk for liver injury in children; however, human evidence is scarce, and previous studies have not considered potential EDC-mixture effects. Furthermore, the association between prenatal EDC exposure and hepatocellular apoptosis in children has not been studied previously. OBJECTIVE: To investigate associations of prenatal exposure to EDC mixtures with liver injury risk and hepatocellular apoptosis in childhood. DESIGN, SETTING, AND PARTICIPANTS: This prospective cohort study used data collected from April 1, 2003, to February 26, 2016, from mother-child pairs from the Human Early-Life Exposome project, a collaborative network of 6 ongoing, population-based prospective birth cohort studies from 6 European countries (France, Greece, Lithuania, Norway, Spain, and the UK). Data were analyzed from April 1, 2021, to January 31, 2022. EXPOSURES: Three organochlorine pesticides, 5 polychlorinated biphenyls, 2 polybrominated diphenyl ethers (PBDEs), 3 phenols, 4 parabens, 10 phthalates, 4 organophosphate pesticides, 5 perfluoroalkyl substances, and 9 metals. MAIN OUTCOMES AND MEASURES: Child serum levels of alanine aminotransferase (ALT), aspartate aminotransferase (AST), <i>γ</i> -glutamyltransferase (GGT), and CK-18 were measured at 6 to 11 years of age. Risk for liver injury was defined as having ALT, AST, and/or GGT levels above the 90th percentile. Associations of liver injury or cytokeratin 18 (CK-18) levels with each chemical group among the 45 EDCs measured in maternal blood or urine samples collected in pregnancy were estimated using 2 complimentary exposure-mixture methods: bayesian weighted quantile sum (BWQS) and bayesian kernel machine regression. RESULTS: The study included 1108 mothers (mean [SD] age at birth, 31.0 [A,1] years) and their singleton children (mean [SD] age at liver assessment, 8.2 [1.6] years; 598 [54.0%] boys). Results of the BWQS method indicated increased odds of liver injury per exposure-mixture quarti		1	A
D769	ヒト(生 殖発生毒 性)	Hu, Janice M Y; Arbuckle, Tye E; Janssen, Patricia; Lanphear, Bruce P; Zhuang, Liheng H; Braun, Joseph M; Chen, Aimin; McCandless, Lawrence C	Prenatal exposure to endocrine disrupting chemical mixtures and infant birth weight: A Bayesian analysis using kernel machine regression	2021	Environ Res. 2021 Apr;195:110749. doi: 10.1016/j.envres.2021.110749. Epub 2021 Jan 17.	BACKGROUND: Pregnant women are regularly exposed to a multitude of endocrine disrupting chemicals (EDCs). EDC exposures, both individually and as mixtures, may affect fetal growth. The relationship of EDC mixtures with infant birth weight, however, remains poorly understood. We examined the relations between prenatal exposure to EDC mixtures and infant birth weight. METHODS: We used data from the Maternal-Infant Research on Environmental Chemicals (MIREC) Study, a pan-Canadian cohort of 1857 pregnant women enrolled between 2008 and 2011. We quantified twenty-one chemical concentrations from five EDC classes, including organochlorine compounds (OCs), metals, perfluoroalkyl substances (PFAS), phenols and phthalate metabolites that were detected in >70% of urine or blood samples collected during the first trimester. In our primary analysis, we used Bayesian kernel machine regression (BKMR) models to assess variable importance, explore EDC mixture effects, and identify any interactions among EDCs. Our secondary analysis used traditional linear regression to compare the results with those of BKMR and to quantify the changes in mean birth weight in relation to prenatal EDC exposures. RESULTS: We found evidence that mixtures of OCs and metals were associated with monotonic decreases in mean birth weight. Our linear regression analysis corroborated the BKMR results and found that a 2-fold increase in trans-nonachlor and Pb concentrations reduced mean birth weight by -38 g (95% confidence interval (CI): -67, -10) and -39 g (95% CI: -69, -9), respectively. A sex-specific association for OC mixture was observed among female infants. PFAS, phenols and phthalates were not associated with birth weight. No interactions were observed among the EDCs. CONCLUSIONS: Using BKMR, we observed that both OC and metal mixtures were associated with decreased birth weight in the MIREC Study. trans-Nonachlor from the OC mixture and Pb from the metal mixture contributed most to the adverse effects.			В

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D770	ヒト(生 殖発生毒 性)	Desalegn, Anteneh Assefa; Collet, Bérénice; Iszatt, Nina; Stigum, Hein; Jensen, Tina K; Jonker, Lydia; Besselink, Harrie; van der Burg, Bart; Eggesbø, Merete	Aryl hydrocarbon receptor activity in human breast milk and cryptorchidism: A case-control study within the prospective Norwegian HUMIS cohort	2022	Environ Res. 2022 Nov;214(Pt 1):113861. doi: 10.1016/j.envres.2022.113861. Epub 2022 Jul 9.	BACKGROUND: The etiology of cryptorchidism remains poorly understood. Endocrine disrupting chemicals can impact estrogen signaling by interacting with aryl hydrocarbon receptor (AhR) activity. OBJECTIVE: To evaluate whether AhR activity in breast milk samples is associated with cryptorchidism. METHOD: We conducted a case-control study based on 199 mother-child pairs (n = 91 cases/108 controls) selected from the Norwegian Human Milk Study (2002-2009). We defined cases for cryptorchidism based on maternal reports at 1-, 6-, 12-, and 24- months after birth. Chemically- and biologically stable AhR activity (pg 2,3,7,8-TCDD equivalent (TEQ)/g lipid) was determined by DR- CALUX® assay in the mothers' milk collected at a median of 33 (10th-90th percentile: 18-57) days after delivery. We used multivariate logistic regression to compare AhR activity levels between cases and controls, and linear regression separately, to establish the relationship with the presence of 27 potential EDCs measured in breast milk and AhR activity. RESULTS: The average estimated daily intake (EDI) of dioxin and (dioxin-like (dl)-compounds via breast milk is 33.7 \pm 17.9 pg TEQ/kg bodyweight per day among Norwegian children. There were no significant differences in AhR activiation in breast milk samples between cases with cryptorchidism and controls. Among the 27 chemicals measured in breast milk, AhR activity was (borderline) significantly associated with all dl-PCBs, three non-dioxin-like (ndl)-PCBs (PCB-74, PCB-180, PCB-194) and two organochlorine pesticides (OCPs; HCB, β -HCH). No associations between AhR activity and brominated flame retardants (PBDEs) or poly- and perfluoroalkyl substances (PFASs). CONCLUSION: No association between AhR activity and cryptorchidism was found among Norwegian boys. The average EDI of dioxin and dl-compounds in exclusively breastfed Norwegian infants remains above the safety threshold and, therefore requires further reduction measures. Consistent with a possible role in the observed AhR activity, all dl-P		C
D771	ヒト(生 殖発生毒 性)	Björvang, Richelle D; Hallberg, Ida; Pikki, Anne; Berglund, Lars; Pedrelli, Matteo; Kiviranta, Hannu; Rantakokko, Panu; Ruokojä rvi, Päivi; Lindh, Christian H; Olovsson, Matts; Persson, Sara; Holte, Jan; Sjunnesson, Ylva; Damdimopoulou, Pauliina	Follicular fluid and blood levels of persistent organic pollutants and reproductive outcomes among women undergoing assisted reproductive technologies	2022	Environ Res. 2022 May 15;208:112626. doi: 10.1016/j.envres.2021.112626. Epub 2021 Dec 29.	Persistent organic pollutants (POPs) are industrial chemicals resistant to degradation and have been shown to have adverse effects on reproductive health in wildlife and humans. Although regulations have reduced their levels, they are still ubiquitously present and pose a global concern. Here, we studied a cohort of 185 women aged 21-43 years with a median of 2 years of infertility who were seeking assisted reproductive technology (ART) treatment at the Carl von Linné Clinic in Uppsala, Sweden. We analyzed the levels of 9 organochlorine pesticides (OCPs), 10 polychlorinated biphenyls (PCBs), 3 polybrominated diphenyl ethers (PBDEs), and 8 perfluoroalkyl substances (PFASs) in the blood and follicular fluid (FF) samples collected during ovum pick-up. Impact of age on chemical transfer from blood to FF was analyzed. Associations of chemicals, both individually and as a mixture, to 10 ART endpoints were investigated using linear, logistic, and weighted quantile sum regression, adjusted for age, body mass index, parity, fatty fish intake and cause of infertility. Out of the 30 chemicals, 20 were detected in more than half of the blood samples and 15 in FF. Chemical transfer from blood to FF increased with age. Chemical groups in blood crossed the blood-follicle barrier at different rates: OCPs > PCBs > PFASs. Hexachlorobenzene, an OCP, was associated with lower anti-Müllerian hormone, clinical pregnancy, and live birth. PCBs and PFASs were associated with higher antral follicle count and ovarian response as measured by ovarian sensitivity index, but also with lower embryo quality. As a mixture, similar findings were seen for the sum of PCBs and PFASs. Our results suggest that age plays a role in the chemical transfer from blood to FF and that exposure to POPs significantly associates with ART outcomes. We strongly encourage further studies to elucidate the underlying mechanisms of reproductive effects of POPs in humans.		в

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D772	ヒト (生 殖発生毒 性)	Matta, Komodo; Lefebvre, Tiphaine; Vigneau, Evelyne; Cariou, Véronique; Marchand, Philippe; Guitton, Yann; Royer, Anne-Lise; Ploteau, Sté phane; Le Bizec, Bruno; Antignac, Jean-Philippe; Cano-Sancho, German	Associations between persistent organic pollutants and endometriosis: A multiblock approach integrating metabolic and cytokine profiling	2022	Environ Int. 2022 Jan;158:106926. doi: 10.1016/j.envint.2021.106926. Epub 2021 Oct 11.	Humans are exposed daily to complex mixtures of chemical pollutants through their environment and diet, some of which have the potential to disrupt the bodies' natural endocrine functions and contribute to reproductive diseases like endometriosis. Increasing epidemiological and experimental evidence supports the association between endometriosis and certain persistent organic pollutants (POPs) like dioxins; however, little is known about the underlying linking mechanisms. The main objective of this study is to proof the methodological applicability and discovery potential of integrating ultra-trace mass spectrometry (MS) profiling of POP biomarkers and endogenous biomarker profiling (MS metabolomics and cytokines) in a case-control study for the etiological research of endometriosis. The approach is applied in a pilot clinical-based study conducted in France where women with and without surgically confirmed endometriosis were recruited. Serum samples were analysed with high-resolution MS for about 30 polychlorinated biphenyls (PCBs), organochlorinated pesticides and perfluoroalkyl substances (PFAS). About 600 serum metabolites and lipids were identified with targeted metabolomics using tandem MS with the Biocrates MxP® Quant 500 Kit. A panel of 4 pro-inflammatory cytokines were analysed using ELISA-based 4-PLEX analyser. Statistical analysis included a battery of variable selection approaches, multivariate logistic regression for single-chemical associations, Bayesian kernel machine regressions (BKMR) to identify mixture effects of POPs and a multiblock approach to identify shared biomarker signatures among high risk clusters. The results showed the positive associations between some POPs and endometriosis risk, including the pesticide trans-nonachlor Odds Ratio (95% Confidence Interval) 3.38 (2.06-5.98), p < 0.0001 and PCB 114 OR (95% CI) 1.83 (1.17-2.93), p = 0.009. The BKMR approach showed a tendency of a positive cumulative effect of the mixture, however trans-nonachlor exhibited significant associations wi		в
D773	ヒト(内 分泌系)	Yan, Dandan; Jiao, Yang; Yan, Honglin; Liu, Tian; Yan, Hong; Yuan, Jingping	Endocrine-disrupting chemicals and the risk of gestational diabetes mellitus: a systematic review and meta-analysis	2022	Environ Health. 2022 May 16;21(1):53. doi: 10.1186/s12940- 022-00858-8.	OBJECTIVE: To conduct a comprehensive systematic review and meta-analysis to estimate the relationship between endocrine- disrupting chemicals (EDCs), including polychlorinated biphenyls (PCBs), poly-brominated diphenyl ethers (PBDEs), phthalates (PAEs), and per- and polyfluoroalkyl substances (PFAS) exposure and risk of gestational diabetes mellitus (GDM). METHODS: Relevant studies from their inception to November 2021 were identified by searching EMBASE, PubMed, and Web of Science. The cohort and case-control studies that reported effect size with 95% confidence intervals (CIs) of EDC exposure and GDM were selected. The heterogeneity among the included studies was quantified by I(2) statistic. Publication bias was evaluated through the Begg and Egger tests. RESULTS: Twenty-five articles with a total of 23,796 participants were found. Results indicated that exposure to PCBs has a significant influence on the incidence of GDM (OR = 1.14 ; 95% CI = 1.00 - 1.31 ; n = 8). The risk of GDM was found to be associated with PBDE exposure (OR = 1.32 ; 95% CI = 1.15 - 1.53 ; n = 4). PAEs and PFASs exposure were also positively associated with the risk of GDM, with summary ORs of 1.10 (95% CI = 1.03 - 1.16 ; n = 7 for PAEs) and 1.09 (95% CI = 1.02- 1.16 ; n = 11 for PFASs), respectively. When only cohort studies were considered, the summary OR between PCBs exposure and the risk of GDM was 0.99 (95% CI = 1.00 - 1.26 ; n = 2), 1.08 (95% CI = 1.02 - 1.15 ; n = 5), and 1.06 (95% CI = 1.00 - 1.12 ; n = 8), respectively. The Beggs and Egger tests did not show publication bias, and the sensitivity analyses did not change the results in this meta-analysis. CONCLUSION: These results support that exposure to certain EDCs, including PCBs, PAEs, and PFAS, increase the risk of GDM. Further large-sample epidemiologic researches and mechanistic studies are needed to verify the potential relationship and biological mechanisms. These results are of public health significance because the daily EDC exposure is		1 A

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨 (原文)	備考	出 村 報 御	ン 文 ン 文 ク 献 ① ラ ② ラ
D774	ヒト(生 殖発生毒 性)	Wang, Bin; Fu, Jianjie; Gao, Ke; Liu, Qian; Zhuang, Lili; Zhang, Guohuan; Long, Manman; Na, Jigen; Ren, Mengyuan; Wang, Anni; Liang, Rong; Shen, Guofeng; Li, Zhiwen; Lu, Qun	Early pregnancy loss: Do Per- and polyfluoroalkyl substances matter?	2021	Environ Int. 2021 Dec;157:106837. doi: 10.1016/j.envint.2021.106837. Epub 2021 Aug 26.	Per- and poly-fluorinated substances (PFASs) with endocrine disrupting effect can efficiently transfer across the blood-follicle barrier. However, it is still controversial and attracting extensive public concern that whether PFASs can affect the human fertility potential. Therefore, we aimed to analyze the associations of women's exposure to PFASs with pregnancy loss, the relevant processes of fertilization, zygote implantation, and embryo development by using a prospective cohort study. The women undergoing in vitro fertilization-embryo transfer (IVF-ET) treatment were recruited in Beijing City (Beijing Center) and Yantai City (Yantai Center) in China during 2015-2017. A total of 305 women were recruited before the IVF-ET treatment. Twelve PFASs were measured in their serum samples collected in the day before the IVF-ET treatment, as well as in the human chorionic gonadotropin (hCG) day. The three IVF-ET outcomes were included, i.e. hCG test negative, clinical pregnancy failure (CPF), and preclinical spontaneous abortion. Nine serum PFASs had detection rate of >70% in Beijing and Yantai centers. The exposure patterns to PFASs between these two centers were overall different. For Beijing Center, we only found a positive association of perflurodecanoic acid (PFDA) with the risk of CPF [RR = 2.28 (95 %CI: 1.02-5.11)], but there is a reverse trend in Yantai Center with [RR = 0.45 (95 %CI: 0.23-0.85)]. However, the serum concentration of PFDA in Beijing Center was relatively lower than that of Yantai Center. Other significant associations of the detected PFASs with the IVF-ET outcomes, or with the relevant clinical processes, were not found. The multi-pollutant regression model of the Bayesian kernel machine regression suggested that there were no joint effects between various PFASs on the concerned outcomes. Overall, we suggest that most PFAS were not associated with early pregnancy loss at the current exposure levels. As for the PFDA, there may exist susceptibility of different populations.			в
D775	ヒト(生 殖発生毒 性)	Björvang, Richelle D; Hassan, Jasmin; Stefopoulou, Maria; Gemzell- Danielsson, Kristina; Pedrelli, Matteo; Kiviranta, Hannu; Rantakokko, Panu; Ruokojä rvi, Päivi; Lindh, Christian H; Acharya, Ganesh; Damdimopoulou, Pauliina	Persistent organic pollutants and the size of ovarian reserve in reproductive-aged women	2021	Environ Int. 2021 Oct;155:106589. doi: 10.1016/j.envint.2021.106589. Epub 2021 May 1.	Industrial chemicals such as persistent organic pollutants (POPs) have been associated with reduced fertility in women, including longer time-to-pregnancy (TTP), higher odds for infertility, and earlier reproductive senescence. Fertility is highly dependent on the ovarian reserve, which is composed of a prenatally determined stock of non-growing follicles. The quantity and quality of the follicles decline with age, thereby eventually leading to menopause. In the clinical setting, assessing ovarian reserve directly through the histological analysis of follicular density in ovaries is not practical. Therefore, surrogate markers of ovarian reserve, such as serum anti-Müllerian hormone (AMH) are typically used. Here, we studied associations between chemical exposure and ovarian reserve in a cohort of pregnant women undergoing elective caesarean section (n = 145) in Stockholm, Sweden. Full data (histological, clinical, serum) were available for 50 women. We estimated the size of the reserve both directly by determining the density of follicles in ovarian cortical tissue samples, and indirectly by measuring AMH in associated serum samples. Concentrations of 9 organochlorine pesticides (OCPs), 10 polychlorinated biphenyls (PCBs), 3 polybrominated diphenylethers (PBDEs) and 9 perfluoroalkyl substances (PFAS) were determined in serum, and clinical data were retrieved from electronic medical records. Healthy follicle densities (median 0, range 0-193 follicles/mm(3)) and AMH levels (median 2.33 ng/mL, range 0.1-14.8 ng/mL) varied substantially. AMH correlated with the density of growing follicle. Twenty-three chemicals detected in more than half of the samples were included in the analyses. None of the chemicals, alone or as a mixture, correlated with AMH, growing or atretic follicles. However, HCB, transnonachlor, PCBs 74 and 99 were associated with decreased non-growing follicle densities. HCB and transnonachlor were also negatively associated with healthy follicle density. Further, mixture of lipophilic POPs (PBDE 99,			В
D776	ヒト (生 殖発生毒 性)	Gross, Rachel S; Ghassabian, Akhgar; Vandyousefi, Sarvenaz; Messito, Mary Jo; Gao, Chongjing; Kannan, Kurunthachalam; Trasande, Leonardo	Persistent organic pollutants exposure in newborn dried blood spots and infant weight status: A case- control study of low-income Hispanic mother-infant pairs	2020	Environ Pollut. 2020 Dec;267:115427. doi: 10.1016/j.envpol.2020.115427. Epub 2020 Aug 15.	Persistent organic pollutants (POPs) are believed to alter metabolic homeostasis during fetal development, leading to childhood obesity. However, limited studies have explored how fetal chemical exposures relate to birth and infant weight outcomes in low- income Hispanic families at the highest risk of obesity. Therefore, we sought to determine associations between neonatal POPs exposure measured in newborn dried blood spots (DBS) and prenatal diet quality, birth weight, and overweight status at 18 months old. We conducted a case-control study nested within the Starting Early Program randomized controlled trial comparing POPs concentrations in infants with healthy weight (n = 46) and overweight status (n = 52) at age 18 months. Three categories of POPs, organochlorine pesticides (OCPs), polybrominated diphenyl ethers (PBDEs) and perfluoroalkyl substances (PFASs) were measured in archived newborn DBS. We assessed correlations between prenatal diet quality and neonatal POPs concentrations. Multivariable regression analyses examined associations between POPs (dichotomized at the mean) and birth weight z-score and weight status at 18 months, controlling for confounders. Seven of eight chemicals had detectable levels in greater than 94% of the sample. Higher protein, sodium and refined grain intake during pregnancy were correlated with lower POPs in newborn DBS. We found that high concentrations of perfluorooctanesulfonate (unstandardized coefficient [B]: -0.62, 95% confidence interval [CI]: - 0.96 to -0.29) and perfluorobexanesulfate (B: -0.65, 95% CI: -0.99 to -0.31) were related to lower birth weight z-scores compared to those with low concentrations. We did not find associations between PBDEs, OCPs, and the other PFASs with birth weight, an important indicator of child health and growth, although direct associations with infant overweight status were not found. Whether neonatal POPs exposures contribute to economic and ethnic disparities in early obesity remains unclear.			в

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン文 ン文 ク献 の献 ① ラ ② ラ
D777	ヒト(生 殖発生毒 性)	Pearce, John L; Neelon, Brian; Bloom, Michael S; Buckley, Jessie P; Ananth, Cande V; Perera, Frederica; Vena, John; Hunt, Kelly	Exploring associations between prenatal exposure to multiple endocrine disruptors and birth weight with exposure continuum mapping	2021	Environ Res. 2021 Sep;200:111386. doi: 10.1016/j.envres.2021.111386. Epub 2021 Jun 2.	BACKGROUND: Improved understanding of how prenatal exposure to environmental mixtures influences birth weight or other adverse outcomes is essential in protecting child health. OBJECTIVE: We illustrate a novel exposure continuum mapping (ECM) framework that combines the self-organizing map (SOM) algorithm with generalized additive modeling (GAM) in order to integrate spatially-correlated learning into the study mixtures of environmental chemicals. We demonstrate our method using biomarker data on chemical mixtures collected from a diverse mother-child cohort. METHODS: We obtained biomarker concentrations for 16 prevalent endocrine disrupting chemicals (EDCs) collected in the first-trimester from a large, ethnically/racially diverse cohort of healthy pregnant women (n = 604) during 2009-2012. This included 4 organochlorine pesticides (OCPs), 4 polybrominated diphenyl ethers (PBDEs), 4 polychorinated biphenyls (PCBs), and 4 perfluoroalkyl substances (PFAS). We applied a two-stage exposure continuum mapping (ECM) approach to investigate the combined impact of the EDCs on birth weight. First, we analyzed our EDC data with SOM in order to reduce the dimensionality of our exposure matrix into a two-dimensional grid (i.e., map) where nodes depict the types of EDC mixture profiles observed within our data. We define this map as the 'exposure continuum map', as the gridded surface reflects a continuous sequence of exposure profiles where adjacent nodes are composed of similar mixtures and profiles at more distal nodes are more distinct. Lastly, we used GAM to estimate a joint-dose response based on the coordinates of our ECM and infant birth weight after adjusting for maternal age, race/ethnicity, pre-pregnancy body mass index (BMI), education, serum cotinine, total plasma lipids, and infant sex. Single chemical regression models were applied to facilitate comparison. RESULTS: We found that an ECM with 36 mixture profiles retained 70% of the total variation in the exposure data. Frequency analysis showed that the most c			В
D778	ヒト(生殖発生毒性)	Mehta, Suril S; James-Todd, Tamarra; Applebaum, Katie M; Bellavia, Andrea; Coleman-Phox, Kimberly; Adler, Nancy; Laraia, Barbara; Epel, Elissa; Parry, Emily; Wang, Miaomiao; Park, June-Soo; Zota, Ami R	Persistent organic pollutants and maternal glycemic outcomes in a diverse pregnancy cohort of overweight women	2021	Environ Res. 2021 Feb;193:110551. doi: 10.1016/j.envres.2020.110551. Epub 2020 Dec 2.	BACKGROUND: Animal and human studies suggest certain persistent organic pollutants (POPs) may impact glucose metabolism; however, few epidemiologic studies have examined environmental determinants of glycemic outcomes during pregnancy. Our objective is to evaluate associations between exposures to individual and mixture of POPs and measures of prenatal fasting glucose, insulin, and insulin resistance during pregnancy in overweight women. METHODS: A cohort of overweight and obese pregnant women (N = 95) was recruited from California. Blood samples were collected during late first or second trimester (median = 16 weeks' gestation; range = 10-24 weeks). Exposures included serum concentrations of polybrominated diphenyl ethers (PBDEs) and hydroxylated metabolites (OH-PBDEs), polychlorinated biphenyls (PCBs), and poly- and perfluoroalkyl substances (PFASs). Outcomes included serum concentrations of fasting plasma glucose, fasting plasma insulin, and calculated homeostatic model assessment of insulin resistance (HOMA-IR). Generalized linear models were used to evaluate cross-sectional associations between individual and aggregate POPs and mean percent difference in fasting glucose, fasting insulin, and HOMA-IR. Bayesian kernel machine regression (BKMR) was used to assess the relative importance of each exposure to the association with our outcomes, using conditional and group posterior inclusion probabilities (PIPs). RESULTS: Study participants were racially/ethnically diverse and nearly half were below the federal poverty level. Across PBDEs and OH-PBDEs, the direction of associations with fasting glucose, fasting insulin and HOMA-IR were varied. A doubling of PCB-138, PCB-153, PCB-180, and Σ PCBs concentrations was associated with a 2.10% mmol/L (95%CI: 0.49%, 3.74%), 2.10% mmol/L (95%CI: 0.14%, 4.39%), 2.10% mmol/L (95%CI: 0.12%, 4.12%), and 2.81% mmol/L (95%CI: 0.38%, 5.31%) increase in fasting glucose, respectively. Exposure to individual PCBs was positively associated with both fasting insulin and HOMA-IR. All			В
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D779	ヒト(生 殖発生毒 性)	Eick, Stephanie M; Enright, Elizabeth A; Padula, Amy M; Aung, Max; Geiger, Sarah D; Cushing, Lara; Trowbridge, Jessica; Keil, Alexander P; Gee Baek, Hyoung; Smith, Sabrina; Park, June-Soo; DeMicco, Erin; Schantz, Susan L; Woodruff, Tracey J; Morello-Frosch, Rachel	Prenatal PFAS and psychosocial stress exposures in relation to fetal growth in two pregnancy cohorts: Applying environmental mixture methods to chemical and non-chemical stressors	2022 Environ Int. 2022 May;163:107238. doi: 10.1016/j.envint.2022.107238. Epub 2022 Apr 9.	BACKGROUND: Prenatal exposure to individual per- and poly-fluoroalkyl substances (PFAS) and psychosocial stressors have been associated with reductions in fetal growth. Studies suggest cumulative or joint effects of chemical and non-chemical stressors on fetal growth. However, few studies have examined PFAS and non-chemical stressors together as a mixture, which better reflects real life exposure patterns. We examined joint associations between PFAS, perceived stress, and depression, and fetal growth using two approaches developed for exposure mixtures. METHODS: Pregnant participants were enrolled in the Chemicals in Our Bodies cohort and Illinois Kids Development Study, which together make up the ECHO.CA.IL cohort. Seven PFAS were previously measured in 2nd trimester maternal serum samples and were natural log transformed for analyses. Perceived stress and depression were assessed using self-reported validated questionnaires, which were converted to t-scores using validated methods. Quantile g-computation and Bayesian kernel machine regression (BKMR) were used to assess joint associations between PFAS, perceived stress and depression t-scores and birthweight z-scores (N = 876). RESULTS: Individual PFAS, depression and perceived stress t-scores were negatively correlated with birthweight z-scores. Using quantile g-computation, a simultaneous one quartile increase in all PFAS, perceived stress and depression t-scores as associated with a slight reduction in birthweight z-scores (mean change per quartile increase = -0.09, 95% confidence interval = -0.21,0.03). BKMR similarly indicated that cumulative PFAS and stress t-scores were modestly associated with lower birthweight z-scores. Across both methods, the joint association appeared to be distributed across multiple exposures rather than due to a single exposure. CONCLUSIONS: Our study is one of the first to examine the joint effects of chemical and non-chemical stressors on fetal growth using mixture methods. We found that PFAS, perceived stress, and depression			В
D780	ヒト(生 殖発生毒 性)	岸 玲子, 荒木 敦 子, 宮下 ちひろ, 伊藤 佐智子, 湊屋 街子, 小林 澄貴, 山﨑 圭子, アイツ バマイ ゆふ, 三浦 りゅう, 田村 菜穂 美	2万人規模の出生コーホートと,500人規模の小コーホー トからなる北海道スタディが目指してきたもの:環境と 子どもの健康 一先天異常・発達・アレルギーの15年にお よぶ経験と成果—	2018 日本衛生学雑誌, 73 巻 2 号 164-177, doi: 10.1265/jjh.73.164	Since "Our Stolen Future" by Theo Colborn was published in 1996, global interest on the impact of chemical substances, such as the endocrine-disrupting action of chemicals, has increased. In Japan, "The Hokkaido Study on Environment and Children's Health: Malformation, Development and Allergy" was launched in 2001. It was a model of Japan Environment and Children's Study of the Ministry of the Environment. In a large-scale, Hokkaido cohort, we obtained the consent of 20,926 mothers at the organogenesis stage with the cooperation of 37 obstetrics clinics in Hokkaido. We tracked the effects of endocrine disruptors on developmental disorders. In a small-scale Sapporo cohort, we observed in detail the neuropsychiatric development of children with the consent of 514 mothers in their late pregnancy. We examined how prenatal exposure to low concentrations of environmental chemicals affect the development of organs and the postnatal development of children. Maternal exposure to POPs, such as PCB/dioxins and perfluorinated alkyl substances, has affected not only children's birth size, thyroid functions, and sex hormone levels, but also postnatal neurodevelopment, infection, and allergy among others. The associations of short-half-life substances, such as DEHP and BPA, with obesity, ASD, and ADHD have been investigated. Gene-environment interactions have been found for smoking, caffeine, folic acid, and PCB/dioxin. In 2015, our center was officially designated as the WHO Collaborating Centre for Environmental Health and Prevention of Chemical Hazards, and we continue to the contribute to the global perspectives of child health.			В
D781	ヒト (生 殖発生毒 性)	那須 民江, 岸 玲 子	胎生期低栄養と小児の健康	2012 日本衛生学雑誌, 67 巻 1 号 21, doi:10.1265/jjh.67.21	国内外間わず子供の健康に対する環境リスクの増大が懸念され、化学物質を中心とした有害物質に対する子供の脆弱性について関心が 高まっている。いままで行われてきた多くの化学物質研究は親世代への影響を追及するものであり、次世代の子供の成長まで観察する 研究は少ない。我が国では環境省がいちはやくこの問題に着手し、全国調査「エコチル調査」が開始し、胎児期から13歳に達するま で定期的に子供たちの健康状態を確認する出生コーホート調査を開始した。この研究会では、「胎児期の栄養と子供の健康」というこ とに焦点をあて、議論をしてみたい。「胎生期の低栄養」で注目されるのは、まず、妊娠期の母親のたんぱく質や脂肪、あるいはビタ ミン等の摂取不足に起因する栄養不足によるものである。福岡は、妊娠期母親の低栄養は次世代の児の生活習慣病リスク(生活習慣病 胎児期発症説)に影響を与えるという新しい概念を紹介する。つまり、成人病のリスクは子宮内環境から始まっている ということで、成人期の健康管理のみでは生活習慣病の予防は不十分であることを示唆するものである。これらの考え方は、大人の心 疾患による死亡率が乳幼児の死亡率や乳児の出生時体重に関連する等、子宮内環境は成人の心疾患による死亡率に影響を与えるという Barker (1)の仮説に端を発し、「健康および成人病の素因は、胎芽、胎児、乳児期の環境に影響を受けて形成され、この変化は出生後 変わることなく、その素因と環境との相互作用で健康および疾病が形成される」というDOHaD (Developmental Origins of Health and Disease) 説が生まれた。一方、妊婦のペルフルオロオクタン酸 (PFOA) やペルフルオロオクタンスルフォン酸濃度と児の出生時 体重は逆相関することがいくつかの疫学研究によって明らかにされている (2-4)。動物実験では、妊娠期の PFOA 曝露が生存仔数を減 らすという報告がされている (5,6)。しかし、これらのメカニズムや「低体重」が児の発達や成人期の病気にどのような影響をもたらす か、興味が持たれる。林らは母親が十分な栄養摂取状況下であっても、プラスチック可塑剤として汎用されているフタル酸ジ (2-エチ ルヘキシル) (DEHP) 曝露が妊娠期母親の血漿中トリグリセライドや必須脂肪酸濃度を低下させ、「低栄養」を招来することに着目 し、新しい視点から、胎仔期化学物質曝露の次世代健康影響の一端を報告する。			В

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D782	ヒト(生 殖発生毒 性)	村田 勝敬, 岩田 豊人, 前田 恵理, 苅田 香苗	環境保健研究のジレンマ	2018	日本衛生学雑誌, 73 巻 2 号 148-155, doi: 10.1265/jjh.73.148	This article presents not only a brief overview of birth cohort studies focusing on environmental health in which the associations between health and environment were examined, but also a tentative plan to apply epidemiological data to benchmark dose calculation. According to the preceding studies, the checkpoints to be scrutinized when a result is not consistent with those of other researchers are as follows: (1) whether the study included all crucial confounders, (2) whether it included any exposure marker or confounder with a U-shaped dose-response curve, (3) whether the outcome measure was conducted by two or more examiners that might lead to measurement bias, (4) whether such examiners picked up information about exposure levels of the subjects before measuring the endpoints, and (5) whether subjects with different genetic factors were included in the analysis. In addition, (6) researchers conducting a children's study on developmental effects due to toxic substances must keep in mind that the impact of prenatal methylmercury exposure, independent of postnatal exposure, may continue for at least seven years. (7) When an environmental health research emphasizes to be population-based study, the levels of exposure to environmental chemical substances in developed countries with strict environmental regulations may be too low to examine a dose-response relationship for critical dose estimation. Such risk assessment should be carried out among the subjects with a wide range of exposure levels.		В
D783	ヒト(生 殖発生毒 性)	佐藤 洋	化学的環境は子どもの発達にどのような影響をおよぼす のか	2010	学術の動向, 15 巻 4 号 4_40-4_45, doi: 10.5363/tits.15.4_40	胎児期(子宮内の)環境も含めて生育環境が、子どもの発達に大きな影響をおよぼしていることは言うまでもない。しかし、その詳細 を明らかにすることは容易ではない。それは、子どもの発達に影響をおよぼす要因は、遺伝的因子をはじめ数多く存在しており、その 要因間の交絡作用も複雑であるからである。本稿では、種々の化学物質の周産期ばく露がその後に与える影響を中心に、化学的環境と 子どもの発達について述べてみたい。		В
D784	ヒト (生 殖発生毒 性)	岩井 美幸, 中山 祥嗣, 磯部 友彦, 小林 弥生, 鈴木 剛, 野村 恭子	化学物質曝露と子どもの健康との関連に関する研究動向	2019	日本衛生学雑誌, 74 巻 論文ID: 18030, doi: 10.1265/jjh.18030	There is mounting concern about the effects of early-life exposure to chemical substances on children's health and development. We summarize the past and ongoing birth cohort studies carried out worldwide on the association between environmental exposure and children's health. Our PubMed search with the keywords 'birth cohort' revealed that the number of articles jumped from 200–300 in the 1980s to over 1,000 in the 1990s. Many of these articles reported elevated risks to children's health posed by chemical exposure owing their vulnerability. At the same time, policies implemented to reduce exposure to lead and dioxins were successful in the past few decades. Research also demonstrated that intervention to reduce exposure to certain chemicals whose exposure routes were well documented was also successful. We summarize the effects of early-life exposure to chemical substances on children's health and development. Our findings will hopefully help safeguard the environment in which future generations grow and live.		В
D785	ヒト(生 殖発生毒 性)	苅田 香苗, 坂本 峰至, 吉田 稔, 龍 田 希, 仲井 邦彦, 岩井 美幸, 岩田 豊人, 前田 恵理, 柳沼 梢, 佐藤 洋, 村田 勝敬	メチル水銀,水銀およびセレンに関する研究動向一疫学 研究を中心に一	2016	日本衛生学雑誌, 71 巻 3 号 236-251, doi: 10.1265/jjh.71.236	More than sixty years has passed since the outbreak of Minamata disease, and high-level methylmercury contaminations now seem nonexistent in Japan. However, mercury has been continuously discharged from natural sources and industrial activities, and the health effects on children susceptible to methylmercury exposure at low levels, in addition to mercury contamination from mercury or gold mining areas in developing countries, become a worldwide concern. In this article, we provide a recent overview of epidemiological studies regarding methylmercury and mercury. The following findings were obtained. (1) Many papers on exposure assessment of methylmercury/mercury have been published since the Minamata Convention on Mercury was adopted in 2013. (2) The most crucial problem is child developmental neurotoxicity resulting from prenatal exposure to methylmercury, but its precise assessment seems to be difficult because most of such effects are neither severe nor specific. (3) Several problems raised in birth cohort studies (e.g., whether IQ deficits due to prenatal methylmercury exposure remain when the children become adults, or whether the postnatal exposure at low levels also causes such adverse effects in children) remain unsolved. (4) Concurrent exposure models of methylmercury, lead, polychlorinated biphenyls, aresenic, and organochlorine pesticides, as well as possible antagonists such as polyunsaturated fatty acids and selenium, should be considered in the study design because the exposure levels of methylmercury are extremely low in developed countries. (5) Further animal experiments and molecular biological studies, in addition to human studies, are required to clarify the mechanism of methylmercury toxicity.		C
D786	ヒト (生 殖発生毒 性)	伊藤 佐智子(北海 道大学環境健康科 学研究教育セン ター), 荒木 敦子, 宮下 ちひろ, 岸 玲子	アジアにおける有機フッ素化合物の胎児期曝露が及ぼす 児の健康影響	2019	北海道公衆衛生学雑誌(0914-2630)32巻2号 Page43- 54(2019.03)	有機フッ素化合物(Perfluoroalkyl Substances:PFASs)は、その撥水性・撥油性から、界面活性剤、食品パッケージなどに使われてきた が、残留性や生物蓄積性を示す。近年、アジア地域では急速に工業化・経済発展が進み、PFASsの製造や廃棄物処理などの問題に直面 している。世界的なPFOS、PFOAの製造規制後も、代替の長炭素鎖または短炭素鎖PFASsの製造が続いている。本総説では、PFASsの 胎児期曝露と児の健康を検討したアジアの知見を整理し、今後の研究課題を探ることを目的とした。2018年11月までに発表された論文 をPubMedにて検索を行い、出生コホートを中心とした27編についてPFASsの曝露濃度および子どもの健康に与える影響をまとめた。 欧米諸国と比較して日本、台湾、韓国、中国での胎児期PFOS曝露濃度は同等および低かったが、出生体格、甲状腺ホルモン値、アレ ルギー・感染症、神経行動発達、性ホルモン・ステロイドホルモン値に影響を及ぼす可能性があることが明らかになった。しかし、ア ウトカムによっては結果が一致していないもの、また報告数が限られているものもあった。今後の課題として、生産量が増加している 短・長炭素鎖のPFASsによる影響評価を行うことに加え、幼少期の健康影響がいつまで続くのか、コホートを追跡することが必要であ る。さらに、PFASs曝露によって攪乱された出生時の甲状腺や性ホルモン値が、その後の神経行動発達、思春期にどのように影響して いくのかを明らかにすることが、PFASsの健康影響に対する生化学的な機序を明らかにすることにつながると考えられる。(著者抄録)		в

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D787	ヒト(生 殖発生毒 性)	岸 玲子(北海道大 学環境健康科学研 究教育センター)	日本で初めての本格的な出生コホート研究(環境と子ども の健康に関する北海道スタデイ)17年の成果と環境省エ コチル研究について	2019	日本小児呼吸器学会雑誌(2187-5731)30巻1号 Page63- 66(2019.06)	2001年から厚生労働科学研究で日本で最初の本格的な出生コーホート研究で「環境と子どもの健康に関する北海道スタデイ:先天異常・ 発達・アレルギー」を立ち上げた。17年にわたって追跡している。PCB・ダイオキシン類、有機フッ素化合物など半減期の長いPOPsで は母の曝露濃度が体格、甲状腺機能、性ホルモンに影響を与え、生後の神経発達、感染症アレルギー等にも影響を与えた。北海道スタ デイ17年の経験から見えてきた出生コーホート研究の強みと今後の課題、あわせて環境省エコチル研究について述べる(表1)。(著者抄 録)		В
D788	ヒト(生 殖発生毒 性)	平尾 雅代(広島国 際大学 薬学部)	環境・衛生 パーフルオロオクタン酸はPPARαを介し て悪性形質転換を誘導する	2019	ファルマシア(0014-8601)55巻2号 Page172(2019.02), doi: 10.14894/faruawpsj.55.2_172	 パーフルオロオクタン酸(PFOA)は、難燃剤や撥水剤として汎用されてきた.また、PFOAはフッ素系製品に不純物として含まれることが知られている.PFOAは環境中で分解されにくい残留性の高い有機フッ素系化合物である.この性質のため、飲料水中から見いだされていることに加え、ヒトの血清等からも検出されており、生体影響が懸念されている.PFOAやこれと同じ有機フッ素化合物であるパーフルオロオクタンスルホン酸(PFOS)と乳がんの関連性が示唆されている.PFOAやPFOSが女性ホルモン系を修飾し得る内分泌かく乱物質と考えられており、最近PFOSによる乳がん悪性化の一部にエストロゲン受容体(ER)の活性化が関与することが報告された.しかし、PFOAによる乳がん増悪とERの活性化に関する共通の結果は得られていない.本稿では、正常な乳房上皮細胞の特徴を有するMCF-10A細胞をモデルとした解析により、PFOAがERによらない機構で悪性形質転換を誘導することを初めて示したPierozanらの研究成果を紹介したい.なお、本稿は下記の文献に基づいて、その研究成果を紹介するものである. 1) Bonefeld-Jorgensen E. C. et al., Environ. Health., 10, 88(2011). 2) Pierozan P. et al., Arch. Toxicol., 92, 1729-1739(2018). 4) Kjeldsen L. S., Bonefeld-Jørgensen E. C., Environ. Sci. Pollut. Res. Int., 20, 8031-8044(2013). 		С
D789	ヒト(生 殖発生毒 性)	岸 玲子(北海道大 学環境健康科学研 究教育センター), 荒木 敦子	【これまでの環境リスクとこれからの環境リスク】わが 国で初めての本格的な出生コーホート研究から見た環境 化学物質の濃度レベルと次世代影響	2018	保健医療科学(1347-6459)67巻3号 Page292-305(2018.08), doi: 10.20683/jniph.67.3_292	 シーア・コルボーンらにより「Our stolen future(邦訳「奪われし未来」)」が出版された1996年頃から、各国で環境化学物質の内分泌 かく乱作用など次世代影響に関心が高まった。日本でも我々は2001年から厚生労働科学研究により「環境と子どもの健康に関する北海 道スタディ:先天異常・発達・アレルギー」として2つのコーホートを立ち上げた。コーホートの1つは北海道全域の産科の協力により器 官形成期に同意を得て、母20,926人のベースライン採血を行い、出生アウトカムを観察し、その児を学童期、思春期と追跡している。 他の一つは妊娠中後期に母514人の同意を得て児の詳細な精神神経発達を観察している。この研究は我が国で初めての本格的な出生 コーホートで、16年に渡って追跡し、現在までに100編を超える原著論文が出ている。コーホート研究の最近の成果を見るとPCB・ダ イオキシン類、有機フッ素化合物、有機塩素系農薬など半減期の長いPOPsでは母の曝露濃度が体格、甲状腺機能、性ホルモンに影響 を与え、生後の神経発達、感染症アレルギー等にも影響を与えた。近年、使用量が増加しているプラスチック可塑剤やBPAなど短半減 期物質と肥満や発達障害等の関係についても検討を開始している。日本では過去に高濃度の水銀曝露で水俣病が、またダイオキシン類 曝露でカネミライスオイル事故が引きおこされた。一方、本研究における比較的低濃度レベルの曝露でも、比較的高い人と低い人では 影響の差が検出された。北海道スタディは当初から環境遺伝交互作用に着目し、SNPs解析によって喫煙やカフェインなど環境要因に感 受性が高いハイリスク群を発見してきた。またエピゲノム解析では、環境化学物質の濃度と関連したメチル化への影響や、出生体重な ど発育に影響するCpGサイトを介在分析で明らかにできた。近年は世界的にDOHaD仮説(Developmental origin of health and Diseases、疾病の胎児期・幼少時期起源説)が重要になっているので、今後は広く小児疾患への環境要因として捉えることが必要にな る、環境疫学では正確な曝露測定に基づくリスク評価を行い、科学的な成果を環境政策に活かすことが重要である。実際に、北海道ス タディは環境省エコチル研究のモデルにもなり、計画設計時から協力している。また日本、韓国、台湾の3つのコーホートの主任研究者 が協力してBiCCA(Birth Cohort Consortium of Asia)を設立し、現在15か国で29の出生コーホートが参加して活動をしている。今後のリ スク評価でも国際共同研究が数多く進展するであろう。(著者抄録) 		В

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No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨 (原文)	備考	出 情 対 報 象 抽	ン文 ン文 ク献 の献 () ラ () ラ
D790	ヒト (生 殖発生毒 性)	Kishi Reiko(Hokkaido University Center for Environmental and Health Sciences), Araki Atsuko, Minatoya Machiko, Hanaoka Tomoyuki, Miyashita Chihiro, Itoh Sachiko, Kobayashi Sumitaka, Bamai Yu Ait, Yamazaki Keiko, Miura Ryu, Tamura Naomi, Ito Kumiko, Goudarzi	環境と子どもの健康に関する北海道出生コホート研究 2017年最新版のコホートプロファイル(The Hokkaido Birth Cohort Study on Environment and Children's Health: cohort profile: updated 2017)(英語)	2017	Environ Health Prev Med. 2017 May 18;22(1):46. doi: 10.1186/s12199-017-0654-3.	北海道出生コホート研究の最新結果を報告した。514名の妊婦の札幌コホートで、母親と臍帯血、母親の毛髪、母乳を採取し、ダイオ キシン、PCB、有機リン系農薬、パーフルオロアルキル物質、フタル酸、ビスフェノールA、メチル水銀への曝露を調べた。経過親察 として、いくつかの異なる年齢で、精神行動学的発達を測定した。20926名の妊婦の北海道コホートで、流産、死産、低出生体重、早 産、胎内発育遅延などの複雑な妊娠と出産結果の罹患率を調べた。また、出生時の大きさ、新生児ホルモンレベル、神経行動発達、喘 息、アレルギーおよび感染症などと環境化学物質曝露との関連を検討した。その結果、本コホートでの環境化学物質に対する曝露レベ ルは以前の報告に比し比較的低かったが、子どもの健康には有害な作用を有した。さらに、遺伝的および後成的分析を行い、遺伝的に 敏感な集団とDNAメチル化に及ぼす環境化学物質曝露の影響が明らかとなった。			В
D791	ヒト(生 殖発生毒 性)	宮下 ちひろ(北海 道大学環境健康科 学研究教育セン ター), 小林 祥子, 岸 玲子	子どもを取り巻く環境と健康(第17回) 胎児期の化学物 質曝露による後天的な遺伝子発現制御への影響	2016	公衆衛生(0368-5187)80巻7号 Page531-537(2016.07)	胎児期の環境化学物質曝露は,出生時のみならず生後,さらには成人後の健康にまで影響する可能性がある.そのメカニズムの一つとして 提唱されている,胎児期環境による児のDNAメチル化の変化について,その示す意味と現在までの疫学研究をわれわれの最新のデータを 交えてまとめた.この分野の報告は近年増加傾向にあり,注目の度合いの高まりがうかがえるが,環境化学物質曝露に関してはごく一部の 遺伝子のメチル化についての報告が散見されるにとどまり,一定の見解を得るまでには至っていない.今後は,曝露の影響を受ける遺伝子 領域の網羅的な探索を行い,より深くメカニズムに迫るとともに,そのメチル化変化がどのように生後の健康・疾病とつながるのか,細 胞・動物実験,出生コーホートでの疫学研究で明らかにする必要がある.(著者抄録)			В
D792	ヒト(生 殖発生毒 性)	岸 玲子(北海道大 学環境健康科学研 究教育センター), 佐々木 成子	【子どもの健康と環境に関するエビデンス】出生コー ホート研究の現状と今後の課題 日本で前向き研究を実 施してきた経験から	2010	保健医療科学(1347-6459)59巻4号 Page366-371(2010.12)	出生コーホート研究は、年代別に大きく2種類に分類できる。まずは20世紀半ばにヨーロッパ諸国で立ち上げられた出生コーホート で、調査対象者は既に老年期に達している。この時代のコーホート研究は、生活習慣病への罹患のしやすさが胎児期の低栄養状態など の影響を受けるというBarker仮説および乳幼児期の影響も重要であるというDOHaD概念につながり、昨近は疾病の環境要因と Epigeneticsとの関連に関心が移ってきている。もうひとつは20世紀後半から始まった環境要因、特に環境化学物質曝露の次世代影響調 査を目的とした一連の研究である。子どもの健康に対する環境要因の影響を調査する疫学研究の必要性が高まるなか、筆者らは「環境 と子どもの健康に関する北海道研究」を2001年に立ち上げ、約10年間調査を行ってきた。この研究の特徴は、1)低濃度の環境要因の影 響解明に焦点を当てたこと、2)前向き研究とし母体血および臍帯血の採取保存により、器官形成期など胎児期の環境要因の曝露測定を 行ったこと、3)先天異常、体格、神経行動発達、甲状腺機能、免疫機能など種々のアウトカムを対象にリスク評価を行ったこと、4)個 人の感受性素因に着目し、化学物質代謝酵素・Ahレセプター・神経伝達物質受容体等の遺伝子多型も考慮したハイリスク群の発見と予 防対策の検討を行ったことである。その結果、PCB・ダイオキシン類の胎児期曝露影響として、体重に負の影響が示された。生後発達 への影響や感染症罹患リスクを上げる可能性も示唆された。総PCDDs濃度、総PCDFs/TEQ濃度と出生時体重との関連には性差が認め られ男児のほうが感受性は高かった。今後の課題として1)アレルギーやADHDなどがより明確になる学童期以降までの追跡、2)複合曝 露による影響の評価、3)生後曝露の測定と評価、4)エビジェネテック作用の検討が挙げられる。現在数多くのコーホートが運営され、 わが国でもエコチル調査を含めた前向き研究が何本か実施されている。それらを子どもの成長に合わせて追跡し、生活習慣などの社会 要因を含めた調査や解析によって健康障害や疾病のリスク要因を明らかにしていくことが重要である。国立保健医療科学院が「社会的 要因」の重要性を指摘し、パネル調査を実施するなど、子どもの健康と環境に関するエビデンスの解明に向けたこれまで以上の積極的 な関与と情報発信が不可欠である。(著者抄録)			с
D793	ヒト(生 殖発生毒 性)	岸 玲子(北海道大 学環境健康科学研 究教育センター), 佐々木 成子	【動き出した"エコチル調査"環境省「子どもの健康と 環境に関する全国調査」】環境化学物質の次世代影響に 関するわが国における研究事例 北海道スタディの概要 とこれまでの成果	2010	医学のあゆみ(0039-2359)235巻11号 Page1117- 1121(2010.12)	Birth cohort"環境と子どもの健康に関する北海道研究"を立ち上げ、約10年間調査を行ってきた。全道20,000人規模と札幌市内514人の 2つのコホートの特徴は、(1)低濃度の環境要因に焦点を当て、(2)器官形成期の母体血および臍帯血の保存により胎児期の曝露測定を行 い、(3)先天異常、体格、甲状腺機能、神経行動発達、アレルギー感染症などのアウトカムを対象に、リスク解析を行ったことであり、 さらに、(4)個人の感受性素因に着目し、化学物質代謝酵素・Ahレセプターなどの遺伝子多型も考慮したハイリスク群の解明を行ってい る。その結果、ダイオキシン類濃度が高いほど児の出生時体重は有意に小さく、IgE濃度は低く、生後の感染症罹患のリスクを上げた。 影響は男児に、より顕著であった。喫煙では、母親のAhR遺伝子とCYP1A1遺伝子の特定の組合せで出生体重への影響がもっとも大き く、-315gであった。ニトロソアミン類代謝活性化に関与するNQO1遺伝子の多型でも、体重低下が-199gで身長と頭囲にも有意の影響 がみられた。(著者抄録)			В

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D794	ヒト (発 がん性)	Jiang, Haihong; Liu, Huan; Liu, Ge; Yu, Jing; Liu, Nana; Jin, Yunqin; Bi, Yongyi; Wang, Hong	Associations between Polyfluoroalkyl Substances Exposure and Breast Cancer: A Meta-Analysis	2022	Toxics. 2022 Jun 11;10(6):318. doi: 10.3390/toxics10060318.	Polyfluoroalkyl substances (PFASs) are persistent pollutants that may cause breast cancer. However, associations between exposure to PFASs and the risk of breast cancer are controversial. We retrieved studies on the association between PFASs-perfluorooctanoic acid (PFOA), perfluoronanoic acid (PFNA), perfluorohexane sulfonic acid (PFHxS), and perfluorooctane sulfonic acid (PFOS)-and breast cancer risk in women from PubMed, Embase, and the Web of Science. The pooled odds ratios (ORs) or relative risks (RRs) and their 95% confidence intervals (CIs) were extracted or calculated from provided data. Moreover, subgroup and metaregression analyses were performed to distinguish the potential sources of heterogeneity between studies. Lastly, eight original studies were included in the meta-analysis. PFOA and PFHxS were positively correlated with breast cancer risk, and the pooled ORs (and 95% CIs) were 1.32 (1.19 and 1.46) and 1.79 (1.51 and 2.11), respectively. PFNA was negatively correlated with breast cancer risk and the pooled OR (and 95% CIs) was 0.76 (0.6 and 0.96), and PFOS was shown to have no correlation with breast cancer risk and the pooled OR (and 95% CIs) was 1.01 (0.87 and 1.17). All results were merged in a random-effects model with significant heterogeneities (I(2) > 90%, p < 0.001). The results demonstrated that PFASs might be potential risk factors for breast cancer, and the compounds in low exposure levels could have a more harmful impact on human health.		1 A
D795	ヒト(発 がん性)	Xie, Meng-Yi; Sun, Xiang-Fei; Wu, Chen-Chou; Huang, Guang- Long; Wang, Po; Lin, Zhi-Ying; Liu, Ya-Wei; Liu, Liang-Ying; Zeng, Eddy Y	Glioma is associated with exposure to legacy and alternative per- and polyfluoroalkyl substances	2023	J Hazard Mater. 2023 Jan 5;441:129819. doi: 10.1016/j.jhazmat.2022.129819. Epub 2022 Aug 24.	Data on the occurrences of legacy and alternative per- and polyfluoroalkyl substances (PFASs) in glioma are scarce. It remains unclear if PFASs exposure is related to the prevalence of glioma. A total of 137 glioma and 40 non-glioma brain tissue samples from patients recruited from the Nanfang Hospital, South China were analyzed for 17 PFAS compounds. Perfluorohexanoic acid, perfluorooctanoic acid (PFOA), perfluorooctane sulfonate (PFOS), perfluorooctane sulfonamide (FOSA), and 6:2 chlorinated polyfluorinated ether sulfonate were frequently detected (> 60 %) in glioma. The total concentrations (range; median) of 17 PFASs in glioma (0.20-140; 3.1 ng g(-1)) were slightly higher than those in non-glioma (0.35-32; 2.2 ng g(-1)), but without statistical significance. The PFAS concentrations in males were statistically higher (p < 0.05) than those in females. Elevated glioma grades were associated with higher concentrations of PFOA, PFOS, and FOSA. Positive correlations were observed between PFAS concentrations (especially for PFOA) and Ki-67 or P53 expression, pathological molecular markers of glioma. Our findings suggested that exposure to PFASs might increase the probability to develop glioma. This is the first case study demonstrating associations between PFASs exposure and brain cancer. More evidences and potential pathogenic mechanisms warranted further investigations.		1 A
D796	ヒト(発 がん性)	Goodrich, Jesse A; Walker, Douglas; Lin, Xiangping; Wang, Hongxu; Lim, Tiffany; McConnell, Rob; Conti, David V; Chatzi, Lida; Setiawan, Veronica Wendy	Exposure to perfluoroalkyl substances and risk of hepatocellular carcinoma in a multiethnic cohort	2022	JHEP Rep. 2022 Aug 8;4(10):100550. doi: 10.1016/j.jhepr.2022.100550. eCollection 2022 Oct.	BACKGROUND & AIMS: Exposure to poly- and perfluoroalkyl substances (PFAS), a class of persistent organic pollutants, is ubiquitous. Animal studies suggest that PFAS may increase risk of fatty liver and hepatocellular carcinoma (HCC) via impacts on hepatic lipid, amino acid, and glucose metabolism, but human data is lacking. We examined associations between PFAS exposure, altered metabolic pathways, and risk of non-viral HCC. METHODS: In this nested case-control study, pre-diagnostic plasma PFAS and metabolomics were measured in 50 incident HCC cases and 50 individually matched controls from the Multiethnic Cohort (MEC) study. Cases/controls were matched by age, sex, race, and study area. PFAS exposure and risk of HCC were examined using conditional logistic regression. A metabolome-wide association study and pathway enrichment analysis was performed for PFAS exposure and HCC risk, and key metabolites/metabolic pathways were identified using a meet in the middle approach. RESULTS: High perfluoroctane sulfonic acid (PFOS) levels (90(th) percentile from NHANES; >55 μ g/L) were associated with 4.5-fold increased risk of HCC (odds ratio 4.5, 95% CI 1.2-16.0). Pathway enrichment analysis showed that PFOS exposure was associated with HLC risk. We identified 4 metabolites linking PFOS exposure with HCC, including glucose, butyric acid (a short-chain fatty acid), α - ketoisovaleric acid (a branched-chain α -keto acid), and 7 α -hydroxy-3-oxo-4-cholestenoate (a bile acid), each of which was positively associated with PFOS exposure and risk of HCC. CONCLUSION: This proof-of-concept analysis shows that exposure to high PFOS levels was associated with increased risk of nor-wiral HCC, likely via alterations in glucose, amino acid, and bile acid metabolism. Larger studies are needed to confirm these findings. LAY SUMMARY: Per- and polyfluoroalkyl substances (PFAS), often referred to as "forever chemicals" because they are difficult to break down and stay in the human body for years, are extremely common and can cause		1 A

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D797	ヒト(発 がん性)	Feng, Yue; Bai, Yansen; Lu, Yanjun; Chen, Mengshi; Fu, Ming; Guan, Xin; Cao, Qiang; Yuan, Fangfang; Jie, Jiali; Li, Mengying; Meng, Iua; Wang, Chenming; Hong, Shiru; Zhou, Yuhan; Zhang, Xiaomin; He, Meian; Guo, Huan	Plasma perfluoroalkyl substance exposure and incidence risk of breast cancer: A case-cohort study in the Dongfeng-Tongji cohort	2022	Environ Pollut. 2022 Aug 1;306:119345. doi: 10.1016/j.envpol.2022.119345. Epub 2022 Apr 23.	Experimental studies have suggested perfluoroalkyl substances (PFASs) as mammary toxicants, but few studies evaluated the prospective associations of PFASs with breast cancer risk. We performed a case-cohort study within the Dongfeng-Tongji cohort, including incident breast cancer cases (n = 226) and a random sub-cohort (n = 990). Baseline plasma concentrations of four perfluorinated carboxylic acids (PFCAs) [perfluorooctanoic acid (PFOA), perfluorononanoic acid (PFNA), perfluorodecanoic acid (PFDA), and perfluoroheptanoic acid (PFHpA)] and two perfluorinated sulfonic acids (PFSAs) [perfluorooctane sulfonic acid (PFOS) and perfluorohexane sulfonic acid (PFHxS)] were measured. Barlow-weighted Cox regression models revealed that each 1-unit increase in In-transformed PFOA and PFHpA was associated with a separate 35% and 20% elevated incident risk of breast cancer [HR(95%CI) = 1.35(1.03, 1.78) and 1.20(1.02, 1.40), respectively]. Which were also significant among postmenopausal females [HR(95%CI) = 1.34(1.01, 1.77) and 1.23 (1.02, 1.48), respectively]. Quantile g-computation analysis observed a 19% increased incident risk of breast cancer along with each simultaneous quartile increase in all In-transformed PFCA concentrations [HR(95%CI) = 1.19(1.01, 1.41)], with PFOA accounting for 56% of the positive effect. Our findings firstly revealed the impact of short-chain PFHpA on increased incident risk of breast cancer, suggested exposure to PFASs as a risk factor for breast cancer, and shed light on breast cancer prevention by regulating PFASs as a chemical class.		1 A
D798	ヒト(発 がん性)	Messmer, Mindi F; Salloway, Jeffrey; Shara, Nawar; Locwin, Ben; Harvey, Megan W; Traviss, Nora	Risk of Cancer in a Community Exposed to Per- and Poly-Fluoroalkyl Substances	2022	Environ Health Insights. 2022 Feb 2 11;16:11786302221076707. doi: 10.1177/11786302221076707. eCollection 2022.	BACKGROUND: Per- and polyfluoroalkyl substances (PFAS) emissions from a plastic coating industrial source in southern New Hampshire (NH) have contaminated at least 65 square miles of drinking water. Prior research indicates that high levels of PFAS are associated with a variety of adverse health outcomes, including an increased risk of cancer. Reports indicate that mean blood serum levels of perfluorooctanoic acid (PFOA), one type of PFAS, in residents of the exposed community are more than 2 times greater than the mean blood serum level in the US. Merrimack public water supply customers also have higher average blood levels of perfluorooctane sulfonic acid (PFOS) and perfluorohexane sulfonic acid (PFHxS) than the time-matched US average. A 2018 report concludes that the incidence rate of cancer in Merrimack does not exceed the incidence rate of cancer in NH in general. However, prior reporting on the risk of cancer in Merrimack is compared only to a state-wide metric influenced by the Merrimack cancer incidence. METHODS: Our ecological study compared the risk in Merrimack, NH residents for 24 types of cancer between 2005 and 2014, targeted in a previous study, and all-cause cancers, to US national cancer rates and cancer rates in demographically similar towns in New England. Four New England "unexposed towns" were chosen based on demographic similarity to Merrimack, with no documented PFAS exposure in water supplies. We utilized unadjusted logistical regression to approximate risk ratios (RR) and 95% confidence intervals (CI) assessing the risk of cancer in Merrimack, NH experienced a significantly higher risk of thyroid cancer (RR = 1.47, 95% CI 1.12-1.93), bladder cancer (RR = 1.45, 95% CI 1.17-1.81), esophageal cancer (RR = 1.69, 95% CI 1.19-2.39), colon cancer (RR = 2.41, 95% CI 1.02-1.57), and prostate cancer (RR = 1.36, 95% CI 1.15, 1.6) compared with similarly exposed New England communities. Our results indicate that residents of Merrimack mesidents experienced a significantly higher risk of some site		D

No.	分野 (参考)	著者	タイトル	発行年 書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン文 ク献 ① ラ ② ラ
D799	ヒト (発 がん性)	Li, Xuejun; Song, Fengju; Liu, Xiaotu; Shan, Anqi; Huang, Yubei; Yang, Zhengjun; Li, Haixin; Yang, Qiaoyun; Yu, Yue; Zheng, Hong; Cao, Xu- Chen; Chen, Da; Chen, Ke-Xin; Chen, Xi; Tang, Nai-Jun	Perfluoroalkyl substances (PFASs) as risk factors for breast cancer: a case-control study in Chinese population	2022 Environ Health. 2022 Sep 9;21(1):83. doi: 10.1186/s12940- 022-00895-3.	BACKGROUND: Perfluoroalkyl substances (PFASs) are a large family of synthetic chemicals, some of which are mammary toxicants and endocrine disruptors. Recent studies have implicated exposure to PFASs as a risk factor for breast cancer in Europe and America. Little is known about the role of PFASs with respect to breast cancer in the Chinese population. METHODS: Participants who were initially diagnosed with breast cancer at Tianjin Medical University Cancer Institute and Hospital between 2012 and 2016 were recruited as cases. The controls were randomly selected from the participants with available blood samples in the Chinese National Breast Cancer Screening Program (CNBCSP) cohort. Ultimately, we enrolled 373 breast cancer patients and 657 controls. Plasma PFASs were measured by an ultra-performance liquid chromatography (UPLC) system coupled to a 5500 Q-Trap triple quadrupole mass spectrometer. A logistic regression model with least absolute shrinkage and selection operator (LASSO) regularization was used to calculate odds ratios (ORs) and 95% confidence intervals (CIs) to assess the relationships between PFASs and breast cancer. The three most predictive variables in the LASSO model were selected from 17 PFASs, which was based on the optimal penalty coefficient ($\lambda = 0.0218$) identified with the minimum criterion. Additionally, Bayesian kernel machine regression (BKMR) and quantile g-computation models were applied to evaluate the associations between separate and mixed exposure to PFASs and breast cancer. RESULTS: Perfluorooctanesulfonic acid (PFOS) exhibited the highest concentration in both the cases and controls. Perfluorooctanoic acid (PFTrDA) was negatively associated with breast cancer according to both the continuous-PFASs and the quartile-PFASs logistic regression models. Of note, PFOA was associated with the occurrence of estrogen receptor (ER)-, progesterone receptor (PR)-, and human epidermal growth factor receptor 2 (HER2)-positive breast cancer (OR(ER+) = 1.47, 95% CI: 1.19, 1.80; OR(PR+) = 1.			в
D800	ヒト(発 がん性)	Cao, Linping; Guo, Yu; Chen, Yuanchen; Hong, Jiawei; Wu, Jian; Hangbiao, Jin	Per-/polyfluoroalkyl substance concentrations in human serum and their associations with liver cancer	2022 Chemosphere. 2022 Jun;296:134083. doi: 10.1016/j.chemosphere.2022.134083. Epub 2022 Feb 22.	Per-/polyfluoroalkyl substances (PFASs) are widespread in global human blood, and have some toxic effects on liver. However, effects of PFAS exposure on human liver cancer (LC) risk are still not known. In this study, 203 LC patients and 203 controls were recruited, and their serum samples were collected between 2019 and 2021. We determined the residues of 12 PFASs in serum from all participants and quantified their association with LC incidence and tumor markers. PFOS (9.8 ng/mL) had the highest mean concentration in human serum, followed by PFOA (8.3 ng/mL) and 6:2 CI-PFESA (3.9 ng/mL). We found that concentrations of PFOS and 6:2 CI-PFESA in human serum were significantly correlated with the levels of alpha fetoprotein (AFP) (β (PFOS) = 0.13, 95% confidence interval (CI(PFOS)): 0.088, 0.17; β (6:2 CI-PFESA) = 0.070, CI(6:2 CI-PFESA): 0.036, 0.10). A positive association of PFOS and 6:2 CI-PFESA with odds ratios (OR) of LC (OR(PFOS) = 0.609, CI(PFOS): 1.179, 4.029, P = 0.001; OR(6:2 CI-PFESA) = 1.844, CI(6:2 CI-PFESA): 1.176, 2.512, P = 0.02) were found, after adjusting for different covariates. Moreover, serum PFOA concentrations were associated with carcinoembryonic antigen (CEA), but their correlation with the LC incidence was not statistically significant. This new finding supports the evidence for the positive associations among PFAS exposure, change of specific tumor marker, and LC risks.			В
D801	ヒト(発がん性)	Omoike, Ogbebor Enaholo; Pack, Robert P; Mamudu, Hadii M; Liu, Ying; Wang, Liang	A cross-sectional study of the association between perfluorinated chemical exposure and cancers related to deregulation of estrogen receptors	2021 Environ Res. 2021 May;196:110329. doi: 10.1016/j.envres.2020.110329. Epub 2020 Oct 14.	BACKGROUND: Environmental exposures acting through different mechanisms have been linked with a number of cancers. Perfluoroalkyl chemicals (PFCs) are endocrine disrupting chemicals affecting estrogen homeostasis. OBJECTIVES: We examined the association between PFCs and a group of estrogen related cancers and explored if increased non-occupational exposure was associated with increased odds of developing these cancers. We also explored which of these chemical exposures was more correlated with each cancer. METHODS: Using data from the National Health and Nutrition Examination Survey (NHANES), we selected participants ≥ 20 years of age. Our outcome variable was presence or absence of breast, prostate, ovarian and uterine cancer (yes/no); our exposure variables were serum PFCs. Logistic regression models were used in investigating the association between PFCs and cancer types and between quartiles of PFCs exposure concentrations and presence or absence of cancer while adjusting for covariates. Discriminant analysis was used to assess the correlation between individual PFCs compounds and individual cancer types. RESULTS: PFCs were associated with increased odds of ovarian cancer; PFOA: 1.02(1.01, 1.02), PFOS: 1.01 (1.012, 1.013), PFHS 1.031 (1.030, 1.033), PFDE: 1.29(1.27, 1.30) and increased odds of breast cancer; PFOA: 1.089(1.089, 1.09), PFOS: 1.011(1.011, 1.011), PFNA: 1.031(1.030, 1.033), PFHS: 1.02 (1.02, 1.02), PFDE: 1.19(1.18, 1.19). PFCs were not associated with increased odds of prostate or uterine cancers. Comparing the odds in quartile 4 to quartile 1 for ovarian cancer, PFOA: 1.77(1.75, 1.79), PFOS: 2.25(2.22, 2.28), PFHS: 1.86(1.84, 1.88), PFDE: 2.11(2.09, 2.14). For breast cancer, PFOA: 2.30(2.28, 2.31), PFOS: 1.47(1.46, 1.48), PFNA: 1.04(1.03, 1.05), PFHS:7.07(6.97,7.17), PFDE: 1.38(1.37, 1.39). PFOA was more correlated with breast cancer (0.7) and PFHS was more correlated with ovarian cancer (0.9). DISCUSSION: PFCs were associated with increased odds of ovarian and breast cancers with a positive			В

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン文ン文 ク献 ① ラ ② ラ
D802	ヒト(発 がん性)	Bartell, Scott M; Vieira, Verónica M	Critical review on PFOA, kidney cancer, and testicular cancer	2021	J Air Waste Manag Assoc. 2021 Jun;71(6):663-679. doi: 10.1080/10962247.2021.1909668.	The carcinogenicity of perfluorooctanoic acid (PFOA) has been reviewed previously by several different regulatory agencies and researchers, with contradictory conclusions-especially regarding epidemiological findings on kidney cancer and testicular cancer. In addition, previous dose-response assessments have focused primarily on evidence from animal studies. This critical review summarizes peer reviewed epidemiological studies on PFOA and cancers of the kidneys and testes, using modified Hill's criteria to assess the evidence for causation. We converted exposures to a common scale based on serum PFOA concentrations and applied meta-analysis to estimate the average increase in cancer risk reported by the studies with sufficient information to estimate serum PFOA. Using random effects meta-analysis, we found that the average relative increase in cancer risk per 10 ng/mL increase in serum PFOA for these studies is 16% (95% CI: 3%, 30%) for kidney cancer and 3% (95% CI: 2%, 4%) for testicular cancer. These associations are most likely causal, but results are limited by the small number of studies for testicular cancer, the overlapping study populations for several studies, and the lack of measured or modeled serum PFOA concentrations for several studies in serum PFOA for these associations are most likely causal, but results are limited by the small number of studies for testicular cancer, the overlapping study populations for several studies, and the lack of measured or modeled serum PFOA for kidney and testicular cancers. These associations are most likely causal, but results are limited by the small number of studies for several studies for testicular cancers. These associations are most likely causal, but results are limited by the small number of studies for testicular cancers. These associations are most likely causal, but results are limited by the small number of studies for testicular cancers. These associations are most likely causal, but results are limited by the small number of studies for testicular c	評価書文 献と重複		A
D803	ヒト(発 がん性)	Shearer, Joseph J; Callahan, Catherine L; Calafat, Antonia M; Huang, Wen- Yi; Jones, Rena R; Sabbisetti, Venkata S; Freedman, Neal D; Sampson, Joshua N; Silverman, Debra T; Purdue, Mark P; Hofmann, Jonathan N	Serum Concentrations of Per- and Polyfluoroalkyl Substances and Risk of Renal Cell Carcinoma	2021	J Natl Cancer Inst. 2021 May 4;113(5):580-587. doi: 10.1093/jnci/djaa143.	BACKGROUND: Per- and polyfluoroalkyl substances (PFAS) are highly persistent chemicals that have been detected in the serum of over 98% of the US population. Studies among highly exposed individuals suggest an association with perfluorooctanoic acid (PFOA) exposure and kidney cancer. It remains unclear whether PFOA or other PFAS are renal carcinogens or if they influence risk of renal cell carcinoma (RCC) at concentrations observed in the general population. METHODS: We measured prediagnostic serum concentrations of PFOA and 7 additional PFAS in 324 RCC cases and 324 individually matched controls within the Prostate, Lung, Colorectal and Ovarian Cancer Screening Trial. Multivariable conditional logistic regression was used to estimate odds ratios (OR) and 95% confidence intervals (CIs) relating serum PFAS concentrations and RCC risk. Individual PFAS were modeled continuously (log2-transformed) and categorically, with adjustment for kidney function and additional potential confounders. All statistical tests were 2-sided. RESULTS: We observed a positive association with RCC risk for PFOA (doubling in serum concentration, ORcontinuous = 1.71, 95% CI = 1.23 to 2.37, P = .002) and a greater than twofold increased risk among those in the highest quartile vs the lowest (OR = 2.63, 95% CI = 1.07 to 2.63, P = .02) and remained apparent in analyses restricted to individuals without evidence of diminished kidney function and in cases diagnosed 8 or more years after phlebotomy. CONCLUSIONS: Our findings add substantially to the weight of evidence that PFOA is a renal carcinogen and may have important public health implications for the many individuals exposed to this ubiquitous and highly persistent chemical.	評価書文 献と重複		A
D804	ヒト(発 がん性)	Li, Huiqi; Hammarstrand, Sofia; Midberg, Bo; Xu, Yiyi; Li, Ying; Olsson, Daniel S; Fletcher, Tony; Jakobsson, Kristina; Andersson, Eva M	Cancer incidence in a Swedish cohort with high exposure to perfluoroalkyl substances in drinking water	2022	Environ Res. 2022 Mar;204(Pt C):112217. doi: 10.1016/j.envres.2021.112217. Epub 2021 Oct 15.	BACKGROUND: The use of firefighting foams at a military airport resulted in high levels of perfluorinated substances (PFAS) in the drinking water distributed to one-third of households in the Swedish municipality of Ronneby between the mid-1980s and the end of 2013. METHOD: The Ronneby Register Cohort, a large cohort comprising all individuals (N = 60,507) who ever lived in the Ronneby municipality during the period of drinking water contamination, was linked to the Swedish Cancer Register 1985-2016. Individual exposure was classified based on comprehensive data on yearly residential address and water distribution. External analysis explored standardized cancer incidence ratios (SIR) for residents never, or ever, residing in the contaminated water district, compared with those residing in other towns in the same county as reference population. Cox models provided hazard ratios (HR) for different exposure groups within the cohort. RESULTS: 5,702 individuals with cancer were identified. SIR for overall cancer was 1.04 for men (95%CI 0.96-1.12) and 0.89 for women (95%CI 0.82-0.96) who ever lived in the contaminated drinking water area. Kidney cancer, which was reported with increased risk in C8 study, showed somewhat elevated HR in this study (HR 1.27; 95%CI 0.85-1.89). The HR was modestly elevated for bladder cancer (HR 1.32; 95%CI 1.01-1.72), and reduced for prostate cancer (HR 0.83; 95%CI 0.71-0.98). In subjects who ever lived in the contaminated water area during 2005-2013, when exposure was estimated to be highest, higher risks for kidney cancer (HR 1.84; 95%CI 1.00-3.37) but lower for prostate cancer (HR 0.76; 95%CI 0.59-0.98) were observed. CONCLUSION: Analysis of this large cohort exposed to high levels of PFAS, dominated by PFHxS and PFOS, revealed no evidence for an overall increased risk of cancer. A moderately increased risk of kidney cancer was observed, in accordance with previous findings after PFAS exposure dominated by PFOA.			В

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D805	ヒト (発 がん性)	Steenland, Kyle; Fletcher, Tony; Stein, Cheryl R; Bartell, Scott M; Darrow, Lyndsey; Lopez-Espinosa, Maria-Jose; Barry Ryan, P; Savitz, David A	Review: Evolution of evidence on PFOA and health following the assessments of the C8 Science Panel	2020	Environ Int. 2020 Dec;145:106125. doi: 10.1016/j.envint.2020.106125. Epub 2020 Sep 18.	BACKGROUND: The C8 Science Panel was composed of three epidemiologists charged with studying the possible health effects of PFOA in a highly exposed population in the mid-Ohio Valley. The Panel determined in 2012 there was a 'probable link' (i.e., more probable than not based on the weight of the available scientific evidence) between PFOA and high cholesterol, thyroid disease, kidney and testicular cancer, pregnancy-induced hypertension, and ulcerative colitis. OBJECTIVE: Here, former C8 Science Panel members and collaborators comment on the PFOA literature regarding thyroid disorders, cancer, immune and auto-immune disorders, liver disease, hypercholesterolemia, reproductive outcomes, neurotoxicity, and kidney disease. We also discuss developments regarding fate and transport, and pharmacokinetic models, and discuss causality assessment in cross-sectional associations among low-exposed populations. DISCUSSION: For cancer, the epidemiologic evidence remains supportive but not definitive for kidney and testicular cancers. There is consistent evidence of a positive association between PFOA and cholesterol, but no evidence of an association with heart disease. There is evidence for an association with ulcerative colitis, but not for other auto-immune diseases. There is good evidence that PFOA is associated with immune response, but uneven evidence for an association with liver enzymes, but not with liver disease. There is little evidence of an association with neurotoxicity. Suggested reductions in birthweight may be due to reverse causality and/or confounding. Fate and transport models and pharmacokinetic models remain central to estimating past exposure for new cohorts, but are difficult to develop without good historical data on emissions of PFOA into the environment. CONCLUSION: Overall, the epidemiologic evidence remains limited. For a few outcomes there has been some replication of our earlier findings. More longitudinal research is needed in large populations with large exposure contrasts. Additional cross	評価書文	В
D806	ヒト(発がん性)	Gogola-Mruk, Justyna; Hoffmann-Mł odzianowska, Marta; Kamiń ska, Kinga; Ptak, Anna	Mixtures of persistent organic pollutants increase ovarian granulosa tumor cell line migration and spheroid invasion by upregulating MMP2 expression and activity via IGF1R	2021	Toxicology. 2021 Mar 30;452:152715. doi: 10.1016/j.tox.2021.152715. Epub 2021 Feb 8.	Granulosa cell tumors (GCT) of the ovary have a good prognosis. Recurrence tends to be late; however, > 66 % of patients with recurrent GCT die from the disease. Most recurrences are abdominopelvic, although distant metastases have been documented. Here, we tested the hypothesis that a mixture of persistent endocrine-disrupting chemicals (EDCs) stimulates the invasion of GCT cells. We selected perfluorooctanoate (PFOA, 2 ng/mL), perfluorooctanesulfonate (PFOS, 8 ng/mL), 2,2- dichlorodiphenyldichloroethylene (p,p'-DDE, 1 ng/mL), polychlorinated biphenyl 153 (PCB153, 100 pg/mL), and hexachlorobenzene (HCB, 50 pg/mL), which have the highest measured concentrations in follicular fluid of women undergoing treatment with assisted reproductive technology. The human GCT cell lines COV434 and KGN have been used as in vitro models of juvenile (JGCT) and adult (AGCT) GCT subtypes, respectively. Cells were treated with a mixture of the test compounds for 15 min prior to analysis of protein phosphorylation; for 4 h prior to analysis in a circular chemorepellent-induced defect assay; for 6 h prior to analysis of matrix metalloproteinase 2 (MMP2) activity; for 24 h prior to analysis of migration, invasion, and gene expression; and for 48 h prior to analysis of protein expression. First, we showed that KGN cells migrated and exhibited invasive behavior. By contrast, COV434 cells lacked migration and invasion potential. Moreover, expression of mesenchymal genes and the gene encoding MMP2 was higher in KGN cells, and that of epithelial genes lower, than that in COV434 cells. Treatment of KGN cells with the EDC mixture in AGCT invasion is not related to changes in expression of epithelial and mesenchymal genes; rather, it is related to increased expression and activity of MMP2. Additionally, silencing insulin-like growth factor 1 (IGF1R) in AGCT abolished the stimulatory effect of the EDC mixture on KGN spheroid invasion. These results demonstrate that the EDC mixture increased KGN spheroid invasion by stimulating expression and		В

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D807	ヒト(発 がん性)	Papadopoulou, Eleni; Stratakis, Nikos; Basagaña, Xavier; Brantsæ ter, Anne Lise; Casas, Maribel; Fossati, Serena; Gražulevičienė, Regina; Små stuen Haug, Line; Heude, Barbara; Maitre, Léa; McEachan, Rosemary R C; Robinson, Oliver; Roumeliotaki, Theano; Sabidó, Eduard; Borràs, Eva; Urquiza, Jose; Vafeiadi, Marina; Zhao, Yingi: Slama, Ré	Prenatal and postnatal exposure to PFAS and cardiometabolic factors and inflammation status in children from six European cohorts	2021	Environ Int. 2021 Dec;157:106853. doi: 10.1016/j.envint.2021.106853. Epub 2021 Sep 6.	Developing children are particularly vulnerable to the effects of exposure to per- and polyfluoroalkyl substances (PFAS), a group of endocrine disrupting chemicals. We hypothesized that early life exposure to PFASs is associated with poor metabolic health in children. We studied the association between prenatal and postnatal PFASs mixture exposure and cardiometabolic health in children, and the role of inflammatory proteins. In 1,101 mothers-child pairs from the Human Early Life Exposome project, we measured the concentrations of PFAS in blood collected in pregnancy and at 8 years (range = 6-12 years). We applied Bayesian Kernel Machine regression (BKMR) to estimate the associations between exposure to PFAS mixture and the cardiometabolic factors as age and sex- specific z-scores of waist circumference (WC), systolic and diastolic blood pressures (BP), and concentrations of triglycerides (TG), high-density lipoprotein (HDL-C) and low-density lipoprotein (LDL-C) cholesterol. We measured thirty six inflammatory biomarkers in child plasma and examined the underlying role of inflammatory status for the exposure-outcome association by integrating the three panels into a network. Exposure to the PFAS mixture was positively associated with HDL-C and systolic BP, and negatively associated with WC, LDL-C and TG. When we examined the independent effects of the individual chemicals in the mixture, prenatal PFHXS was negatively associated with HDL-C and prenatal PFNA was positively associated with WC and these were opposing directions. The selected inflammatory biomarkers were positively, while the postnatal PFAS were negatively related with the included cardiometabolic factors, and only prenatal PFOA was positively related with the pro-inflammatory cytokine IL-1beta and WC. Our study supports that prenatal PFOA was positively related with the pro-inflammatory cytokine IL-1beta and WC. Our study supports that prenatal, rather than postnatal, PFAS exposure might contribute to an unfavorable lipidemic profile and adiposity i		В
D808	ヒト(発がん性)	Yu, Guoqi; Luo, Fei; Nian, Min; Li, Shuman; Liu, Bin; Feng, Liping; Zhang, Jun	Exposure to Perfluoroalkyl Substances During Pregnancy and Fetal BDNF Level: A Prospective Cohort Study	2021	Front Endocrinol (Lausanne). 2021 Jun 1;12:653095. doi: 10.3389/fendo.2021.653095. eCollection 2021.	BACKGROUND: Humans are widely exposed to environmental perfluoroalkyl substances (PFAS), which may affect fetal neurodevelopment. Brain-derived neurotrophic factor (BDNF) is an important factor in neurodevelopment, but its role in PFAS-induced neurotoxicity is unclear. We investigated the association between prenatal PFAS exposure and fetal BDNF level in the umbilical cord blood in a large prospective cohort. METHODS: A total of 725 pregnant women who participated in the Shanghai Birth Cohort were included. 10 PFAS were measured by high-performance liquid chromatography/tandem mass spectrometry (HPLC/MS-MS) in the plasma samples of early pregnancy. The BDNF level was determined by ELISA. The concentration of total mercury (Hg) in the umbilical cord blood was tested by cold vapor atomic absorption spectrometry (AAS) and included as a main confounder, along with other covariates. Multiple linear regression was used to explore the associations between PFAS on BDNF level. RESULTS: The mean BDNF level in the total population was 10797 (±4713) pg/ml. Male fetuses had a higher level than female fetuses (P<0.001). A significant positive association was observed between PFHxS and BDNF level after adjusting for potential confounders [β =1285 (95% CI: 453, 2118, P=0.003)]. No association was observed between other PFAS congeners and BDNF level. Results of the mixed exposure model showed that the joint effects of PFAS mixture were not associated with BDNF [β =447 (95% CI: -83, 978, P=0.10)], while the positive associations were more prominent in male [β =773 (95% CI: 25, 1520, P= 0.04)] than female fetuses [β =105 (95% CI: -791, 1002, P= 0.82)] for the mixed effects. CONCLUSIONS: Prenatal exposure to PFHxS was associated with an increased BDNF level in the umbilical blood, especially in male fetuses.		В

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨 (原文)	備考	出 情 対 報 象 抽	ン文 ン文 ク献 ① ラ ② ラ
D809	ヒト(発がん性)	Oh, Jiwon; Schmidt, Rebecca J; Tancredi, Daniel; Calafat, Antonia M; Roa, Dorcas L; Hertz- Picciotto, Irva; Shin, Hyeong- Moo	Prenatal exposure to per- and polyfluoroalkyl substances and cognitive development in infancy and toddlerhood	2021	Environ Res. 2021 May;196:110939. doi: 10.1016/j.envres.2021.110939. Epub 2021 Feb 26.	BACKGROUND/OBJECTIVE: Per- and polyfluoroalkyl substances (PFAS) have neurobehavioral toxicity in experimental studies. Evidence on associations between prenatal PFAS exposure and child's cognitive development is inconsistent partly due to differences in assessment time points and tools. We examined associations of prenatal maternal serum PFAS concentrations with child's cognitive development assessed at multiple time points in infancy and toddlerhood. METHODS: We included 140 mother- child pairs from MARBLES (Markers of Autism Risk in Babies - Learning Early Signs), a longitudinal cohort of children with a first degree relative who was diagnosed with autism spectrum disorder followed from birth. Study children's cognitive development was assessed at 6, 12, 24, and 36 months of age using the Mullen Scales of Early Learning (MSEL) which provides an overall Early Learning Composite (normative mean of 100 and SD of 15) and four subscales (i.e., fine motor, visual reception, receptive language, and expressive language abilities; normative mean of 50 and SD of 10). Nine PFAS were quantified in maternal serum collected during pregnancy. We examined associations of log 2-transformed prenatal maternal serum PFAS concentrations with the MSEL Composite and each of the subscale scores at each time point as well as longitudinal changes in the scores over the four time points. We also classified trajectories into low- and high-score groups and fit Poisson regression models to estimate associations expressed as relative risks (RR). RESULTS: Among six PFAS detected in more than 60% of the samples, prenatal maternal serum perfluorooctanoate (PFOA) was inversely associated with child's Composite score at 24 months ($\beta = -5.22$, 95% CI: -8.27, -2.17) and 36 months of age ($\beta = -5.18$, 95% CI: -9.46, -0.91), while other five PFAS were not strongly associated with Composite score at any time points. When assessing longitudinal changes in the scores over the four time points, PFOA was associated with trajectories having a negative			A
D810	ヒト(発 がん性)	Chen, Lin; Tong, Chuanliang; Huo, Xiaona; Zhang, Jun; Tian, Ying	Prenatal exposure to perfluoroalkyl and polyfluoroalkyl substances and birth outcomes: A longitudinal cohort with repeated measurements	2021	Chemosphere. 2021 Mar;267:128899. doi: 10.1016/j.chemosphere.2020.128899. Epub 2020 Nov 7.	Dopulation-based studies are needed to commit our initings.BACKGROUND: Previous studies on perfluoroalkyl and polyfluoroalkyl substances (PFAS) showed inconsistent results whenbiological samples were collected in different time of pregnancy. OBJECTIVES: To describe the change of PFAS concentrationduring pregnancy and to identify a sensitive window for adverse effects of PFAS on the fetus. METHODS: A total of 255 pregnantwomen were selected from the Shanghai Birth Cohort (SBC). We quantified 10 PFAS with high-performance liquidchromatography/tandem mass spectrometry (HPLC-MS/MS) in maternal plasma at three trimesters and cord blood at delivery.Multiple linear regression analyses were used to analyze the association between PFAS and birth outcomes, including birthweight, birth length, and head circumference. RESULTS: The concentrations of most PFAS declined substantially duringpregnancy. PFOS, PFNA, PFDA, PFUA and PFDoA were negatively related to birth length only in the first trimester. Thecoefficients and 95% confidence intervals (CI) of birth length change with a log-unit increase in PFOS, PFNA, PFDA, PFUS andPFDoA concentrations were -0.27 cm (-0.51, -0.02), -0.34 cm (-0.65, -0.03), -0.27 cm (-0.53, -0.01), -0.29 cm (-0.58, -0.01), and -0.54 cm (-1.00, -0.08), respectively. The effects were only observed for female fetuses. No association between PFAS and birthweight or head circumference was observed. CONCLUSION: The concentrations of most PFAS in the maternal circulation declinedduring pregnancy. There were negative associations between several PFAS and birth length. The sensitive window of exposureappeared to be the first trimester. The association was stronger for female fetuses.			В
D811	ヒト(発 がん性)	Pan, Dongxiang; Shao, Yantao; Song, Yanye; Huang, Dongping; Liu, Shun; Zeng, Xiaoyun; Liang, Jun; Juan Jennifer Tan, Hui; Qiu, Xiaoqiang	Association between maternal per- and polyfluoroalkyl substance exposure and newborn telomere length: Effect modification by birth seasons	2022	Environ Int. 2022 Mar;161:107125. doi: 10.1016/j.envint.2022.107125. Epub 2022 Feb 17.	BACKGROUND: Telomere length (TL) is an important biomarker of biological aging and disease that may be affected by prenatal exposure to environmental pollutants. Birth seasons have been linked to reproductive and immune-related diseases. Prenatal exposure to per- and polyfluoroalkyl substance (PFAS) has been associated with adverse birth outcomes, but the effects of PFAS and birth seasons on newborn TL are poorly understood. OBJECTIVES: To explore the individual and combined effects of maternal PFAS exposure on newborn TL, with exploration of the interaction between PFAS and birth seasons on newborn TL. METHODS: Between June 2015 and May 2018, a total of 499 mother-newborn pairs were recruited for a birth cohort study in Guangxi, China. Maternal blood samples were collected during pregnancy. Nine PFASs were measured by ultraperformance liquid chromatography-mass spectrometry. Newborn TL was assessed using quantitative real-time polymerase chain reaction. Modeling newborn TL as the outcome, multivariable linear regressions were performed for individual PFAS exposures, and Bayesian Kernel Machine Regressions were performed for PFAS mixtures. Furthermore, interaction analyses were conducted to evaluate the effect modification by birth seasons in these relationships. RESULTS: For both single and multipollutant models, PFASs exposure were inversely associated with newborn TL, although none of the relationships were significant. Each In-transformed unit concentration increase in PFOA was related to a 20.41% (95% CI: -30.44%, -8.93%) shorter TL in spring-born infants but not in those born in other birth seasons. Mothers in the middle and highest tertiles of PFOA exposure had 11.69% and 10.71% shorter TLs in spring-born infants, respectively. CONCLUSION: Maternal PFAS exposure showed little association with newborn TL.			В
D812	ヒト(発 がん性)	Fenner, Annette	Is PFOA a renal carcinogen?	2020	Nat Rev Urol. 2020 Nov;17(11):602. doi: 10.1038/s41585- 020-00388-3.	No abstract available			D

パーフルオロ化合物に係る国際機関等の評価及び科学的知見の情報収集並びに整理

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 村 報 教 抽	ン 文 ク 献 ① ラ	ン 文 ク 献 ② ラ
D813	ヒト(発 がん性)	Stevenson, Eric D; Kleinman, Michael T; Bai, Xuelien; Barlaz, Morton; Abraczinskas, Michael; Guidry, Virginia; Watson, John; Chow, Judy	Critical review on PFOA, kidney cancer, and testicular cancer	2021	J Air Waste Manag Assoc. 2021 Oct;71(10):1265-1276. doi: 10.1080/10962247.2021.1975995.	No abstract available			D	
D814	ヒト(発 がん性)	Imir, Ozan Berk; Kaminsky, Alanna Zoe; Zuo, Qian-Ying; Liu, Yu-Jeh; Singh, Ratnakar; Spinella, Michael J; Irudayaraj, Joseph; Hu, Wen-Yang; Prins, Gail S; Madak Erdogan, Zeynep	Per- and Polyfluoroalkyl Substance Exposure Combined with High-Fat Diet Supports Prostate Cancer Progression	2021	Nutrients. 2021 Oct 30;13(11):3902. doi: 10.3390/nu13113902.	Per- and polyfluoroalkyl substances (PFAS) are synthetic chemicals utilized in various industrial settings and include products such as flame retardants, artificial film-forming foams, cosmetics, and non-stick cookware, among others. Epidemiological studies suggest a link between increased blood PFAS levels and prostate cancer incidence, but the mechanism through which PFAS impact cancer development is unclear. To investigate the link between PFAS and prostate cancer, we evaluated the impact of metabolic alterations resulting from a high-fat diet combined with PFAS exposure on prostate tumor progression. We evaluated in vivo prostate cancer xenograft models exposed to perfluorooctane sulfonate (PFOS), a type of PFAS compound, and different diets to study the effects of PFAS on prostate cancer progression and metabolic activity. Metabolomics and transcriptomics were used to understand the metabolic landscape shifts upon PFAS exposure. We evaluated metabolic changes in benign or tumor cells that lead to epigenomic reprogramming and altered signaling, which ultimately increase tumorigenic risk and tumor aggressiveness. Our studies are the first in the field to provide new and clinically relevant insights regarding novel metabolic and epigenetic states as well as to support the future development of effective preventative and therapeutic strategies for PFAS-induced prostate cancers. Our findings enhance understanding of how PFAS synergize with high-fat diets to contribute to prostate cancer development and establish an important basis to mitigate PFAS exposure.			E	В
D815	ヒト(発 がん性)	Itoh, Hiroaki; Harada, Kouji H; Kasuga, Yoshio; Yokoyama, Yoshio; Onuma, Hiroshi; Nishimura, Hideki; Kusama, Ritsu; Yokoyama, Kazuhito; Zhu, Jing; Harada Sassa, Mariko; Tsugane, Shoichiro; Iwasaki, Motoki	Serum perfluoroalkyl substances and breast cancer risk in Japanese women: A case-control study	2021	Sci Total Environ. 2021 Dec 15;800:149316. doi: 10.1016/j.scitotenv.2021.149316. Epub 2021 Jul 29.	BACKGROUND: Perfluoroalkyl substances (PFASs) may contribute to causing breast cancer; however, associations between exposure to PFASs and risk of breast cancer are controversial. OBJECTIVES: In the present study, we newly distinguished branched isomers of PFASs from their linear isomers and aimed to investigate the association between serum PFAS concentrations and breast cancer risk in Japanese women. METHODS: We used a case-control design to study 405 eligible matched pairs attending four hospitals in Nagano Prefecture, Japan from May 2001 to September 2005. We used in-port arylation gas-chromatography mass spectrometry with negative chemical ionization to measure serum concentrations of 20 PFAS congeners. We calculated multivariable-adjusted odds ratios (ORs) and 95% confidence intervals (Cls) of breast cancer and its hormone-receptor subtypes by quartiles or tertiles of serum PFASs. RESULTS: After multivariable adjustment for breast cancer risk factors, we found that serum concentrations of 20 PFAS congeners were significantly inversely associated with risk of breast cancer. Comparing the extreme quartiles of linear isomers of perfluoroctane sulfonate or perfluoroctanoic acid, ORs were 0.15 (95% Cl: 0.07, 0.33 P for trend <0.0001) and 0.21 95% Cl: 0.10, 0.44 P for trend <0.0001). Among postmenopausal women, whereas we found the linear isomer of perfluorotridecanoic acid to be inversely associated with breast cancer risk, a medium degree of exposure to the branched isomer of perfluorotridecanoic acid was associated with a marginally increased risk of breast cancer (OR [95% Cl] = 1.74 [0.98, 3.09]). DISCUSSION: In our case-control study, we found overall no association between serum PFAS concentrations and breast cancer. Kany inverse associations between serum PFAS concentrations and breast cancer.			В	
D816	ヒト(発 がん性)	Polemi, Katelyn M; Nguyen, Vy K; Heidt, Julien; Kahana, Adam; Jolliet, Olivier; Colacino, Justin A	Identifying the link between chemical exposures and breast cancer in African American women via integrated in vitro and exposure biomarker data	2021	Toxicology. 2021 Nov;463:152964. doi: 10.1016/j.tox.2021.152964. Epub 2021 Sep 30.	Among women, breast cancer is the most prevalent form of cancer worldwide and has the second highest mortality rate of any cancer in the United States. The breast cancer related death rate is 40 % higher in non-Hispanic Black women compared to non-Hispanic White women. The incidence of triple negative breast cancer (TNBC), an aggressive subtype of breast cancer for which there is no targeted therapy, is also approximately three times higher for Black, relative to, White women. The drivers of these differences are poorly understood. Here, we aimed to identify chemical exposures which play a role in breast cancer disparities. Using chemical biomonitoring data from the National Health and Nutrition Examination Survey (NHANES) and biological activity data from the EPA's ToxCast program, we assessed the toxicological profiles of chemicals to which US Black women are disproportionately exposed. We conducted a literature search to identify breast cancer targets in ToxCast to analyze the response of chemicals with exposure disparities in these assays. Forty-three chemical biomarkers are significantly higher in Black women. Investigation of these chemicals in ToxCast resulted in 32,683 assays for analysis, 5172 of which contained nonzero values for the concentration at which the dose-response fitted model reaches the cutoff considered "active". Of these chemicals BPA, PFOS, and thiram are most comprehensively assayed. 2,5-dichlorophenol, 1,4-dichlorobenzene, and methyl and propyl parabens had higher biomarker concentrations in Black women and moderate testing and activity in ToxCast. The distribution of active concentrations for these chemicals in ToxCast assays are comparable to biomarker concentrations in Black women and moderate testing and activity in ToxCast. The distribution of active concentrations for these chemicals in ToxCast assays are comparable to biomarker concentrations in Black women NHANES participants. Through this integrated analysis, we identify that multiple chemicals, including thiram, propylparabe			В	

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	書誌情報 要旨(原文)		出 情 対 報 象 抽	ン 文 ン 文 ク 献 ク 献 ① ラ ② ラ
D817	ヒト(発 がん性)	0	What's in the water? Tumor and serum levels of per - and polyfluoroalkyl PFAS in hepatobiliary and gastrointestinal malignancies	2022	Am J Surg. 2022 Mar;223(3):519-520. doi: 10.1016/j.amjsurg.2022.02.031. Epub 2022 Feb 10.	No abstract available			D
D818	ヒト(発 がん性)	Messmer, Mindi; Salloway, Jeff; Shara, Nawar; Locwin, Ben; Ward Harvey, Megan; Traviss, Nora	Author Response: Risk of Cancer in a Community Exposure to Per- and Poly-Fluoroalkyl Substances	2022	Environ Health Insights. 2022 Jul 12;16:11786302221112920. doi: 10.1177/11786302221112920. eCollection 2022.	No abstract available			D
D819	ヒト(発 がん性)	Phosri, Arthit; Paoin, Kanawat; Harada, Kouji H	Comment on "Associations between Novel and Legacy Per- and Polyfluoroalkyl Substances in Human Serum and Thyroid Cancer: A Case and Healthy Population in Shandong Province, East China"	2022	Environ Sci Technol. 2022 Sep 20;56(18):13510-13511. doi: 10.1021/acs.est.2c04610. Epub 2022 Sep 1.	No abstract available			D
D820	ヒト(発 がん性)	Peacock, Janet L; Laue, Hannah E; Titus, Linda; Rees, Judy R	Response to Messmer et al (Risk of Cancer in a Community Exposed to Per- and Poly-Fluoroalkyl Substances, Environmental Health Insights 2022, Volume 16: 1-16)	2022	Environ Health Insights. 2022 Jul 12;16:11786302221112914. doi: 10.1177/11786302221112914. eCollection 2022.	Background: Per- and polyfluoroalkyl substances (PFAS) emissions from a plastic coating industrial source in southern New Hampshire (NH) have contaminated at least 65 square miles of drinking water. Prior research indicates that high levels of PFAS are associated with a variety of adverse health outcomes, including an increased risk of cancer. Reports indicate that mean blood serum levels of perfluorooctanoic acid (PFOA), one type of PFAS, in residents of the exposed community are more than 2 times greater than the mean blood serum level in the US. Merrimack public water supply customers also have higher average blood levels of perfluorooctane sulfonic acid (PFOS) and perfluorohexane sulfonic acid (PFHxS) than the time—matched US average. A 2018 report concludes that the incidence rate of cancer in Merrimack does not exceed the incidence rate of cancer in NH in general. However, prior reporting on the risk of cancer in Merrimack is compared only to a state-wide metric influenced by the Merrimack cancer incidence. Methods: Our ecological study compared the risk in Merrimack, NH residents for 24 types of cancer between 2005 and 2014, targeted in a previous study, and all-cause cancers, to US national cancer rates and cancer rates in demographically similar towns in New England. Four New England "unexposed towns" were chosen based on demographic similarity to Merrimack, with no documented PFAS exposure in water supplies. We utilized unadjusted logistical regression to approximate risk ratios (RR) and 95% confidence intervals (CI) assessing the risk of cancer in Merrimack NH to each of the 4 comparator communities, the pooled comparator variable, and national average incidence. Results: Residents of Merrimack, NH experienced a significantly higher risk of thyroid cancer (RR = 1.47, 95% CI 1.12-1.93), bladder cancer (RR = 1.45, 95% CI 1.17-1.81), esophageal cancer (RR = 1.71, 95% CI 1.12-2.39), colon cancer (RR = 1.27, risk of all-cause cancer (RR = 1.34, 95% CI 1.25-1.43), thyroid cancer (RR = 1			D
D821	ヒト(発 がん性)	Liu, Mei; Li, An; Li, Yingming; Zhang, Qinghua; Jiang, Guibin	Response to Comment on "Associations between Novel and Legacy Per- and Polyfluoroalkyl Substances in Human Serum and Thyroid Cancer: A Case and Healthy Population in Shandong Province, East China"	2022	Environ Sci Technol. 2022 Sep 20;56(18):13512-13514. doi: 10.1021/acs.est.2c05480. Epub 2022 Sep 1.	No abstract available			D

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨 (原文)	出 情 備考 対 報 象 抽		ン文ン ク献ク ① ラ②	文献ラ
D822	ヒト(発 がん性)	Wan, Murphy Lam Yim; Co, Vanessa Anna; El-Nezami, Hani	Endocrine disrupting chemicals and breast cancer: a systematic review of epidemiological studies	2022	Crit Rev Food Sci Nutr. 2022;62(24):6549-6576. doi: 10.1080/10408398.2021.1903382. Epub 2021 Apr 5.	BACKGROUND: Endocrine-disrupting compounds (EDCs) are ubiquitous substances that are found in our everyday lives, including pesticides, plasticizers, pharmaceutical agents, personal care products, and also in food products and food packaging. Increasing epidemiological evidence suggest that EDCs may affect the development or progression of breast cancer and consequently lead to lifelong harmful health consequences, especially when exposure occurs during early life in humans. Yet so far no appraisal of the available evidence has been conducted on this topic. OBJECTIVE: To systematically review all the available epidemiological studies about the association of the levels of environmental exposures of EDCs with breast cancer risk. METHODS: The search was performed in accordance with the PRISMA guidelines. We retrieved articles from PubMed (MEDLINE) until 10 March 2021. The key words used in this research were: "Endocrine disruptor(s)" OR "Endocrine disrupting chemical(s)" OR any of the EDCs mentioned below AND "Breast cancer" to locate all relevant articles published. We included only cohort studies and case-control studies. All relevant articles were accessed in full text and were evaluated and summarized in tables. RESULTS: We identified 131 studies that met the search criteria and were included in this systematic review. EDCs reviewed herein included pesticides (e.g. p,p'-dichlorodiphenyltrichloroethane (DDT), p,p'-dichlorodiphenyldichloroethylene (DDE), atrazine, 2,3,7,8-tetrachloridibenzo-p-dioxin (TCDD or dioxin)), synthetic chemicals (e.g. bisphenol A (BPA), phthalates, per- and polyfluoroalkyl substances (PFAS), parabens, polychlorinated biphenyls (PCBs), polybrominated diphenyl ethers (PBDEs), contraceptive pills), phytoestrogens (e.g. genistein, resveratrol), and certain mycotoxins (e.g. zearalenone). Most studies assessed environmental EDCs exposure via biomarker measurements. CONCLUSION: We identified certain EDC exposures could potentially elevate the risk of breast cancer. As majority of EDCs are hig			В	
D823	ヒト (肝 毒性)	Liu, Jiao-Jiao; Cui, Xin-Xin; Tan, Ya-Wen; Dong, Peng-Xin; Ou, Yan-Qiu; Li, Qing-Qing; Chu, Chu; Wu, Lu-Yin; Liang, Li-Xia; Qin, Shuang- Jian; Zeeshan, Mohammed; Zhou, Yang; Hu, Li-Wen; Liu, Ru- Qing; Zeng, Xiao- Wen; Dong, Guang-Hui; Zhao, Xiao-Miao	Per- and perfluoroalkyl substances alternatives, mixtures and liver function in adults: A community- based population study in China	2022	Environ Int. 2022 May;163:107179. doi: 10.1016/j.envint.2022.107179. Epub 2022 Mar 21.	Experimental evidence has shown that per- and polyfluoroalkyl substances (PFAS) alternatives and mixtures may exert hepatotoxic effects in animals. However, epidemiological evidence is limited. This research aimed to explore associations of PFAS and the alternatives with liver function in a general adult population. The study participants consisted of 1,303 adults from a community-based cross-sectional investigation in Guangzhou, China, from November 2018 to August 2019. We selected 13 PFAS with detection rates > 85% in serum samples and focused on perfluorooctane-sulfonic acid (PFOS), perfluorootanoic acid (PFOA) and their alternatives [6:2 chlorinated polyfluorinated ether sulfonate (6:2 Cl-PFESA), 8:2 Cl-PFESA, and perfluorohexanoic acid (PFHxA)] as predictors of outcome. Six liver function biomarkers (ALB, ALT, AST, GGT, ALP, and DBIL) were chosen as outcomes. We applied regression models with restricted cubic spline function to explore correlations between single PFAS and liver function and inspected the combined effect of PFAS mixtures on liver by applying Bayesian kernel machine regression (BKMR). We discovered positive associations among PFAS and liver function biomarkers except for ALP. For example, compared with the 25th percentile of PFAS concentration, the level of ALT increased by 12.36% (95% Cl: 7.91%, 16.98%) for In-6:2 Cl-PFESA, 5.59% (95% Cl: 2.35%, 8.92%) for In-8:2 Cl-PFESA, 3.56% (95% Cl: -0.39%, 7.68%) for In-PFHxA, 13.91% (95% Cl: 8.93%, 19.13%) for In-PFOA, and 14.25% (95% Cl: 9.91%, 18.77%) for In-PFOS at their 75th percentile. In addition, higher exposed serum PFAS was found to be correlated with greater odds of abnormal liver function. Analysis from BKMR models also showed an adverse association between PFAS mixtures and liver function. The combined effect of the PFAS mixture appeared to be non-interactive, in which PFOS was the main contributor to the overall effect. Our findings provide evidence of associations between PFAS alternatives, PFAS mixtures, and liver function in the gener		1	Α,	A

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン 文 ク 献 ① ラ	ン 文 ク 献 ② ラ
D824	ヒト (肝 毒性)	Borghese, Michael M; Liang, Chun Lei; Owen, James; Fisher, Mandy	Individual and mixture associations of perfluoroalkyl substances on liver function biomarkers in the Canadian Health Measures Survey	2022	Environ Health. 2022 Sep 14;21(1):85. doi: 10.1186/s12940- 022-00892-6.	BACKGROUND: Perfluoroalkyl substances can disrupt hepatic metabolism and may be associated with liver function biomarkers. We examined individual and mixture associations of PFAS on liver function biomarkers in a representative sample of Canadian adults. We explored the potential for effect modification by sex and body mass index, as well as by physical activity level which may attenuate the deleterious effect of PFAS on metabolic disorders. METHODS: We analyzed data from participants aged 20-74 from the Canadian Health Measures Survey. We used linear regression to examine associations between plasma concentrations of PFOA, PFOS, PFHXS, PFNA, PFDA, and PFUDA on serum concentrations of aspartate aminotransferase (AST), gamma- glutamyltransferase (GGT), alkaline phosphatase (ALP), alanine aminotransferase (ALT) and total bilirubin. We used quantile g- computation to estimate associations with a PFAS mixture for each simultaneous, one-quartile change in PFAS concentrations. RESULTS: Each doubling of PFOA, PFOS, PFHxS, or PFNA concentrations was associated with higher AST, GGT, and ALP concentrations. Each doubling of PFOA concentrations was associated with 16.5% (95%CI: 10.4, 23.0) higher GGT concentrations among adults not meeting Canada's physical activity guidelines vs. 6.6% (95%CI: -1.6, 15.5) among those meeting these guidelines. Sex and BMI also modified some associations, though to a lesser extent. We did not observe associations between ALT and PFOA (1.2% change; 95%CI: -2.5, 4.9), PFOS (2.2% change; 95%CI: -0.8, 5.3), or PFHxS (1.5% change; 95%CI: -0.4, 3.4). We also did not observe consistent associations for PFDA and PFUDA or with total bilirubin. In quantile g-computation models, each simultaneous one-quartile increase in the PFAS mixture was positively associated with AST (7.5% higher; 95%CI: 4.0, 10.4), GGT (9.7% higher; 95%CI: 1.7, 17.0), and ALP (2.8% higher; 95%CI: 0.5, 5.4). CONCLUSION: Higher plasma concentrations of PFOA, PFOS, PFHxS, and PFNA - both individually and as a mixture - were associa		1	A	A
D825	ヒト (肝 毒性)	Choi, Jihee; Kim, Jong-Yeon; Lee, Hae-Jeung	Human Evidence of Perfluorooctanoic Acid (PFOA) Exposure on Hepatic Disease: A Systematic Review and Meta-Analysis	2022	Int J Environ Res Public Health. 2022 Sep 8;19(18):11318. doi: 10.3390/ijerph191811318.	BACKGROUND: Perfluorooctanoic acid (PFOA) is widely used throughout different industries, including the food industry, because it is resistant to heat and prevents water or oil from easily permeating into or contaminating materials coated by PFOA. Although many studies have reported an association between PFOA exposure and the risk of developing hepatic diseases, it is still in debate because they have shown conflicting results. Therefore, this study conducted a systematic review and meta-analysis on the relationship between PFOA exposure and hepatic diseases. METHODS: This study searched studies related to hepatic diseases due to PFOA exposure until 31 December 2021, using PubMed, EMBASE, and Web of Science. This study performed a systematic review and meta-analysis through research question development, literature screening, data extraction, and risk of bias evaluation. This study found 8280 studies after excluding duplicate literature and selected 5 studies in the final stage. Among them, two studies were included in the meta-analysis. RESULTS: The results of the meta-analysis showed that the ALT of people exposed to PFOA was 117% higher than the ALT of those not exposed to PFOA, and it was significantly different (OR = 1.167; 95% CI, 1.086-1.254). CONCLUSION: However, since the number of studies included in the analysis was not large enough to conclude that PFOA exposure was associated with the development of hepatic diseases, more observational studies are needed to confirm its long-term effects.			В	В
D826	ヒト (肝 毒性)	Pfohl, Marisa; Marques, Emily; Auclair, Adam; Barlock, Benjamin; Jamwal, Rohitash; Goedken, Michael; Akhlaghi, Fatemeh; Slitt, Angela L	An 'Omics Approach to Unraveling the Paradoxical Effect of Diet on Perfluorooctanesulfonic Acid (PFOS) and Perfluorononanoic Acid (PFNA)-Induced Hepatic Steatosis	2021	Toxicol Sci. 2021 Apr 12;180(2):277-294. doi: 10.1093/toxsci/kfaa172.	Perfluoroalkyl substances (PFAS) are a family of toxicants universally detected in human serum and known to cause dyslipidemia in animals and humans. Hepatic steatosis, which is defined as lipid deposition in the liver, is known to be a consequence of poor diet. Similarly, PFAS are known to induce hepatic steatosis in animals on a low-fat chow. This study explored diet-PFAS interactions in the liver and their potential to modulate hepatic steatosis. Male C57BL/6J mice were fed with either a low-fat diet (10% kcal from fat, LFD) or a moderately high-fat diet (45% kcal from fat, HFD) with or without perfluoroctanesulfonic acid (3 ppm, PFOS) or perfluorononanoic acid (3 ppm, PFNA) in feed for 12 weeks. Livers were excised for histology and quantification of PFAS and lipids. The PFOS and PFNA coadministration with HFD reduced the hepatic accumulation of lipid and PFAS relative to the LFD treatment groups. Furthermore, transcriptomic analysis revealed that PFAS administration in the presence of an HFD significantly reduces expression of known hepatic PFAS uptake transporters, organic anion transporter proteins. Transcriptomics and proteomics further revealed several pathways related to lipid metabolism, synthesis, transport, and storage that were modulated by PFAS exposure and further impacted by the presence of dietary fat. Both dietary fat content and the chemical functional head group exerted significant influence on hepatic PFAS accumulation and the resulting biochemical signature, suggesting that diet and structure should be considered in the design and interpretation of research on PFAS induced hepatic steatosis.			В	В

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D827	ヒト (肝 毒性)	Massart, Julie; Begriche, Karima; Corlu, Anne; Fromenty, Bernard	Xenobiotic-Induced Aggravation of Metabolic- Associated Fatty Liver Disease	2022	Int J Mol Sci. 2022 Jan 19;23(3):1062. doi: 10.3390/ijms23031062.	Metabolic-associated fatty liver disease (MAFLD), which is often linked to obesity, encompasses a large spectrum of hepatic lesions, including simple fatty liver, steatohepatitis, cirrhosis and hepatocellular carcinoma. Besides nutritional and genetic factors, different xenobiotics such as pharmaceuticals and environmental toxicants are suspected to aggravate MAFLD in obese individuals. More specifically, pre-existing fatty liver or steatohepatitis may worsen, or fatty liver may progress faster to steatohepatitis in treated patients, or exposed individuals. The mechanisms whereby xenobiotics can aggravate MAFLD are still poorly understood and are currently under deep investigations. Nevertheless, previous studies pointed to the role of different metabolic pathways and cellular events such as activation of de novo lipogenesis and mitochondrial dysfunction, mostly associated with reactive oxygen species overproduction. This review presents the available data gathered with some prototypic compounds with a focus on corticosteroids and rosiglitazone for pharmaceuticals as well as bisphenol A and perfluorooctanoic acid for endocrine disruptors. Although not typically considered as a xenobiotic, ethanol is also discussed because its abuse has dire consequences on obese liver.		сс
D828	ヒト (肝 毒性)	Canova, Cristina; Barbieri, Giulia; Zare Jeddi, Maryam; Gion, Massimo; Fabricio, Aline; Daprà, Francesca; Russo, Francesca; Fletcher, Tony; Pitter, Gisella	Associations between perfluoroalkyl substances and lipid profile in a highly exposed young adult population in the Veneto Region	2020	Environ Int. 2020 Dec;145:106117. doi: 10.1016/j.envint.2020.106117. Epub 2020 Sep 21.	BACKGROUND: Residents of a large area of the Veneto Region (North-Eastern Italy) were exposed for decades to drinking water contaminated by perfluoroalkyl substances (PFAS). PFAS have been consistently associated with raised serum lipids, mainly in cross-sectional studies and in background exposure contexts, but the shape of the dose-response relationships has been poorly investigated. The objectives of our study were to evaluate the association between serum PFAS and serum lipids and their dose-response patterns in a large exposed population. METHODS: A cross-sectional study was conducted in 16,224 individuals aged 20-39 years recruited in the regional health surveillance program. 15,720 subjects were analysed after excluding pregnant women (n = 327), participants reporting use of cholesterol lowering medications (n = 67) or with missing information on the selected covariates (n = 110). Twelve PFAS were measured by HPLC-MS in serum; three (PFOA, PFOS and PFHxS) were quantifiable in at least 50% of samples. Non-fasting serum total cholesterol (TC), high-density lipoprotein cholesterol (HDL-C) and triglycerides were measured by enzymatic assays in automated analysers and low-density lipoprotein cholesterol (LDL-C), non-HDL cholesterol and total/HDL cholesterol ratio were calculated. The associations between natural log (ln) transformed PFAS and lipids were assessed through generalized additive models using linear regression and smoothing thin plate splines, adjusted for potential confounders. RESULTS: There were strong positive associations between the ln-transformed PFOA, PFOS, and PFHxS and TC, HDL-C, and LDL-C, and between In PFOA and PFHxS and triglycerides. Each In-increase in PFOA was associated with an increase of 1.94 mg/dL (95% CI 1.48-2.41) in TC, with 4.99 mg/dL (CI 4.12-5.86) for PFOS and 2.02 mg/dL (CI 1.45-2.58) for PFHxS. CONCLUSIONS: Investigation of the shape of exposure-response associations using splines showed a positive association with the largest increases per unit of PFAS in cholesterol l	評価書文 献と重複	A A
D829	ヒト (脂 質)	Andersen, Melvin E; Hagenbuch, Bruno; Apte, Udayan; Corton, J Christopher; Fletcher, Tony; Lau, Christopher; Roth, William L; Staels, Bart; Vega, Gloria L; Clewell, Harvey J 3rd; Longnecker, Matthew P	Why is elevation of serum cholesterol associated with exposure to perfluoroalkyl substances (PFAS) in humans? A workshop report on potential mechanisms	2021	Toxicology. 2021 Jul;459:152845. doi: 10.1016/j.tox.2021.152845. Epub 2021 Jul 8.	Serum concentrations of cholesterol are positively correlated with exposure to perfluorooctanoic acid (PFOA) and perfluorooctane sulfonic acid (PFOS) in humans. The associated change in cholesterol is small across a broad range of exposure to PFOA and PFOS. Animal studies generally have not indicated a mechanism that would account for the association in humans. The extent to which the relationship is causal is an open question. Nonetheless, the association is of particular importance because increased serum cholesterol has been considered as an endpoint to derive a point of departure in at least one recent risk assessment. To gain insight into potential mechanisms for the association, both causal and non-causal, an expert workshop was held Oct 31 and Nov 1, 2019 to discuss relevant data and propose new studies. In this report, we summarize the relevant background data, the discussion among the attendees, and their recommendations for further research.	評価書文 献と重複	ВВ

No.	分野 (参考)	著者	タイトル

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 対報 象抽 ① ラ	ン 文 ク 献 ② ラ
D830	ヒト (脂 質)	Batzella, Erich; Zare Jeddi, Maryam; Pitter, Gisella; Russo, Francesca; Fletcher, Tony; Canova, Cristina	Associations between Mixture of Perfluoroalkyl Substances and Lipid Profile in a Highly Exposed Adult Community in the Veneto Region	: 2022	Int J Environ Res Public Health. 2022 Sep 29;19(19):12421. doi: 10.3390/ijerph191912421.	BACKGROUND: Residents of a large area in the Veneto Region (Northeastern Italy) were exposed to drinking water contaminated by perfluoroalkyl substances (PFAS) for decades. While exposure to PFAS has been consistently associated with elevated serum lipids, combined exposures to multiple PFASs have been poorly investigated. Utilising different statistical approaches, we examine the association between chemical mixtures and lipid parameters. METHODS: Cross-sectional data from the regional health surveillance program (34,633 individuals aged 20-64 years) were used to examine the combined effects of PFAS mixture (Perfluoroactanoic acid (PFOA), perfluoroactane sulfonate (PFOS), perfluoronanoic acid (PFNA) and perfluorohexane sulfonate (PFHxS)) on total cholesterol (TC), high-density lipoprotein cholesterol (HDL-C) and low-density lipoprotein cholesterol (LDL-C). Weighted Quantile Sum (WQS) regression, Quantile-based G-computation (Q-Gcomp) and Bayesian Kernel Machine Regression (BKMR) were used based on their ability to handle highly correlated chemicals. RESULTS: We observed that each quartile increase in the WQS index was associated with an increase in the levels of TC (β : 4.09, 95% CI: 3.47-4.71), HDL-C (β : 1.13, 95% CI: 0.92-1.33) and LDL-C (β : 3.14, 95% CI: 2.65-3.63). Q-Gcomp estimated that a quartile increase in the PFAS mixture was associated with increased TC (ψ : 4.04, 95% CI : 3.5-4.58), HDL-C (ψ : 1.07, 95% CI 20.87-1.27) and LDL-C (ψ : 2.71, 95% CI 2.23- 3.19). In the BKMR analysis, the effect of PFAS mixture on serum lipids increased significantly when their concentrations were at their 75th percentiles or above, compared to those at their 50th percentile. All methods revealed a major contribution of PFOS and PFNA, although the main exposure was due to PFOA. We found suggestive evidence that associations varied when stratified by gender. CONCLUSIONS: The PFAS mixture was positively associated with lipid parameters, regardless of the applied method. Very similar results obtained from the		В	A
D831	ヒト (脂 質)	Dunder, Linda; Lind, P Monica; Salihovic, Samira; Stubleski, Jordan; Kärrman, Anna; Lind, Lars	Changes in plasma levels of per- and polyfluoroalkyl substances (PFAS) are associated with changes in plasma lipids - A longitudinal study over 10 years	2022	Environ Res. 2022 Aug;211:112903. doi: 10.1016/j.envres.2022.112903. Epub 2022 Feb 26.	BACKGROUND: Associations between per- and polyfluoroalkyl substances (PFAS), mainly PFOS and PFOA, and increased blood lipids have been reported primarily from cross-sectional studies. The aim of the present study was to investigate associations between multiple PFAS and blood lipids in a longitudinal fashion. METHODS: A total of 864 men and women aged 70 years and free from lipid medication were included from the Prospective Investigation of the Vasculature in Uppsala Seniors (PIVUS) study from Uppsala Sweden, 614 and 404 of those were reinvestigated at age 75 and 80. At all three occasions, eight PFAS were measured in plasma using ultra-performance liquid chromatography-tandem mass spectrometry (UPLC-MS/MS). Total cholesterol, triglycerides, low-density lipoprotein cholesterol (LDL-C) and high-density lipoprotein cholesterol (HDL-C) were also measured in plasma at all three occasions. Mixed-effects linear regression models were used to examine the relationship between the changes in PFAS levels and changes in lipid levels. RESULTS: Changes in plasma levels of six out of the eight investigated PFAS were positively associated with changes in plasma lipids after adjustment for sex, change in body mass index (BMI), smoking, physical activity, statin use (age was the same in all subjects), and correction for multiple testing. For example, changes in perfluorodecanoic acid (PFDA) were positively associated with the changes in total cholesterol (β : 0.08, 95% CI: 0.04-0.11). CONCLUSION: In this longitudinal study with three measurements over 10 years of both plasma PFAS and lipids, changes in six out of the eight investigated PFAS were positively associated with changes in plasma lipids, giving further support for a role of PFAS exposure in human lipid metabolism.		В	В
D832	ヒト (脂質)	Zeng, Guowei; Zhang, Qi; Wang, Xiaowei; Wu, Kai-Hong	The relationship between multiple perfluoroalkyl substances and cardiorespiratory fitness in male adolescents	2022	, Environ Sci Pollut Res Int. 2022 Jul;29(35):53433-53443. doi: 10.1007/s11356-022-19685-y. Epub 2022 Mar 14.	Exposure to perfluoroalkyl substances (PFASs) is associated with a number of adverse health outcomes. However, the relationship between mixed and individual PFAS exposure and cardiorespiratory fitness (CRF) in adolescents remains unclear. We used cross-sectional data from 491 teenagers (aged 13-19 years) from the 2003-2004 National Health and Nutrition Examination Survey (NHANES) and examined the association between mixed PFAS exposure and CRF via weighted quantile sum (WQS) regression. Maximal oxygen consumption (VO(2)max) was used to evaluate CRF. Multivariate linear regression was performed to investigate the relationship between each PFAS and VO(2)max as well as the relationship between PFAS exposure and the : inflammation parameters and blood lipid content. Mediation analyses were performed to investigate possible explanations of the risk of low CRF due to PFAS exposure. The results showed that for males, mixed PFAS exposure was negatively related to VO(2)max (beta = -0.80, 95% CI: -1.53 to -0.10, P = 0.028) and that of the PFASs, perfluorononanoic acid (PFNA) had the greatest influence on VO(2)max. In the individual PFAS analysis, PFNA was negatively related to VO(2)max in male adolescents (beta = -1.49, 95% CI: -2.65 to -0.32, P = 0.013). Additionally, significant relationships among serum PFNA levels and total cholesterol and the white blood cell (WBC) count were found. Mediation analyses revealed that WBC count accounted for 24.18% of the variation between PFNA level and CRF. The present results provide epidemiological evidence that exposure to PFASs, mainly PFNA, is negatively associated with CRF, possibly via alterations in WBC count.		В	В

No.	分野 (参考)	著者	タイトル		書誌情報	要旨(原文)
D833	ヒト (代 謝)	Averina, Maria; Brox, Jan; Huber, Sandra; Furberg, Anne-Sofie	Exposure to perfluoroalkyl substances (PFAS) and dyslipidemia, hypertension and obesity in adolescents. The Fit Futures study	2021	Environ Res. 2021 Apr;195:110740. doi: 10.1016/j.envres.2021.110740. Epub 2021 Jan 15.	BACKGROUND: Prevalence of obesity, hypertension and dyslipidemia has been increasing in Exposure to environmental pollutants may contribute to this development. Our aim was to stuperfluoroalkyl substances (PFAS) and dyslipidemia, hypertension and obesity in a population-METHODS: Serum PFAS concentrations were measured in 940 adolescents, mean age 16.4 (Sectional Fit Futures study by the UHPLC-MS/MS method. The following endpoints were use pressure over 130 mmHg and/or diastolic blood pressure over 80 mmHg); obesity (body mass for adolescents); dyslipidemia (total cholesterol \geq 5.17 mmol/L, and/or LDL-cholesterol \geq 3.3 1.10 g/L). RESULTS: Perfluorooctane sulfonate (PFOS), perfluorononanoate (PFNA), perfluor perfluoroundecanoate (PFUnDA) serum concentrations were positively associated with apolig cholesterol. The highest vs. lowest quartiles of total PFAS (Σ PFAS), PFNA and PFDA concent with the risk of dyslipidemia: OR 2.24 (95% CI 1.10-4.54), OR 2.30 (95% CI 1.16-4.57) and 2.36 highest vs. lowest quartiles of Σ PFAS, perfluorohexane sulfonate (PFHxS), PFOS, perfluorood were positively associated with the risk of hypertension: OR 1.91 (95% CI 1.12-3.26), OR 2.06 3.19) and 2.08 (95% CI 1.17-3.69) respectively. PFHxS and perfluoroheptane sulfonate (PFHp) associated with obesity. CONCLUSIONS: This cross-sectional study showed a possible link be dyslipidemia, hypertension and obesity in Norwegian adolescents.
D834	ヒト (代 謝)	Geiger, Sarah Dee; Yao, Ping; Vaughn, Michael G; Qian, Zhengmin	PFAS exposure and overweight/obesity among children in a nationally representative sample	2021	Chemosphere. 2021 Apr;268:128852. doi: 10.1016/j.chemosphere.2020.128852. Epub 2020 Nov 3.	PURPOSE: Perfluoroalkyl substances (PFASs) are a class of manmade chemicals commonly to manufacturing. Perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS) are two Both are present in the blood of the most Americans. PFASs are associated with intermediate outcomes, but their relationship with obesity, a risk factor for intermediate and advanced CVE this context, we aimed to explore the relationship between PFASs and both overweight/obesi children. METHODS: We examine associations between PFOA and PFOS levels, and Body Ma circumference (WC) in a representative sample (N = 2473) of US children, aged 12-18 years f and Prevention's National Health and Nutrition Examination Survey 1999-2012. Overweight/o BMI z-score \geq 85th percentile; abdominal obesity is defined as age-, sex-specific waist circum RESULTS: Associations between PFASs and anthropometric outcomes show a dose-response overweight/obese BMI z-score, findings indicate OR = 1.42 and 95% Cl: 0.85-2.38 for quartile Cl: 1.20-4.13) for quartile 3 of PFOA exposure; and OR = 2.73 (95% Cl:1.10-6.74) for quartile 4 Findings indicate an association between elevated PFOA and overweight/obesity among childred as age-, sex-specific waist circum fermines indicate an association between elevated PFOA and overweight/obesity among childred for the provide the pr
D835	ヒト (代 謝)	Lin, Pi-I D; Cardenas, Andres; Hauser, Russ; Gold, Diane R; Kleinman, Ken P; Hivert, Marie- France; Calafat, Antonia M; Webster, Thomas F; Horton, Edward S; Oken, Emily	Temporal trends of concentrations of per- and polyfluoroalkyl substances among adults with overweight and obesity in the United States: Results from the Diabetes Prevention Program and NHANES	2021	Environ Int. 2021 Dec;157:106789. doi: 10.1016/j.envint.2021.106789. Epub 2021 Jul 29.	BACKGROUND: Understanding the temporal trends and change of concentrations of per- and is important to evaluate the health impact of PFAS at both the individual- and population-level available for pre-diabetic adults in the U.S. OBJECTIVES: Determine trends and rate of chang overweight or obese U.S. adults and evaluate variation by sex, race/ethnicity, and age. METH of plasma PFAS concentrations using samples collected in 1996-1998, 1999-2001, and 2011-2 enrolled in the Diabetes Prevention Program (DPP) trial and Outcomes Study (DPPOS) and control the National Health and Nutrition Examination Survey (NHANES 1999-2000, 2003-2016, examined associations between participants' characteristics and PFAS concentrations and estimated measures in DPP/DPPOS individuals were comparable to NHANES cross-sectional population concentrations of perfluorooctanesulfonic acid (PFOS), perfluorooctane sulfonamido acetic acid (EtFOSAA), and N-methylperfluorooctane sulfonamido acetic

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ing in children and adolescents worldwide. to study associations between lation-based sample of adolescents. 16.4 (SD 1.3) years, from the cross- re used: hypertension (systolic blood mass index over 2 z-score, WHO charts $I \ge 3.36$ mmol/I, and/or apolipoprotein B \ge erfluorodecanoate (PFDA) and apolipoprotein B, total- and LDL oncentrations were positively associated d 2.36 (95% CI 1.08-5.16), respectively. The uorooctanoate (PFOA) concentrations s 2.06 (95% CI 1.16-3.65), 1.86 (95% CI 1.08- PFHpS) concentrations were positively link between several PFAS and			В	В
nonly used in consumer product the two of the most highly studied PFASs. ediate cardiovascular disease (CVD) d CVD, remains largely unconfirmed. In d'obesity and abdominal obesity among dy Mass Index (BMI) and waist trears from the Centers for Disease Control ght/obesity is defined as age-, sex-specific circumference ≥90th percentile. sponse relationship overall. For uartile 2 of PFOA exposure; OR = 2.22 (95% artile 4 of PFOA exposure. DISCUSSION: g children after multivariable adjustment.			В	В
r- and polyfluoroalkyl substances (PFAS) n-level, however, limited information is change of plasma PFAS concentrations in METHODS: We described temporal trends 2011-2012 from 957 pre-diabetic adults and compared to serum concentrations 2016, adults with BMI ≥ 24 kg/m(2)). We and estimated the rate of change using : Longitudinal measures of PFAS I populational means. Plasma obexanesulfonic acid (PFHxS), N-ethyl- onamido acetic acid (MeFOSAA) started to sed after 2000 and, for NHANES, male, compared to female, and higher concentrations to decrease by half ranged wnward temporal trend in plasma PFOS ale and Black participants consistently nces in exposure patterns, metabolism or			В	В

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No.	分野 著者 (参考)	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 対報 象抽 ① ラ	ン 文 ク 献 ② ラ
D836	とト (代 謝)	ng; u, ee lin, g, Associations between both legacy and alternative per- and polyfluoroalkyl substances and glucose- homeostasis: The Isomers of C8 health project in China u; n;	2022	Environ Int. 2022 Jan;158:106913. doi: 10.1016/j.envint.2021.106913. Epub 2021 Oct 5.	BACKGROUND: Epidemiological studies on the associations of legacy per- and polyfluoroalkyl substances (PFASs) and glucose homeostasis remain discordant. Understanding of PFAS alternatives is limited, and few studies have reported joint associations of PFASs and PFAS alternatives. OBJECTIVES: To investigate associations of novel PFAS alternatives (chlorinated perfluoroalkyl ether sulfonic acids, CI-PFESAs and perfluorobutanoic acid, PFBA) and two legacy PFASs (Perfluoroactancia caid, PFOA and perfluoroactane sulfonate, PFOS) with glucose-homeostasis markers and explore joint associations of 13 legacy and alternative PFASs with the selected outcomes. METHODS: We used cross-sectional data of 1,038 adults from the Isomers of C8 Health Project in China. Associations of PFASs and PFAS alternatives with glucose-homeostasis were explored in single-pollutant models using generalized linear models with natural cubic splines for PFASs. Bayesian Kernel Machine Regression (BKMR) models were applied to assess joint associations of exposures and outcomes. Sex-specific analyses were also conducted to evaluate effect modification. RESULTS: After adjusting for confounders, both legacy (PFOA, PFOS) and alternative (CI-PFESAs and PFBA) PFASs were positively associated with glucose-homeostasis markers in single-pollutant models. For example, in the total study population, estimated changes with 95% confidence intervals (CI) of fasting glucose at the 95th percentile of 6:2CI-PFESA and PFOS against the thresholds were 0.90 (95% CI: 0.59, 1.21) and 0.44 (95% CI: 0.26, 0.62). Positive joint associations were found in BKMR models with 6:2CI-PFESA were pastively associated with glucose-homeostasis markers and expleted in both single- and multi-pollutant models. CONCLUSIONS: Legacy and alternative PFASs were positively associated with glucose-homeostasis markers. 6:2CI-PFESA was the primary contributor. Sex-specific associations existed in both single- and multi-pollutant models. CONCLUSIONS: Legacy and alternative PFASs were positively a		В	В
D837	Ding, Ning; Karvonen- Gutierrez, Car A; Herman, William H; Calafat, Antor M; Mukherjee Bhramar; Park Sung Kyun	ie Associations of perfluoroalkyl and polyfluoroalkyl substances (PFAS) and PFAS mixtures with adipokines in midlife women ,	2021	Int J Hyg Environ Health. 2021 Jun;235:113777. doi: 10.1016/j.ijheh.2021.113777. Epub 2021 Jun 2.	BACKGROUND: Perfluoroalkyl and polyfluoroalkyl substances (PFAS) exposure have been associated with obesity and related comorbidities, possibly through disrupting signaling pathways of adipokines. Both leptin and adiponectin can modulate metabolic processes. However, the effects of PFAS on adipokines are not well understood. OBJECTIVE: We determined if serum PFAS concentrations were associated with adipokine profiles in midlife women. METHODS: We examined 1245 women aged 45-56 years from the Study of Women's Health Across the Nation. Concentrations of 11 PFAS were quantified in baseline serum samples collected in 1999-2000. Linear and branched perfluoroactane sulfonic acid isomers (n-PFOS and Sm-PFOS) and their sum (PFOS), linear perfluoroactancic acid (n-PFOA), perfluorononancic acid (PFNA), perfluorobexane sulfonic acid (PFHXS), 2-(N-methyl-perfluoroactane sulfonamido) acetic acid (MeFOSAA), and 2-(N-ethyl-perfluorobexane sulfoniadid) acetic acid (EFFOSAA) with detection frequencies >60% were included in the analysis. Adipokines regression (BKMR) to assess individual and overall joint index (FLI, the ratio of leptin to sOB-R), total and high molecular weight (HMW) adiponectin were assessed in 2002-2003. We utilized multivariable linear regressions and Bayesian kernel machine regression (BKMR) to assess individual and overall joint effects of PFAS on adipokines with adjustment for age, race/ethnicity, study site, education, smoking status, physical activity, menopausal status, and waist circumference. RESULTS: A doubling of PFAS concentrations was associated with lower sOB-R concentrations (-1.4%, 95% CI: -2.7%, -0.1%). Results remained in women with overweight or obesity but not those with normal weight or underweight. No statistically significant associations were observed with total or HMW adiponectin, except for PFNA with total and HW adiponectin observed in women with normal weight or underweight. No statistically significant associations were observed with total or HMW adiponectin, except for PFNA with t		A	В

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D838	ヒト (代 謝)	Jain, Ram B; Ducatman, Alan	Associations between apolipoprotein B and selected perfluoroalkyl substances among diabetics and nondiabetics	2021	Environ Sci Pollut Res Int. 2021 Mar;28(11):13819-13828. doi: 10.1007/s11356-020-11593-3. Epub 2020 Nov 16.	Previous population investigation of perfluoroalkyl substances (PFAS) features associations with lipids in a number of populations; these investigations have seldom included consideration of apolipoproteins. Apolipoprotein B (Apo B) fractions were considered in this descriptive analysis because they are essential to the assembly, transport, and cellular uptake of lipid classes associated with poorer health outcomes, and they are associated with incident and prevalent disease. Regression models stratified by diabetes and lipid lowering medication (LLM) status for data from National Health and Nutrition Examination Survey for 2007-2014 were fitted to interrogate associated with perfluoroctancic acid (PFOA β = 0.03878, p < 0.01), perfluoroctane sulfonic acid (PFOS β = .02029, p = 0.02), and perfluorononanoic acid (PFNA β = .01968, p = .03) for nondiabetics who were not taking lipid lowering medications. These associations were not seen among diabetic participants, except for perfluorodecanoic acid (PFDA) in those taking LLMs (β = 0.03831, p = 0.02). We also note that LLMs have an inferred greater impact on Apo B in the diabetics compared to the nondiabetic populations. We have considered several sources of confounding and think the data are most consistent with a weak causal association that PFAS exposure increases Apo B. The rodent toxicology literature also contains evidence that PFAS disrupt fatty acid trafficking including Apo B, although how the specific findings may relate to circulating human Apo B concentrations is unclear. We therefore advocate for attempts to replicate the findings in other populations and to consider additional types of mechanistic studies.			В	в	
D839	ヒト (代 謝)	Janis, Jaclyn A; Rifas-Shiman, Sheryl L; Seshasayee, Shravanthi M; Sagiv, Sharon; Calafat, Antonia M; Gold, Diane R; Coull, Brent A; Rosen, Clifford J; Oken, Emily; Fleisch, Abby F	Plasma Concentrations of Per- and Polyfluoroalkyl Substances and Body Composition From Mid- Childhood to Early Adolescence	2021	J Clin Endocrinol Metab. 2021 Aug 18;106(9):e3760-e3770. doi: 10.1210/clinem/dgab187.	CONTEXT: Per- and polyfluoroalkyl substances (PFAS) may alter body composition by lowering anabolic hormones and increasing inflammation, but data are limited, particularly in adolescence when body composition is rapidly changing. OBJECTIVE: To evaluate associations of PFAS plasma concentrations in childhood with change in body composition through early adolescence. METHODS: A total of 537 children in the Boston-area Project Viva cohort participated in this study. We used multivariable linear regression and Bayesian kernel machine regression (BKMR) to examine associations of plasma concentrations of 6 PFAS, quantified by mass spectrometry, in mid-childhood (mean age, 7.9 years; 2007-2010) with change in body composition measured by dual-energy x-ray absorptiometry from mid-childhood to early adolescence (mean age, 13.1 years). RESULTS: In single-PFAS linear regression models, children with higher concentrations of perfluorooctanoate (PFOA), perfluorooctane sulfonate (PFOS), perfluorodecanoate (PFDA), and perfluorohexane sulfonate (PFHxS) had less accrual of total and truncal fat mass (eg, -0.32 [95% CI: -0.52, -0.13] kg/m2 per doubling of PFOA). Children with higher PFOS and PFHxS had less accrual of total and truncal fat mass (eg, -0.32 [95% CI: -0.54, -0.11] kg/m2 total fat mass per doubling of PFOA), perfluorononanoate (PFNA) had greater accrual of visceral fat mass (eg, 0.44 [95% CI: 0.13, 0.75] g/m2 per doubling of PFDA). Results from BKMR mixture models were consistent with linear regression analyses. CONCLUSION: Early life exposure to some but not all PFAS may be associated with adverse changes in body composition.			В	с	:
D840	ヒト (代 謝)	Nilsson, Sandra; Smurthwaite, Kayla; Aylward, Lesa L; Kay, Margaret; Toms, Leisa-Maree; King, Leisa; Marrington, Shelby; Kirk, Martyn D; Mueller, Jochen F; Bräunig, Jennifer	Associations between serum perfluoroalkyl acid (PFAA) concentrations and health related biomarkers in firefighters	2022	Environ Res. 2022 Dec;215(Pt 3):114370. doi: 10.1016/j.envres.2022.114370. Epub 2022 Sep 26.	Firefighters who used aqueous film forming foam in the past have experienced elevated exposures to perfluoroalkyl acids (PFAAs). The objective of this study was to examine the associations between clinical chemistry endpoints and serum concentrations of perfluoroactanoic acid (PFOA), perfluorohexane sulfonate (PFHxS), perfluoroheptane sulfonate (PFHpS) and perfluoroctane sulfonate (PFOS) in firefighters. Multiple linear regression was used to assess relationships between PFAA serum concentrations and biochemical markers for cardiovascular disease, kidney-, liver- and thyroid function, in a cross-sectional survey of 783 firefighters with elevated levels of PFHxS, PFHpS and PFOS in relation to the most recently reported levels in the general Australian population. Linear logistic regression was used to assess relationships between PFAAs and biomarkers for cardiovascular disease and kidney function longitudinally in a subset of the firefighters (n = 130) where serum measurements were available from two timepoints, five years apart. In the cross-sectional analysis, higher levels of all PFAAs were significantly associated with higher levels of biomarkers for cardiovascular disease (total-cholesterol, and LDL-cholesterol). For example, doubling in PFOS serum concentration were associated with increases in total cholesterol (β : 0.111, 95% confidence interval (95%CI): 0.026, 0.195 mmol/L) and LDL-cholesterol (β : 0.104, 95%CI:0.03, 0.178 mmol/L). Doubling in PFOA concentration, despite not being elevated in the study population, were additionally positively associated with kidney function marker urate (e.g., β : 0.010, 95%CI; 0.004, 0.016 mmol/L) and thyroid function marker TSH (e.g., β : 0.087, 95%CI: 0.014, 0.161 mIU/L). PFAAs were not associated with any assessed self-reported health conditions. No significant relationships were observed in the longitudinal analysis. Findings support previous studies, particularly on the association between PFAAs and serum lipids.			В	В	

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D841	ヒト (代 謝)	Liu, Yun; Li, Nan; Papandonatos, George D; Calafat, Antonia M; Eaton, Charles B; Kelsey, Karl T; Chen, Aimin; Lanphear, Bruce P; Cecil, Kim M; Kalkwarf, Heidi J; Yolton, Kimberly; Braun, Joseph M	Exposure to Per- and Polyfluoroalkyl Substances and Adiposity at Age 12 Years: Evaluating Periods of Susceptibility	2020	Environ Sci Technol. 2020 Dec 15;54(24):16039-16049. doi: 10.1021/acs.est.0c06088. Epub 2020 Dec 3.	Per- and polyfluoroalkyl substances (PFAS) exposure may increase adiposity and obesity risk in children. However, no studies have extended these findings into adolescence or identified periods of heightened susceptibility. We estimated associations of repeated pre- and postnatal serum PFAS concentrations with adolescent adiposity and risk of overweight/obesity. We studied 212 mother-offspring pairs from the HOME Study. We quantified serum concentrations of four PFAS in mothers at ~16 week gestation and their children at birth and ages 3, 8, and 12 years. We assessed adiposity at 12 years using anthropometry and dual-energy X-ray absorptiometry. Using multiple informant models, we estimated covariate-adjusted associations of an interquartile range (IQR) increase in log(2)-transformed PFAS for each time period with adiposity measures and tested differences in these associations. Serum perfluorooctanoate (PFOA) and perfluorohexane sulfonate (PFHxS) concentrations during pregnancy were associated with modest increases in central adiposity and risk of overweight/obesity, but there was no consistent pattern for postnatal concentrations. We observed nonlinear associations of gestational PFOA and PFHxS concentrations with central adiposity and the risk of obesity in adolescents, while no pattern was observed for postnatal PFAS concentrations.			А В
D842	ヒト (代 謝)	Mitro, Susanna D; Liu, Jinxi; Jaacks, Lindsay M; Fleisch, Abby F; Williams, Paige L; Knowler, William C; Laferrère, Blandine; Perng, Wei; Bray, George A; Wallia, Amisha; Hivert, Marie-France; Oken, Emily; James-Todd, Tamarra M; Temprosa, Marinella	Per- and polyfluoroalkyl substance plasma concentrations and metabolomic markers of type 2 diabetes in the Diabetes Prevention Program trial	2021	Int J Hyg Environ Health. 2021 Mar;232:113680. doi: 10.1016/j.ijheh.2020.113680. Epub 2020 Dec 18.	BACKGROUND: Per- and polyfluoroalkyl substances (PFAS) are widely used chemicals, some of which have been linked to type 2 diabetes. We tested whether PFAS concentrations were cross-sectionally associated with metabolites previously shown to predict incident type 2 diabetes using the Diabetes Prevention Program (DPP), a trial of individuals at high risk of type 2 diabetes. METHODS: We evaluated 691 participants enrolled in the DPP with baseline measures of 10 PFAS (including total perfluorooctanesulfonic acid (PFOS), total perfluorooctanoic acid (PFOA), and Sb-PFOA [branched isomers of PFOA]) and 77 metabolites. We used log(2)-transformed PFAS concentrations as exposures and standardized metabolite concentrations as outcomes in linear regression models adjusted for age, sex, race/ethnicity, use of anti-hyperlipidemic or triglyceride-lowering medication, income, years of education, marital status, smoking, and family history of diabetes, with Benjamini-Hochberg linear step-up false discovery rate correction. RESULTS: Sb-PFOA was associated with the largest number of tested metabolites (29 of 77). Each doubling in Sb-PFOA was associated with higher leucine ($\beta = 0.07$ [95%CI: 0.02, 0.11] SD) and lower glycine (-0.08 [95%CI: 0.03, -0.13] SD). Each doubling of either total PFOA or n-PFOA was associated with -0.13 [95%CI: 0.04, -0.22] SD lower glycine. PFOA were positively associated with multiple triacylglycerols and diacylglycerols, and total PFOS, total PFOA, and Sb-PFOA were positively associated with phosphatidylethanolamines. CONCLUSIONS: PFAS concentrations are associated with metabolites linked to type 2 diabetes (particularly amino acid, glycerolipid and glycerophospholipid pathways). Further prospective research is needed to test whether these metabolites mediate associations of PFAS and type 2 diabetes.			ВВ
D843	ヒト (代 謝)	Canova, Cristina; Di Nisio, Andrea; Barbieri, Giulia; Russo, Francesca; Fletcher, Tony; Batzella, Erich; Dalla Zuanna, Teresa; Pitter, Gisella	As Concentrations and Cardiometabolic Traits in hy Exposed Children and Adolescents It J Environ Res Public Health. 2021 Dec 7;18(24):12881. BACKGROUND: Residents of a large area of north-eastern Italy were exposed for decades to high concentrations of perfluoroalkyl and polyfluoroalkyl substances (PFAS) via drinking water. Despite the large amount of evidence in adults of a positive association between serum PFAS concentrations that were quantifiable in at least 40% of samples and lipid profile, blood pressure (BP) and body mass index (BM) in highly exposed adolescents and children. METHODS: A cross-sectional analysis was conducted in 6669 adolescents (14-19 years) and 2693 children (8-11 years) enrolled in the health surveillance program of the Veneto Region. Non-fasting blood samples were obtained and analyzed for perfluorootanoic acid (PFOA), perfluoroatane sulfonate (PFOS), perfluorobectance (MpL-C) and triglycerides. Low-density lipoprotein cholesterol (UDL-C) was calculated. Systolic and diastolic BP were measured, and BMI z-score accounting for age and sex was estimated. The associations between In- transformed PFAS (and categorized into quartiles) and continuous outcomes were assessed using generalized additive models. The weighted quantile sum with TC, LDL-C, and to a lesses PFAS-mixture effects for each outcome. Associations with TQ, LDL-C and HDL-C, while PFAS and PFNA bad significant associations with TQ, LDL-C, and to a lesser extent HDL-C. Among children, PFDS and PFNA bad significant associations with TQ, LDL-C and HDL-C, while PFAS and PFNA bad significant associations with TQ, LDL-C, and to a lesser extent HDL-C. Among children, PFDS and PFNA bad significant associations with TQ, LDL-C and HDL-C, while PFAS and PFNA bad significant associations with TQ, LDL-C, and to a lesser extent HDL-C. Among children, PFDS and PFNA bad significant associations with TQ, LDL-C and HDL-C, while PFAS and TQ, HDL-C and Serve IDFNA bad significant associat				B A		

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No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D844	ヒト (代 謝)	Cheng, Xu; Wei, Yue; Zhang, Zefang; Wang, Fei; He, Jia; Wang, Ruixin; Xu, Yali; Keerman, Mulatibieke; Zhang, Shiyang; Zhang, Ying; Bi, Jiao; Yao, Jinqiu; He, Meian	Plasma PFOA and PFOS Levels, DNA Methylation, and Blood Lipid Levels: A Pilot Study	2022	Environ Sci Technol. 2022 Nov 14. doi: 10.1021/acs.est.2c04107. Online ahead of print.	Exposure to perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS) is associated with blood lipids in adults, but the underlying mechanisms remain unclear. This pilot study aimed to investigate the associations between PFOA or PFOS and epigenome-wide DNA methylation and assess the mediating effect of DNA methylation on the PFOA/PFOS-blood lipid association. We measured plasma PFOA/PFOS and leukocyte DNA methylation in 98 patients enrolled from the hospital between October 2018 and August 2019. The median plasma PFOA/PFOS levels were 0.85 and 2.29 ng/mL. Plasma PFOA and PFOS levels were significantly associated with elevated total cholesterol (TC) and low-density lipoprotein cholesterol (LDL) levels. There were 63/87 CpG positions and 8/11 differentially methylated regions (DMRs) associated with plasma PFOA/PFOS levels, respectively. In addition, 5 CpG positions (annotated to AFF3, CREB5, NRG2, USF2, and intergenic region) and one DMR annotated to IRF6 may mediate the association between plasma PFOA/PFOS and LDL levels (mediated proportion from 7.29 to 46.77%); two CpG positions may mediate the association between plasma PFOA/PFOS exposure alters DNA methylation. More importantly, the association of PFOA/PFOS with lipid indicators was partly mediated by DNA methylation changes in lipid metabolism-related genes.		ВВ
D845	ヒト (代 謝)	Ji, Junjun; Song, Lingyan; Wang, Jing; Yang, Zhiyun; Yan, Haotian; Li, Ting; Yu, Li; Jian, Lingyu; Jiang, Feixiang; Li, Junfeng; Zheng, Jinping; Li, Kefeng	Association between urinary per- and poly-fluoroalkyl substances and COVID-19 susceptibility	2021	Environ Int. 2021 Aug;153:106524. doi: 10.1016/j.envint.2021.106524. Epub 2021 Mar 19.	BACKGROUND AND OBJECTIVE: The growing impact of the COVID-19 pandemic has heightened the urgency of identifying individuals most at risk of infection. Per- and poly-fluoroalkyl substances (PFASs) are manufactured fluorinated chemicals widely used in many industrial and household products. The objective of this case-control study was to assess the association between PFASs exposure and COVID-19 susceptibility and to elucidate the metabolic dysregulation associated with PFASs exposure in COVID-19 patients. METHODS: Total 160 subjects (80 COVID-19 patients and 80 symptom-free controls) were recruited from Shanxi and Shandong provinces, two regions heavily polluted by PFASs in China. Twelve common PFASs were quantified in both urine and serum. Urine metabolome profiling was performed by liquid chromatography coupled with tandem mass spectrometry (LC-MS/MS). RESULTS: In unadjusted models, the risk of COVID-19 infection was positively associated with urinary levels of perfluorooctanesulfonic acid (PFOS) (Odds ratio: 2.29 [95% CI: 1.52-3.22]), perfluorooctanci acid (PFOA) (2.91, [1.95-4.83], and total PFASs (Σ (12) PFASs) (3.31, [2.05-4.65]). After controlling for age, sex, body mass index (BMI), comorbidities, and urine albumin-to-creatinine ratio (UACR), the associations remained statistically significant (Adjusted odds ratio of 1.94 [95% CI: 1.39-2.96] for PFOS, 2.73 [1.71-4.55] for PFOA, and 2.82 [1.97-3.51] for Σ (12) PFASs). Urine metabolome-PFASs associated nualysis revealed that 59% of PFASs-associated urinary endogenous metabolites in COVID-19 patients were identified to be produced or largely regulated by mitochondrial function. In addition, the increase of PFASs exposure was associated with the accumulation of key metabolites in kynurenine metabolism, which are involved in immune responses (Combined β coefficient of 0.60 [95% CI: 0.25-0.95, P = 0.001]). Moreover, alternations in PFASs-associated metabolites in mitochondrial and kynurenine metabolism were also correlated with clinical lab biomarkers f		ВВ

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D846	ヒト (代 謝)	Zeeshan, Mohammed; Zhang, Yun-Ting; Yu, Shu; Huang, Wen-Zhong; Zhou, Yang; Vinothkumar, Rajamanickam; Chu, Chu; Li, Qing-Qing; Wu, Qi-Zhen; Ye, Wan-Lin; Zhou, Peien; Dong, Pengxin; Zeng, Xiao-Wen; Hu, Li-Wen; Yang, Bo-Yi; Shen, Xubo; Zhou, Yuanzhong; Dong, Guang-Hui	Exposure to isomers of per- and polyfluoroalkyl substances increases the risk of diabetes and impairs glucose-homeostasis in Chinese adults: Isomers of C8 health project	2021 Chemosphere. 2021 Sep;278:130486. doi: 10.1016/j.chemosphere.2021.130486. Epub 2021 Apr 5.	Per- and polyfluoroalkyl substances (PFAS) exposure has been linked to diabetes, but evidence on the association of isomers of PFAS with type 2 diabetes (T2D) remains scant. This population based cross-sectional study aimed to investigate associations between serum PFAS isomers, glucose-homeostasis markers and T2D, adjusted for multiple potential confounders. We used data from "Isomers of C8 Health Project in China" from July 2015 to October 2016. A total of 10 PFAS including isomers of PFOS and PFOA were measured in serum of 1045 Chinese adults. Fasting blood glucose, fasting insulin, homeostasis model of insulin (HOMA-IR) and beta cell function (HOMA- β) were considered as markers of glucose-homeostasis. We found significant positive associations between serum PFAS isomers and glucose-homeostasis markers, namely, fasting blood glucose, fasting insulin and HOMA-IR. Per log-unit increase in branched (br)-PFOS concentration was associated with increased fasting blood glucose (β = 0.25, 95% CI: 0.18, 0.33), fasting insulin (β = 2.19, 95% CI: 1.44, 2.93) and HOMA-IR (β = 0.69, 95% CI: 0.50, 0.89). As compared to br-PFOS, linear (n)-PFOS and -PFOA showed lesser significant associations with glucose-homeostasis markers. Further, exposure to all PFAS including isomeric PFOS, PFOA and PFHXS increased the risk of T2D with br-PFOS exhibiting the highest risk (OR = 5.41, 95% CI: 3.68-7.96). The associations were stronger among women than men. In conclusion, chronic exposure to PFAS isomers was associated with impaired glucose-homeostasis and may increase the prevalence of T2D in Chinese adults. Given the ubiquity of PFAS in the environment and the public health burden of T2D, future studies are warranted to corroborate the findings.			ВВ
D847	ヒト(代 謝)	Lin, Ting-An; Huang, Chi-Wei; Wei, Chia-Cheng	Early-life perfluorooctanoic acid (PFOA) and perfluorooctane sulfonic acid (PFOS) exposure cause obesity by disrupting fatty acids metabolism and enhancing triglyceride synthesis in Caenorhabditis elegans	2022 Aquat Toxicol. 2022 Oct;251:106274. doi: 10.1016/j.aquatox.2022.106274. Epub 2022 Aug 19.	Perfluorooctanoic acid (PFOA) and perfluorooctane sulfonic acid (PFOS) are widely used and considered as emerging persistent pollutants, posing a potential threat to the aquatic ecosystem due to their metabolic toxicity. However, the effects of early-life PFOA and PFOS exposure on metabolic disruption and underlying mechanisms are not fully understood. Therefore, we investigated the effects of early-life PFOA or PFOS exposure on lipid accumulation, feeding behaviors, fatty acids composition, and possible genetic regulation using the nematode Caenorhabditis elegans as an in vivo model. Our results showed that low concentrations of PFOA and PFOS (0.1 and 1 μ M) induced obesity in C. elegans, which was not due to the increased feeding rate. The altered fatty acid composition illustrated the decrease of saturated fatty acids and the increase of polyunsaturated fatty acids. Furthermore, the mutant assay and mRNA levels revealed that fatty acid desaturation related genes mdt-15, nhr-49, fat-6 as well as fatty acid (fasn-1) and triglyceride (TG) (dgat-2) synthesis related genes, were associated with the increased body fat, TG, and lipid droplet (LD) contents in C. elegans exposed to PFOA and PFOS. Hence, this present study provides the genetic regulatory information of PFOA and PFOS induced metabolic disruption of lipid metabolism and obesity.			ВВ
D848	ヒト (代 謝)	Park, Sung Kyun; Wang, Xin; Ding, Ning; Karvonen- Gutierrez, Carrie A; Calafat, Antonia M; Herman, William H; Mukherjee, Bhramar; Harlow, Siobán D	Per- and polyfluoroalkyl substances and incident diabetes in midlife women: the Study of Women's Health Across the Nation (SWAN)	2022 Diabetologia. 2022 Jul;65(7):1157-1168. doi: 10.1007/s00125-022-05695-5. Epub 2022 Apr 11.	AIMS/HYPOTHESIS: Diabetogenic effects of per- and polyfluoroalkyl substances (PFAS) have been suggested. However, evidence based on prospective cohort studies is limited. We examined the association between serum PFAS concentrations and incident diabetes in the Study of Women's Health Across the Nation Multi-Pollutant Study (SWAN-MPS). METHODS: We included 1237 diabetes-free women aged 45-56 years at baseline (1999-2000) who were followed up to 2017. At each follow-up visit, women with incident diabetes were identified by the presence of one or more of the following conditions: (1) use of a glucose- lowering medication at any visit; (2) fasting glucose ≥7 mmol/l on two consecutive visits while not on steroids; and (3) any two visits with self-reported diabetes and at least one visit with fasting blood glucose ≥7 mmol/l. Serum concentrations of 11 PFAS were quantified by online solid-phase extraction-HPLC-isotope dilution-tandem MS. Seven PFAS with high detection rates (>96%) (n-perfluorooctanoic acid [n-PFOA], perfluorononanoic acid [PFNA], perfluorohexane sulfonic acid [PFHS], n- perfluoroctane sulfonic acid [n-PFOS], sum of perfluoromethylheptane sulfonic acid isomers [Sm-PFOS], 2-[N-methyl- perfluorooctane sulfonamido] acetic acid [MeFOSAA] and 2-[N-ethyl-perfluorooctane sulfonic mone steries of PFAS mixtures. RESULTS: After adjustment for race/ethnicity, site, education, smoking status, alcohol consumption, total energy intake, physical activity, menopausal status and BMI, the HR (95% CI) comparing the lowest with the highest tertile was 1.67 (1.21, 2.31) for n-PFOA (p(trend) = 0.001), 1.58 (1.13, 2.21) for PFHXS (p(trend) = 0.003), 1.36 (0.97, 1.90) for Sm-PFOS (p(trend) = 0.05), 1			A B

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)		出 情 対 報 象 抽	ン 文 ク 献 ① ラ ② ラ
D849	ヒト (代 謝)	Pitter, Gisella; Zare Jeddi, Maryam; Barbieri, Giulia; Gion, Massimo; Fabricio, Aline S C; Daprà, Francesca; Russo, Francesca; Fletcher, Tony; Canova, Cristina	Perfluoroalkyl substances are associated with elevated blood pressure and hypertension in highly exposed young adults	2020	Environ Health. 2020 Sep 21;19(1):102. doi: 10.1186/s12940- 020-00656-0.	BACKGROUND: Residents in a large area of North-Eastern Italy were exposed to perfluoroalkyl substances (PFAS) via drinking water. Studies on the association between PFAS and blood pressure levels are limited, and results are inconsistent. Using cross-sectional data from the Regional health surveillance program, we aimed to quantify the associations between PFAS serum concentrations and blood pressure and hypertension prevalence. METHODS: The study comprised 16,224 individuals aged 20-39 years. Pregnant women (n = 327), or individuals with missing information on the selected covariates (n = 111) were excluded, leaving 15,786 subjects for the analyses. Hypertension was defined as any self-reported diagnosis, use of antihypertensive drugs, or elevated systolic blood pressure (SBP \geq 140 mmHg)/diastolic blood pressure (DBP \geq 90 mmHg). Generalized additive models were used to investigate the relation between perfluorooctancic acid (PFOA), perfluorooctane sulfonic acid (PFOS), perfluorohexane sulfonic acid (PFHXS), and perfluorononanoic acid (PFNA)) natural log (ln) transformed and by decile, and SBP, DBP, hypertension, adjusted for potential confounders. RESULTS: Both SBP and DBP increased significantly with an increase in the In-transformed serum PFAS concentrations in a monotonic way. The predicted increase in SBP and DBP were 1.54 mmHg (95%CI 0.61-2.47), 1.60 mmHg (95%CI 0.92-2.27) from lowest to highest decile of PFOA. The associations were stronger for SBP in men and for DBP in women. One unit increase in each In-transformed PFAS was positively associated with an increased odd of hypertension in men: PFOA OR = 1.06 (1.01-1.11), PFOS OR = 1.13 (1.03-1.23), PFHxS OR = 1.08 (1.02-1.15), PFNA OR = 1.20 (1.02-1.40). CONCLUSIONS: Our findings suggest that serum PFAS concentrations were associated with increased systolic and diastolic blood pressure in a large highly exposed young adult population. Although the magnitude of the observed effect was relatively small, if confirmed it would be of public health relevan			ВВ
D850	ヒト (代 謝)	Zare Jeddi, Maryam; Dalla Zuanna, Teresa; Barbieri, Giulia; Fabricio, Aline S C; Daprà, Francesca; Fletcher, Tony; Russo, Francesca; Pitter, Gisella; Canova, Cristina	Associations of Perfluoroalkyl Substances with Prevalence of Metabolic Syndrome in Highly Exposed Young Adult Community Residents-A Cross-Sectional Study in Veneto Region, Italy	2021	Int J Environ Res Public Health. 2021 Jan 29;18(3):1194. doi: 10.3390/ijerph18031194.	BACKGROUND: Studies on the association between perfluoroalkyl substances (PFAS) and metabolic syndrome (MetS) are limited, and results are inconsistent. We aimed to examine the associations between PFAS serum levels and the prevalence of MetS among highly exposed young adults (ages 20-39) residents of a large area of the Veneto Region (North-Eastern Italy) primarily stemming from PFAS water contamination before September 2013. A total of 15,876 eligible young adult residents living in the investigated municipalities were enrolled in the study from January 2017 to July 2019. METHODS: MetS was defined by using a modified harmonized definition requiring the presence of 3 of the following: obesity (body mass index ≥30), elevated triglyceride (TG), reduced high-density lipoprotein cholesterol, elevated blood pressure, and hemoglobin A1c ≥ 6.1% or self-reported diabetes mellitus or drug treatment for hyperglycemia. Multivariable generalized additive models were performed to identify the associations between four serum PFAS, including perfluorooctane sulfonic acid (PFOS), perfluorooctanoic acid (PFOA), perfluorohexane sulfonic acid (PFHxS), and perfluorononanoic acid (PFNA), and risk of MetS controlling for potential confounders. RESULTS: A total of 1282 participants (8.1%) met the criteria of MetS with a higher prevalence among men. PFOA, PFHxS, and PFNA were not associated with the risk of MetS, whereas PFOS showed a consistent protective effect against the risk of MetS (OR 0.76, (95% CI: 0.69, 0.85) per In-PFOS). However, we found statistically significant positive associations between PFAS serum levels and individual components of MetS, mainly elevated blood pressure and elevated TG. CONCLUSION: Our results did not support a consistent association between PFAS and MetS and conflicting findings were observed for individual components of MetS.			в с
D851	ヒト (代 謝)	Brosset, Eloïse; Ngueta, Gerard	Exposure to per- and polyfluoroalkyl substances and glycemic control in older US adults with type 2 diabetes mellitus	2022	Environ Res. 2022 Nov 2;216(Pt 3):114697. doi: 10.1016/j.envres.2022.114697. Online ahead of print.	BACKGROUND: Perfluoroalkyl substances (PFAS) have been associated with impaired glucose homeostasis. We aimed to examine associations of serum concentrations of PFAS with poor glycemic control (PGC) in US adults aged \geq 65 years with type 2 diabetes mellitus (T2DM). METHODS: We abstracted data from the 1999 to 2018 NHANES examination. In main analyses, we defined PGC as glycated haemoglobin A1C \geq 8.0% in adults aged \geq 75 years and A1C \geq 7.0% (in main analyses) or A1C \geq 7.5% (in sensitivity analyses) in those aged 65-74 years. We considered PFAS detected in >80% of the US population: perfluorodecanoic acid (PFDA), perfluorononanoic acid (PFNA), perfluoroctanoic acid (PFOA), perfluorooctane sulfonic acid (PFOS), and perfluorohexane sulfonic acid (PFHXS). We estimated the adjusted odds ratio (aOR) and 95% confidence intervals (95% CI) of PGC across quartiles of PFAS concentrations using generalized linear mixed models, with the logit link. RESULTS: Of the 4575 adults included, 42.2% were \geq 75 years of age and men represented 53.2%. Compared to adults in the bottom quartile, the odds of PGC was lower in the third quartile of PFDA (aOR = 0.46, 95% CI: 0.29-0.77; P = 0.0026) and PFHxS (aOR = 0.56, 95% CI: 0.32-0.96; P = 0.0368), the second quartile of PFNA (aOR = 0.41, 95% CI: 0.23-0.71), the upper quartile of PFOA (aOR = 0.29, 95% CI: 0.12-0.73; P = 0.0017), and higher in the second quartile of Σ PFAS (aOR = 1.85, 95% CI: 1.16-2.95; P = 0.0102). In sensitivity analyses, likelihood for PGC was higher in the upper quartile of PFNA (aOR = 2.30, 95% CI: 1.12-4.21; P = 0.027), PFHxS (aOR = 1.80, 95% CI: 1.19-3.32; P = 0.0240) and Σ PFAS (aOR = 2.29, 95% CI: 1.40-3.77; P = 0.0010). CONCLUSIONS: In US adults aged \geq 65 years with known T2DM, PGC is more likely to be observed in those with high serum levels of PFNA and PFHxS (independent of sex) and PFDeA (in men), after controlling for confounders.			ВВ

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)		出情 ン文 ン文 対報 象抽 ① ラ ② ラ
D852	ヒト (代 謝)	Behr, Anne- Cathrin; Kwiatkowski, Anna; Stahlman, Marcus; Schmidt, Felix Florian; Luckert, Claudia; Braeuning, Albert; Buhrke, Thorsten	Correction to: Impairment of bile acid metabolism by perfluorooctanoic acid (PFOA) and perfluorooctanesulfonic acid (PFOS) in human HepaRG hepatoma cells	202:	1 Arch Toxicol. 2021 Aug;95(8):2891. doi: 10.1007/s00204- 021-03089-x.	The most prominent slow reacting substance from rat basophilic leukemia cells (type I) was characterized by radiochemical, chemical and physical methods and shown to contain a C20 unsaturated fatty acid oxygenated at the 5 position and a sulfur containing side chain in thioether linkage at the 6 position. Its spasmogenic action on guinea pig ileal muscle was largely inactivated under reducing conditions which suggested that a peroxy group was present and important for contractile activity. This was supported by ferrous thiocyanate analysis. The peroxy group is almost certainly at the 5 position, probably in the form of a peroxy ester or hydroperoxide. Based on amino acid hydrolysis (0.85 moles of glycine and 0.30 moles of glutamic acid per mole SRS), the sulfur containing side chain is apparently a mixture of glutathione and cysteinyl-glycine, but by chromatography the side chain is predominantly glutathione and the low yield of glutamic acid may be due to complexing of its alpha COOH group in a peroxy ester linkage. The fatty acid moiety has 3 conjugated double bonds, probably at the 7,8, 9,10 and 11,12 positions. Type II SRS, the second major species, differs in that the sulfur containing side chain is linked at the 12 or 13 position and is almost certainly glutathione and in the failure of alkaline borohydride to produce inactivation. These observations strongly implicate the lipoxygenase pathway in slow reacting substance biosynthesis.		сс
D853	ヒト (代 謝)	Feng, Yue; Fu, Ming; Guan, Xin; Wang, Chenming; Meng, Hua; Zhou, Yuhan; He, Meian; Guo, Huan	Associations of exposure to perfluoroalkyl substances with serum uric acid change and hyperuricemia among Chinese women: Results from a longitudinal study	2022	2 2 2 10.1016/j.chemosphere.2022.136438. Epub 2022 Sep 15.	BACKGROUND: Cross-sectional studies have reported associations of perfluoroctanoic acid (PFOA) with concurrent serum uric acid (UA) levels. However, the prospective associations of other commonly detected perfluoroalkyl substances (PFASs) with serum UA and hyperuricemia remain unclear. METHODS: A total of 654 females from the Dongfeng-Tongji cohort, who were followed up from 2008 to 2018, were included in this study. We measured their baseline plasma concentrations of six PFASs [including perfluoroactane sulfonic acid (PFOS), PFOA, perfluorononanoic acid (PFNA), perfluorohexane sulfonic acid (PFHxS), perfluorodecanoic acid (PFDA), and perfluoroheptanoic acid (PFHpA)], as well as their serum UA levels at both baseline and follow-up visits. General linear and logistic regression models were constructed to explore the associations of each PFAS with annual change of serum UA and incident hyperuricemia. Mixture effects of PFASs were further assessed by using the quantile g- computation approach. RESULTS: Compared to participants with low PFNA exposure (\leq 50(th)), those with high PFNA exposure ($>$ 75(th)) had significantly increased annual increment of serum UA [β (95%CI) = 2.58 (0.60, 4.55)]. No significant associations of PFOS, PFOA, PFDA, PFHxS, or PFHpA with serum UA change were observed. Besides, females with high PFOA or PFHpA ($>$ 75(th)) exposure had higher incident risk of hyperuricemia than those with low exposure ($<$ 50(th)) [OR (95%CI) = 1.94 (1.00, 3.76) and 1.86 (1.03, 3.36), respectively]. No significant associations of PFOS, PFNA, PFDA, and PFHxS with hyperuricemia risk were observed. Quantile g-computation approach didn't find significant effects of PFAS co-exposure on serum UA change or hyperuricemia incidence. CONCLUSIONS: Our findings suggested exposure to PFASs as a risk factor for hyperuricemia and shed light on hyperuricemia prevention for elderly females.		B C
D854	ヒト (代 謝)	Batzella, Erich; Girardi, Paolo; Russo, Francesca; Pitter, Gisella; Da Re, Filippo; Fletcher, Tony; Canova, Cristina				ВВ		

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文ン文 対報 象抽 ① ラ ② ラ
D855	ヒト (代 謝)	Lind, P Monica; Lind, Lars; Salihovic, Samira; Ahlströ m, Håkan; Michaelsson, Karl; Kullberg, Joel; Strand, Robin	Serum levels of perfluoroalkyl substances (PFAS) and body composition - A cross-sectional study in a middle-aged population	2022	Environ Res. 2022 Jun;209:112677. doi: 10.1016/j.envres.2022.112677. Epub 2022 Jan 22.	BACKGROUND: It has been suggested that per- and polyfluoroalkyl substances (PFAS) are endocrine disruptors with a potential to influence fat mass. OBJECTIVE: The primary hypothesis tested was that we would find positive relationships for PFAS vs measures of adiposity. METHODS: In 321 subjects all aged 50 years in the POEM study, five PFAS (perfluorooctane sulfonic acid (PFOS), perfluorooctanoic acid (PFOA), perfluorohexane sulfonic acid (PFHxS), perfluorononanoic acid (PFNA), perfluorodecanoic acid (PFDA)) were measured in serum together with a Dual-energy X-ray absorptiometry (DXA) scan for determination of fat and lean mass. Whole-body magnetic resonance imaging scan was performed and the body was divided into >1 million voxels. Voxel-wise statistical analysis was carried out by a novel method denoted lmiomics. RESULTS: PFOS and PFHxS, did not show any consistent associations with body composition. However, PFOA, and especially PFNA and PFDA, levels were inversely related to most traditional measures reflecting the amount of fat in women, but not in men. In the Imiomics analysis of tissue volume, PFDA and PFNA levels were inversely related to the volume of subcutaneous fat, mainly in the arm, trunk and hip regions in women, while no such clear relationship was seen in men. Also, the visceral fat content of the liver, the pericardium, and the gluteus muscle were inversely related to PFDA and PFNA in women. DISCUSSION: Contrary to our hypothesis, some PFAS showed inverse relationships vs measurements of adiposity. CONCLUSION: PFOS and PFHxS levels in plasma did not show any consistent associations with body composition, but PFOA, and especially PFNA and PFDA were inversely related to multiple measures reflecting the amount of fat, but in women only.		ВC
D856	ヒト (代 謝)	Chung, Seung Min; Heo, Dong- Gyu; Kim, Ju- Hyun; Yoon, Ji Sung; Lee, Hyoung Woo; Kim, Jong-Yeon; Moon, Jun Sung; Won, Kyu Chang	Perfluorinated compounds in adults and their association with fasting glucose and incident diabetes: a prospective cohort study	2022	Environ Health. 2022 Oct 26;21(1):101. doi: 10.1186/s12940- 022-00915-2.	BACKGROUND: The endocrine disruption of perfluorinated compounds is an emerging issue. We aimed to examine the association of serum perfluoroctanoic acid (PFOA) and perfluoroctanesulfonic acid (PFOS) levels with incident diabetes and fasting serum glucose concentration. METHODS: This prospective cohort study was based on an urban-based cohort subpopulation from the Korean Genome and Epidemiology Study. Serum samples (600μ L) were received from 100 participants in the normoglycemic baseline survey (2004-2013), and concentrations of PFOA and PFOS were measured using mass spectrometry. The incidence of diabetes was tracked in the follow-up survey ($2012-2016$). RESULTS: The mean age was 56.4 years (men, 59%). The median serum PFOA and PFOS concentrations were 4.29 ng/mL and 9.44 ng/mL, respectively. PFOA and PFOS concentrations differed according to age, sex, and residential area. After 60 months, 23 patients had diabetes. Log-transformed PFOA (InPFOA) and log-transformed PFOS (InPFOS) were significantly higher in those who transitioned to diabetes than in those who did not (both p < 0.05). After multivariate adjustment, InPFOA (coefficient = 6.98, 95% CI -0.04-14, p = 0.054) and InPFOS (coefficient = 7.06, 95% CI -0.96-15.08, p = 0.088) predicted increased fasting glucose without statistical significance. In addition, InPFOA, but not InPFOS, significantly predicted incident diabetes (HR = 3.98, 95% CI 1.42-11.1, p < 0.01). CONCLUSION: Exposure to PFOA and PFOS may have a potential dysglycemic effect. In particular, exposure to PFOA increased the risk of diabetes. Further research with larger sample size is warranted.		ВВ
D857	ヒト (代 謝)	Schillemans, Tessa; Iszatt, Nina; Remy, Sylvie; Schoeters, Greet; Fernández, Mariana F; D'Cruz, Shereen Cynthia; Desalegn, Anteneh; Haug, Line S; Lignell, Sanna; Lindroos, Anna Karin; Fá belová, Lucia; Murinova, Lubica Palkovicova; Kosjek, Tina; Tkalec, Žiga; Gabriel, Catherine; Sarigiannis,	Cross-sectional associations between exposure to per- and polyfluoroalkyl substances and body mass index among European teenagers in the HBM4EU aligned studies	2022	Environ Pollut. 2022 Nov 2;316(Pt 1):120566. doi: 10.1016/j.envpol.2022.120566. Online ahead of print.	Per- and polyfluoroalkyl substances (PFAS) are widespread pollutants that may impact youth adiposity patterns. We investigated cross-sectional associations between PFAS and body mass index (BMI) in teenagers/adolescents across nine European countries within the Human Biomonitoring for Europe (HBM4EU) initiative. We used data from 1957 teenagers (12-18 yrs) that were part of the HBM4EU aligned studies, consisting of nine HBM studies (NEBII, Norway; Riksmaten Adolescents 2016-17, Sweden; PCB cohort (follow-up), Slovakia; SLO CRP, Slovenia; CROME, Greece; BEA, Spain; ESTEBAN, France; FLEHS IV, Belgium; GerES V-sub, Germany). Twelve PFAS were measured in blood, whilst weight and height were measured by field nurse/physician or self-reported in questionnaires. We assessed associations between PFAS and age- and sex-adjusted BMI z-scores using linear and logistic regression adjusted for potential confounders. Random-effects meta-analysis and mixed effects models were used to pool studies. We assessed mixture effects using molar sums of exposure biomarkers with toxicological/structural similarities and quantile g-computation. In all studies, the highest concentrations of PFAS were PFOS (medians ranging from 1.34 to 2.79 μ g/L). There was a tendency for negative associations with BMI z-scores for all PFAS (except for PFHxS and PFHpS), which was borderline significant for the molar sum of [PFOA and PFNA] and significant for single PFOA [β -coefficient (95% CI) per interquartile range fold change = -0.06 (-0.17, 0.00) and -0.08 (-0.15, -0.01), respectively]. Mixture assessment indicated similar negative associations of the total mixture of [PFOA, PFNA and PFOS] were negatively associated, [PFHxS] associated positively with BMI z-score. Our results indicated a tendency for associations of relatively low PFAS concentrations of rhealth later in life.		вВ

分野 著者 タイトル 発行年 書誌情報 要旨 (原文) No. (参考) Per- and poly-fluoroalkyl substances (PFAS) are ubiquitous and may persist in human tissue proportion of PFAS have been studied for human health effects. We tested the association b PFAS and several clinical measures of organ and metabolic function in a nationally represen aged 3-79 years old who participated in the Canadian Health Measures Survey. Cross-section generalized linear mixed models incorporating survey-specific sampling weights. An increase Cakmak, Sabit; equivalent to the magnitude of its geometric mean (GM) of 2.0 μ g/L was associated with pe Lukina, Anna The association between blood PFAS concentrations enzymes reflecting liver function: aspartate aminotransferase (AST) 3.7 (1.1, 6.4), gamma-gl Sci Total Environ. 2022 Jun 25;827:153900. doi: ヒト (代 Karthikeyan, and clinical biochemical measures of organ function 21.8), alanine aminotransferase (ALT) 3.2 (0.5, 5.9), and bilirubin 3.6 (2.7, 4.5). A GM increas D858 10.1016/j.scitotenv.2022.153900. Epub 2022 Feb 23. and metabolism in participants of the Canadian Health 0.2 μ g/L was positively associated with percentage increases in GGT, triglycerides, low-der Subramanian: Atlas, Ella; Dales, Measures Survey (CHMS) total cholesterol, and calcium with respective increases of 15.5 (2.2, 30.4), 7.0 (1.0, 13.2), 10. Robert (0.3, 1.3). PFOA, perfluorooctane sulfonate (PFOS), PFDA and perfluorononanoic acid (PFNA GGT. All six congeners were positively associated with at least one biomarker of lipid metable perfluorohexane sulfonate (PFHxS) and PFNA were positively associated with serum calcium associated with clinical blood tests reflecting metabolism and the function of several organ changes may possibly indicate early pathology that is clinically inapparent and may possibly population or in individuals exposed to very high levels of PFAS. BACKGROUND/OBJECTIVES: Perfluoroalkyl and polyfluoroalkyl substances (PFAS) have be epidemiologic evidence is limited. We examined associations of serum PFAS concentrations weight, waist circumference (WC), fat mass, and proportion fat in midlife women. SUBJECTS 1,381 midlife women, with a total of 15,000 repeated measures from the multi-racial/ethnic Ding, Ning; Nation between 1999 and 2018. The average follow-up was 14.9 (range: 0-18.6) years. Body Karvonen-WC) and body composition from dual-energy X-ray absorptiometry were assessed at near-a Gutierrez, Carrie piecewise linear splines were utilized to model non-linear trajectories of body size and comp Perfluoroalkyl and polyfluoroalkyl substances and A; Herman, adjustment, PFAS concentrations were positively associated with weight, WC, fat mass, and ヒト (代 body size and composition trajectories in midlife Int J Obes (Lond). 2021 Sep;45(9):1937-1948. doi: D859 William H; follow-up. Comparing the highest to the lowest tertiles of PFAS concentrations, adjusted geo 2021 10.1038/s41366-021-00848-9. Epub 2021 May 13. omen: the study of women's health across the natior Calafat, Antonia 69.6 kg for PFOS (P < 0.0001), and 74.0 vs. 69.4 kg for linear PFOA (P < 0.0001) at baseli 1999-2018 M; Mukherjee, PFOS had an annual increase rate of 0.33% (95% CI: 0.27%, 0.40%) in weight, compared to the Bhramar; Park, 0.04%, 0.17%) (P < 0.0001). PFOS was also significantly related to higher increase rates in 0.002) and fat mass (difference = 0.25% per vear. P = 0.0002). EtFOSAA and MeFOSAA s Sung Kyun Although PFHxS was not related to body size or fat at baseline, PFHxS was significantly assi weight (P < 0.0001), WC (P = 0.003), fat mass (P < 0.0001), and proportion fat (P = 0.00 for PFNA. CONCLUSIONS: Certain PFAS were positively associated with greater body size a change over time. PFAS may be an underappreciated contributing factor to obesity risk. Laboratory and epidemiologic studies suggested that exposure to perfluoroalkyl substances metabolisms, but data remain limited for pregnant women. A total of 436 pregnant women w Yang, Jiaqi; China. Serum levels of 11 PFASs were determined in the early term of pregnancy. Four lipids Wang, Hexing; (TG), high-density lipoprotein (HDL), and low-density lipoprotein (LDL)) were measured in Du, Hongyi; PFASs, seven had a detection rate of greater than 70%. After adjusting for potential confoun Fang, Hongji; perfluororohexanesulfonic acid (In PFHxS) was positively associated with TC (β : 0.184, 95% Han, Minghui; ヒト (代 Serum perfluoroalkyl substances in relation to lipid Chemosphere. 2021 Jun;273:128566. doi: CI: 0.001-0.083), and LDL (β: 0.091, 95% CI: 0.001-0.185). Ln perfluoroundecanoic acid (PF D860 Xu, Linji; Liu, 2021 鲥) 10.1016/j.chemosphere.2020.128566. Epub 2020 Oct 8. HDL (β : 0.021, 95% CI: 0.001-0.044), while Ln perfluorodecanoic acid (PFDA) was negative metabolism in Chinese pregnant women Shuping; Yi, CI: -0.098~-0.009) and In perfluorootanoic acid (PFOA) was negatively associated with LDL Jianping; Chen, 0.009). In principal component analysis, the component with a large loading of 31.3% for PFC Yue; Jiang, PFDA and PFUdA showed a negative association with LDL/HDL. After serum concentration Qingwu; He, quartiles, a higher level of TC was seen in the second quartile of PFOA or PFNA than the first Gengsheng was seen in the fourth quartile of PFOA, PFUdA or PFDA. These results suggested that exp. influence lipid metabolisms in pregnant women

	備考	出 情 対 報 象 抽	ン 文 ク 献 ① ラ	ン 文 ク 献 ② ラ
e for several years. Only a small between human blood levels of six itative sample of 6768 participants onal associations were assessed by e in perfluorooctanoic acid (PFOA) ercentage (95% CI) increases in serum lutamyl transferase (GGT) 11.8 (2.5, se in perfluorodecanoic acid (PFDA) of nsity lipoprotein (LDL) cholesterol, .7 (5.5, 16.1), 2.8 (0.2, 5.3), and 0.8 A) were positively associated with olism, and 5 of 6, PFOA, PFOS, PFDA, m. Exposure to selected PFAS is systems. These relatively small be of significance in a general			В	A
then suggested as obesogens but with longitudinal trajectories of S/METHODS: This study included Study of Women's Health Across the size (objectively measured weight and nnual visits. Linear mixed models with bosition. RESULTS: After multivariable I proportion fat at baseline and during ometric mean weight was 73.9 kg vs. ne. Women with the highest tertile of he lowest tertile with 0.10% (95% CI: WC (difference = 0.12% per year, P = showed similar effects to PFOS. ociated with accelerated increases in 009). No significant results were found ind body fat, and higher rates of			A	В
(PFASs) could affect lipid vere selected in Tangshan City, North is (total cholesterol (TC), triglyceride the late term of pregnancy. Of 11 inders, natural log-transformed is Cl: 0.045-0.321), HDL (β : 0.040, 95% UdA) was positively associated with ly associated with LDL (β : -0.053, 95% /HDL (β : -0.042, 95% Cl: -0.075~- DA, perfluorononanoic acid (PFNA), is of PFASs were categorized into st quartile, but a lower LDL/HDL ratio posure to PFASs has a potential to			В	В

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D861	ヒト (代 謝)	Zhang, Ruijia; Chen, Baowei; Lin, Li; Zhang, Hui; Luan, Tiangang	(13)C isotope-based metabolic flux analysis revealing cellular landscape of glucose metabolism in human liver cells exposed to perfluorooctanoic acid	2021	Sci Total Environ. 2021 May 20;770:145329. doi: 10.1016/j.scitotenv.2021.145329. Epub 2021 Jan 22.	Perfluorooctanoic acid (PFOA) is well known to break glucose homeostasis. However, the effects of PFOA on glucose metabolism are difficult to be evaluated because related metabolites may be synthesized from other nutritional substrates. Here, the relative contribution of glucose to metabolites (e.g., pyruvate and citrate) in the PFOA-treated human liver cells (HepG2) was determined using the (13)C isotope-based metabolic flux analysis (MFA), i.e., pathway activities. The relative percentage of [U-(13)C(6)] glucose-derived pyruvate in cells exposed to PFOA was not significantly different from that in the controls, indicating that the metabolic pattern of glycolysis was not substantially changed by PFOA. The pathway activity of [U-(13)C(6)] glucose-driven tricarboxylic acid (TCA) cycle was dramatically inhibited by PFOA. Consequently, mitochondrial respiratory function was phenotypically impaired by PFOA, as observed from the decreasing basal oxygen consumption rate (OCR), ATP-linked OCR and spare respiratory capacity. This study suggests that PFOA may cause the abnormal glucose metabolism via altering the metabolic pattern of TCA cycle instead of glycolysis. The MFA is strongly recommended as a promising and robust tool to address the toxicity mechanisms of contaminants associated with glucose metabolism.			С	С
D862	ヒト (代 謝)	Ye, Wan-Lin; Chen, Zan-Xiong; Xie, Yan-Qi; Kong, Min-Li; Li, Qing-Qing; Yu, Shu; Chu, Chu; Dong, Guang- Hui; Zeng, Xiao- Wen	Associations between serum isomers of perfluoroalkyl acids and metabolic syndrome in adults: Isomers of C8 Health Project in China	2021	Environ Res. 2021 May;196:110430. doi: 10.1016/j.envres.2020.110430. Epub 2020 Nov 9.	BACKGROUND: Exposure to perfluoroalkyl acids (PFAAs) is known to be associated with metabolic disorders. However, whether PFAAs isomers are associated with metabolic syndrome (MetS) still remains unknown. OBJECTIVES: To explore the associations between serum PFAAs isomers and MetS. METHODS: We recruited 1,501 adults from a cross-sectional study, the "Isomers of C8 Health Project in China" to investigate the associations between PFAAs isomers and MetS. A total of 20 PFAAs including the isomers of PFOS and PFOA were detected. Logistic regression models and restricted cubic spline models were used to evaluate the relationship of serum PFAAs isomers exposure with MetS and its components as well after adjusting for covariates. RESULTS: The MetS prevalence in our study was 43.0%. The serum levels of both PFOS and PFOA isomers were higher in participants with MetS than that with non-MetS (p < 0.05). We found positive associations for per natural log-transformed ng/mL of branched perfluorooctane sulfonate (br-PFOS) (odds ratio (OR) = 1.18, 95% confidence interval (CI): 1.01, 1.38)) linear perfluoronanoic acid (n-PFOA) (OR = 1.32, 95% CI: 1.16, 1.58) and perfluoro-6-methylpheptanoic acid (6 m-PFOA) (OR = 1.32, 95% CI: 1.11, 1.57) with higher odds of MetS after covariates adjustment, while null association was observed for linear isomers of PFOS (OR = 1.09, 95% CI: 0.94, 1.25). We found a nonlinear dose-response relationship with a "threshold" effect in serum br-PFOS isomers with MetS, in which the odds of MetS increased quickly with increasing serum br-PFOS isomers and MetS and the nonlinearity of dose-response relationship with br-PFOS isomers. Our findings indicate that more attention is needed to pay on the nonlinearity of dose-response relationship with human health.			В	В
D863	ヒト (代 謝)	Ward-Caviness, Cavin K; Moyer, Joshua; Weaver, Anne; Devlin, Robert; Diaz- Sanchez, David	Associations between PFAS occurrence and multimorbidity as observed in an electronic health record cohort	2022	Environ Epidemiol. 2022 Jul 14;6(4):e217. doi: 10.1097/EE9.0000000000000217. eCollection 2022 Aug.	Per and polyfluoroalkyl substances (PFAS) are associated with health outcomes ranging from cancer to high cholesterol. However, there has been little examination of how PFAS exposure might impact the development of multiple chronic diseases, known as multimorbidity. Here, we associated the presence of one or more PFAS in water systems serving the zip code of residence with chronic disease and multimorbidity. METHODS: We used data from the unregulated contaminant monitoring rule 3 to estimate exposure to PFAS for a random sample of 10,168 patients from the University of North Carolina Healthcare System. The presence of 16 chronic diseases was determined via. their electronic health records. We used a logistic regression model in a cross-sectional study design to associate the presence of one or more PFAS with multimorbidity. Models were adjusted for age, race, sex, smoking status, socioeconomic status, and 20 county-level confounders. RESULTS: There were four PFAS found in water systems that served at least one zip code represented in our patient data: PFOA, PFHpA, PFOS, and PFHxS. Exposure to any PFAS was associated with a odds ratio of 1.25 for multimorbidity (95% confidence interval = 1.09, 1.45). Among the chronic diseases with at least 300 cases, we observed associations with dyslipidemia, hypertension, ischemic heart disease, and osteoporosis. CONCLUSION: Exposure to PFAS is associated with a range of chronic diseases as well as multimorbidity. Accounting for the joint impacts of PFAS on multiple chronic conditions may give an increasingly clear picture of the public health impacts of PFAS.			С	С

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D864	ヒト (代 謝)	Han, Xu; Meng, Lingling; Zhang, Gaoxin; Li, Yingming; Shi, Yali; Zhang, Qinghua; Jiang, Guibin	Exposure to novel and legacy per- and polyfluoroalkyl substances (PFASs) and associations with type 2 diabetes: A case-control study in East China	2021	Environ Int. 2021 Nov;156:106637. doi: 10.1016/j.envint.2021.106637. Epub 2021 May 13.	Associations between per- and polyfluoroalkyl substances (PFASs) and the incidence of type 2 diabetes are controversial in epidemiological studies. In addition, limited data are available for assessing the health effects of novel PFAS alternatives. Our study evaluated the effects of PFAS exposure on type 2 diabetes by estimating the associations of PFASs in human serum with the risk of type 2 diabetes and levels of glycemic biomarkers and lipid fractions. The case-control study consisted of 304 participants from Shandong Province, East China, half of which were diagnosed with type 2 diabetes. Logistic regression showed that most PFASs were inversely associated with the risk of type 2 diabetes after adjusting for age, sex, and body mass index. However, concentrations of perfluorooctanoic acid (PFOA) in the control group were positively associated with fasting plasma glucose levels ($\beta = 0.04$, 95% confidence interval (CI): 0.0003, 0.08), which may promote the development of type 2 diabetes. Furthermore, each log-unit increase in the concentrations of perfluoronanonic acid (PFNA), perfluoroundecanoic acid (PFUnDA), and 6:2 chlorinated polyfluoroalkyl ether sulfonic acid (CI-PFESA) were associated with a total cholesterol increase (i.e., 17.49% (95% CI: 0.93%, 34.90%), 17.49% (95% CI: 4.71%, 31.83%), and 17.49% (95% CI: 4.71%, 31.83%), respectively). Positive associations were also observed between PFNA, PFUnDA, perfluorooctane sulfonate (PFOS), and 6:2 CI-PFESA and low-density lipoprotein cholesterol reached statistical significance, nor associations between PFAS mixtures and outcomes of interest. In conclusion, the significant correlations between serum PFASs and glycemic biomarkers and lipid fractions indicated that PFAS exposure may be a potential diabetogenic factor. To the best of our knowledge, this is the first study to assess the associations between novel CI-PFESAs and type 2 diabetes, although the inverse associations observed require clarification in future studies.			в с
D865	ヒト (代 謝)	Chen, Zhanghua; Yang, Tingyu; Walker, Douglas I; Thomas, Duncan C; Qiu, Chenyu; Chatzi, Leda; Alderete, Tanya L; Kim, Jeniffer S; Conti, David V; Breton, Carrie V; Liang, Donghai; Hauser, Elizabeth R; Jones, Dean P; Gilliland, Frank D	Dysregulated lipid and fatty acid metabolism link perfluoroalkyl substances exposure and impaired glucose metabolism in young adults	2020	Environ Int. 2020 Dec;145:106091. doi: 10.1016/j.envint.2020.106091. Epub 2020 Sep 3.	BACKGROUND: Per- and polyfluoroalkyl substances (PFASs) exposure is ubiquitous among the US population and has been linked to adverse health outcomes including cardiometabolic diseases, immune dysregulation and endocrine disruption. However, the metabolic mechanism underlying the adverse health effect of PFASs exposure is unknown. OBJECTIVE: The aim of this project is to investigate the association between PFASs exposure and altered metabolic pathways linked to increased cardiometabolic risk in young adults. METHODS: A total of 102 young adults with 82% overweight or obese participants were enrolled from Southern California between 2014 and 2017. Cardiometabolic outcomes were assessed including oral glucose tolerance test (OGTT) measures, body fat and lipid profiles. High-resolution metabolomics was used to quantify plasma exposure levels of three PFAS congeners and intensity profiles of the untargeted metabolome. Fasting concentrations of 45 targeted metabolites involved in fatty acid and lipid metabolism were used to verify untargeted metabolomics findings. Bayesian Kernel Machine Regression (BKMR) was used to examine the associations between PFAS exposure mixture and cardiometabolic outcomes adjusting for covariates. Mummichog pathway enrichment analysis was used to explore PFAS-associated metabolic pathways. Moreover, the effect of PFAS exposure on the metabolic network, including metabolomic profiles and cardiometabolic outcomes, was investigated. RESULTS: Higher exposure to perfluorooctanoic acid (PFOA) was associated with higher 30-minute glucose levels and glucose area under the curve (AUC) during the OGTT ($p < 0.001$). PFAS exposure was also associated with altered lipid pathways, which contributed to the metabolic network connecting PFOA and higher glucose levels following the OGTT. Targeted metabolomics analysis indicated that higher PFOA exposure was associated with higher levels of glycerol ($p = 0.006$), which itself was associated with higher 30-minute glucose ($p = 0.006$). CONCLUSIONS: Increa			ВВ
D866	ヒト (代 謝)	Thomsen, Mathilde Lolk; Henriksen, Louise Scheutz; Tinggaard, Jeanette; Nielsen, Flemming; Jensen, Tina Kold; Main, Katharina M	Associations between exposure to perfluoroalkyl substances and body fat evaluated by DXA and MRI in 109 adolescent boys	2021	Environ Health. 2021 Jun 28;20(1):73. doi: 10.1186/s12940- 021-00758-3.	BACKGROUND: Exposure to perfluoroalkyl substances (PFASs) has been associated with changes in body mass index and adiposity, but evidence is inconsistent as study design, population age, follow-up periods and exposure levels vary between studies. We investigated associations between PFAS exposure and body fat in a cross-sectional study of healthy boys. METHODS: In 109 boys (10-14 years old), magnetic resonance imaging and dual-energy X-ray absorptiometry were performed to evaluate abdominal, visceral fat, total body, android, gynoid, android/gynoid ratio, and total fat percentage standard deviation score. Serum was analysed for perfluorooctanoic acid, perfluorooctane sulfonic acid (PFOS), perfluorohexane sulfonic acid, perfluorononanoic acid, and perfluorodecanoic acid using liquid chromatography and triple quadrupole mass spectrometry. Data were analysed by multivariate linear regression. RESULTS: Serum concentrations of PFASs were low. Generally, no clear associations between PFAS exposure and body fat measures were found; however, PFOS was negatively associated with abdominal fat (β = -0.18, P = 0.046), android fat (β = -0.34, P = 0.022), android/gynoid ratio (β = -0.21, P = 0.004), as well as total body fat (β = -0.21, P = 0.079) when adjusting for Tanner stage. CONCLUSIONS: Overall, we found no consistent associations between PFAS exposure and body fat. This could be due to our cross-sectional study design. Furthermore, we assessed PFAS exposure in adolescence and not in utero, which is considered a more vulnerable time window of exposure.			вс

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D867	ヒト (代 謝)	Valvi, Damaskini; Højlund, Kurt; Coull, Brent A; Nielsen, Flemming; Weihe, Pal; Grandjean, Philippe	Life-course Exposure to Perfluoroalkyl Substances in Relation to Markers of Glucose Homeostasis in Early Adulthood	2021	J Clin Endocrinol Metab. 2021 Jul 13;106(8):2495-2504. doi: 10.1210/clinem/dgab267.	OBJECTIVE: To investigate the prospective associations of life-course perfluoroalkyl substances (PFASs) exposure with glucose homeostasis at adulthood. METHODS: We calculated insulin sensitivity and beta-cell function indices based on 2-h oral glucose tolerance tests at age 28 in 699 Faroese born in 1986-1987. Five major PFASs were measured in cord whole blood and in serum from ages 7, 14, 22, and 28 years. We evaluated the associations with glucose homeostasis measures by PFAS exposures at different ages using multiple informant models fitting generalized estimating equations and by life-course PFAS exposures using structural equation models. RESULTS: Associations were stronger for perfluorooctane sulfonate (PFOS) and suggested decreased insulin sensitivity and increased beta-cell function-for example, β (95% CI) for log-insulinogenic index per PFOS doubling = 0.12 (0.02, 0.22) for prenatal exposures, 0.04 (-0.10, 0.19) at age 7, 0.07 (-0.07, 0.21) at age 14, 0.05 (-0.04, 0.15) at age 22, and 0.04 (- 0.03, 0.11) at age 28. Associations were consistent across ages (P for age interaction > 0.10 for all PFASs) and sex (P for sex interaction > 0.10 for all PFASs, except perfluorodecanoic acid). The overall life-course PFOS exposure was also associated with altered glucose homeostasis (P = 0.04). Associations for other life-course PFAS exposures were nonsignificant. CONCLUSIONS: Life-course PFAS exposure is associated with decreased insulin sensitivity and increased pancreatic beta-cell function in young adults.		вв
D868	ヒト (代 謝)	Blomberg, Annelise J; Shih, Yu-Hsuan; Messerlian, Carmen; Jø rgensen, Louise Helskov; Weihe, Pál; Grandjean, Philippe	Early-life associations between per- and polyfluoroalkyl substances and serum lipids in a longitudinal birth cohort	2021	Environ Res. 2021 Sep;200:111400. doi: 10.1016/j.envres.2021.111400. Epub 2021 May 31.	BACKGROUND: Exposures to per- and polyfluoroalkyl substances (PFASs) may affect metabolic outcomes, including lipid concentrations in the blood. However, few studies have evaluated potential associations between PFASs and lipids longitudinally. OBJECTIVES: We estimated associations between PFAS and lipid concentrations at birth and at several points in childhood. METHODS: We measured concentrations of five major PFASs in cord serum and in serum collected at 18 months, five years and nine years in 490 children from a prospective cohort in the Faroe Islands. Total cholesterol (TC), low-density lipoprotein cholesterol (HDL-C) and triglyceride (TG) concentrations were measured at birth, 18 months and nine years. We estimated associations between PFAS and lipid concentrations and evaluated possible effect modification by sex. We also tested whether PFAS associations with age-nine lipids varied by exposure period. RESULTS: Serum PFAS concentrations at ages five and nine were positively associated with lipid concentrations of perfluorodecanoic acid (PFDA), perfluoronanoic acid (PFNA) and perfluorooctanesulfonic acid (PFOS) associated with increases in TC, HDL-C and LDL-C. We found statistically significant differences in estimated PFAS effects by sex, where girls had stronger positive associations between PFASs and TC and LDL-C and boys had stronger positive associations with HDL-C. In repeated measure models, exposure period was a significant modifier of PFAS effects. CONCLUSIONS: Our findings suggest that childhood PFAS exposures may be associated with elevated serum lipid concentrations. This is a public health concern, as a detrimental lipid profile in childhood is a risk factor for later development of hyperlipidemia and cardiovascular disease.		в В
D869	ヒト (代 謝)	Dos Santos, Reinaldo Sousa; Medina-Gali, Regla María; Babiloni-Chust, Ignacio; Marroqui, Laura; Nadal, Angel	In Vitro Assays to Identify Metabolism-Disrupting Chemicals with Diabetogenic Activity in a Human Pancreatic β -Cell Model	2022	Int J Mol Sci. 2022 May 1;23(9):5040. doi: 10.3390/ijms23095040.	There is a need to develop identification tests for Metabolism Disrupting Chemicals (MDCs) with diabetogenic activity. Here we used the human EndoC- β H1 β -cell line, the rat β -cell line INS-1E and dispersed mouse islet cells to assess the effects of endocrine disruptors on cell viability and glucose-stimulated insulin secretion (GSIS). We tested six chemicals at concentrations within human exposure (from 0.1 pM to 1 μ M). Bisphenol-A (BPA) and tributyltin (TBT) were used as controls while four other chemicals, namely perfluorooctanoic acid (PFOA), triphenylphosphate (TPP), triclosan (TCS) and dichlorodiphenyldichloroethylene (DDE), were used as "unknowns". Regarding cell viability, BPA and TBT increased cell death as previously observed. Their mode of action involved the activation of estrogen receptors and PPAR γ , respectively. ROS production was a consistent key event in BPA-and TBT-treated cells. None of the other MDCs tested modified viability or ROS production. Concerning GSIS, TBT increased insulin secretion while BPA produced no effects. PFOA decreased GSIS, suggesting that this chemical could be a "new" diabetogenic agent. Our results indicate that the EndoC- β H1 cell line is a suitable human β -cell model for testing diabetogenic MDCs. Optimization of the test methods proposed here could be incorporated into a set of protocols for the identification of MDCs.		сс

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No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D870	ヒト (代 謝)	Goodrich, Jesse A; Alderete, Tanya L; Baumert, Brittney O; Berhane, Kiros; Chen, Zhanghua; Gilliland, Frank D; Goran, Michael I; Hu, Xin; Jones, Dean P; Margetaki, Katerina; Rock, Sarah; Stratakis, Nikos; Valvi, Damaskini; Walker, Douglas I; Conti, David V; Chatzi, Leda	Exposure to Perfluoroalkyl Substances and Glucose Homeostasis in Youth	2021	Environ Health Perspect. 2021 Sep;129(9):97002. doi: 10.1289/EHP9200. Epub 2021 Sep 1.	BACKGROUND: Exposure to per- and polyfluoroalkyl substances (PFAS), a prevalent class of persistent pollutants, may increase the risk of type 2 diabetes. OBJECTIVE: We examined associations between PFAS exposure and glucose metabolism in youth. METHODS: Overweight/obese adolescents from the Study of Latino Adolescents at Risk of Type 2 Diabetes (SOLAR; n = 310) participated in annual visits for an average of 3.3 ± 2.9 y. Generalizability of findings were tested in young adults from the Southern California Children's Health Study (CHS; n = 135) who participated in a clinical visit with a similar protocol. At each visit, oral glucose tolerance tests were performed to estimate glucose metabolism and β -cell function via the insulinogenic index. Four PFAS were measured at baseline using liquid chromatography-high-resolution mass spectrometry; high levels were defined as concentrations > 66th percentile. RESULTS: In females from the SOLAR, high perfluorohexane sulfonate (PFHxS) levels (≥ 2.0 ng/mL) were associated with the development of dysregulated glucose metabolism beginning in late puberty. The magnitude of these associations increased postpuberty and persisted through 18 years of age. For example, postpuberty, females with high PFHxS levels had 25-mg/dL higher 60-min glucose (95% CI: 1, 39 mg/dL; p < 0.0001), 15-mg/dL higher 2-h glucose (95% CI: 1, 28 mg/dL; p = 0.04), and 25% lower β -cell function ($p = 0.02$) compared with females with low levels. Results were largely consistent in the CHS, where females with elevated PFHxS levels had 26-mg/dL higher 60-min glucose, which did not meet statistical significance (95% CI: -1, 39 mg/dL; p = 0.08). In males, no consistent associations between PFHxS and glucose metabolism were observed. No consistent associations were observed for other PFAS and glucose metabolism. DISCUSSION: Youth exposure to PFHxS was associated with dysregulated glucose metabolism in females, which may be due to changes in β -cell function. These associations appeared during puberty a		A B
D871	ヒト (代 謝)	He, Xiwei; Jiang, Jinhong; Zhang, Xu-Xiang	Environmental exposure to low-dose perfluorohexanesulfonate promotes obesity and non- alcoholic fatty liver disease in mice fed a high-fat diet	2022	Environ Sci Pollut Res Int. 2022 Jul;29(32):49279-49290. doi: 10.1007/s11356-022-19369-7. Epub 2022 Feb 25.	Perfluorohexanesulfonate (PFHxS) is one of the most prevalent perfluoroalkyls. It is widely distributed in both abiotic and biotic environments because of its prevalence and bioaccumulative properties. Exposure to PFHxS has been associated with the higher serum liver functions associated with steatosis in obese people. This study explores the impact of chronic exposure to low-dose PFHxS on predisposition to non-alcoholic fatty liver disease (NAFLD) as well as on metabolic functions in diet-induced obese mice. Results showed that 12-week exposure to PFHxS at a dose of 450 μ g/L through drinking water significantly promoted obesity and metabolic syndrome in male C57 mice fed a high-fat diet. The PFHxS exposure markedly aggravated hepatic symptoms resembling NAFLD and caused systematic metabolic disorders as well as gut dysbiosis in the obese mice. Key genes of hepatic lipid metabolism, inflammation, and fibrosis were strongly altered, while gut microflora that have been associated with obesity and pathogenesis of NAFLD, including the Bacteroides/Firmicutes ratio, Desulfovibrio, Mucispirillum, and Akkermansia, were significantly affected by the PFHxS exposure. The findings of this study suggest that environmental PFHxS exposure is a tangible risk factor for metabolic diseases such as NAFLD, especially among obese individuals.		вС
D872	ヒト (代 謝)	Mohanto, Nayan Chandra; Ito, Yuki; Kato, Sayaka; Kamijima, Michihiro	Life-Time Environmental Chemical Exposure and Obesity: Review of Epidemiological Studies Using Human Biomonitoring Methods	2021	Front Endocrinol (Lausanne). 2021 Nov 11;12:778737. doi: 10.3389/fendo.2021.778737. eCollection 2021.	The exponential global increase in the incidence of obesity may be partly attributable to environmental chemical (EC) exposure. Humans are constantly exposed to ECs, primarily through environmental components. This review compiled human epidemiological study findings of associations between blood and/or urinary exposure levels of ECs and anthropometric overweight and obesity indices. The findings reveal research gaps that should be addressed. We searched MEDLINE (PubMed) for full text English articles published in 2006-2020 using the keywords "environmental exposure" and "obesity". A total of 821 articles were retrieved; 102 reported relationships between environmental exposure and obesity indices. ECs were the predominantly studied environmental exposure compounds. The ECs were grouped into phenols, phthalates, and persistent organic pollutants (POPs) to evaluate obesogenic roles. In total, 106 articles meeting the inclusion criteria were summarized after an additional search by each group of EC combined with obesity in the PubMed and Scopus databases. Dose-dependent positive associations between bisphenol A (BPA) and various obesity indices were revealed. Both individual and summed di(2-ethylhexyl) phthalate (DEHP) and non-DEHP metabolites showed inconsistent associations with overweight and obesity indices, although mono-butyl phthalate (MBP), mono-ethyl phthalate (MEP), and mono-benzyl phthalate (MBZP) seem to have obesogenic roles in adolescents, adults, and the elderly. Maternal exposure levels of individual POP metabolites or congeners showed inconsistent associations, whereas dichlorodiphenyldichloroethylene (DDE) and perfluorooctanoic acid (PFOA) were positively associated with obesity indices. There was insufficient evidence of associations between early childhood EC exposure and the subsequent development of overweight and obesity in late childhood. Overall, human evidence explicitly reveals the consistent obesogenic roles of BPA, DDE, and PFOA, but inconsistent roles of phthalate metabolites and oth		СВ

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨 (原文)	備考	出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D873	ヒト (代 謝)	Duan, Yishuang; Sun, Hongwen; Yao, Yiming; Li, Yongcheng; Meng, Yue; Lu, Yuan; Han, Liping; Chen, Liming	Serum concentrations of per-/polyfluoroalkyl substances and risk of type 2 diabetes: A case-control study	2021	Sci Total Environ. 2021 Sep 15;787:147476. doi: 10.1016/j.scitotenv.2021.147476. Epub 2021 Apr 30.	Per-/polyfluoroalkyl substances (PFASs), as a group of synthetic chemicals, have been extensively detected in human samples. Recently, epidemiological investigations have reported relationships between exposure to PFASs with risk of type 2 diabetes mellitus (T2DM), but with contradictory results. In this study, a case-control study was conducted to explore associations between serum PFASs and T2DM risk among 252 T2DM cases and 252 controls, who were both diagnosed according to fasting glucose and glycosylated hemoglobin levels. Besides, dose-response relationships were analyzed to clarify effects of PFAS exposure on T2DM risk at different exposure levels. Multivariable logistic regression models showed that compared to the lowest tertiles, elevated odds of T2DM risk were observed in the middle tertiles of perfluorohexane sulfonic acid (PFHxS) [odds ratio (OR): 4.09; 95% confidence interval (CI): 2.23, 7.50; $p < 0.01$] and perfluorohexane sulfonic acid (PFHpA) (OR: 1.87; 95% CI: 1.06, 3.29; $p = 0.03$), but not in the highest tertiles, and the restricted cubic spline regression models presented inverted U-shaped dose-response relationships for exposure to PFHxS and PFHpA with T2DM risk, indicating non-monotonic dose-response effect and low-dose effect. Most other PFASs were inversely associated with risk of T2DM, especially at higher exposure levels. Our findings suggested that there are associations between exposure to PFASs and risk of T2DM. Further mechanism research is worthy to be conducted to elucidate the mode of action of different PFASs on T2DM at different exposure levels.		ВВ
D874	ヒト(代謝)	Yang, Qiaoyun; Guo, Xiaoli; Chen, Yujiao; Zhang, Wei; Ren, Jing; Wang, Jingyu; Tang, Naijun; Gao, Ai	Blood levels of perfluoroalkyl substances (PFASs), elements and their associations with metabolic syndrome (MetS) in Chinese male adults mediated by metabolic-related risk factors	2020	Sci Total Environ. 2020 Nov 10;742:140595. doi: 10.1016/j.scitotenv.2020.140595. Epub 2020 Jun 29.	Our preliminary studies have suggested PFASs, heavy metals, and trace elements could bring significant risks to MetS. However, the role of epigenetic mechanisms (i.e., miRNAs) and risk factors of metabolic alternation (i.e., thyroid functions, glucose and lipids metabolism) are not fully understood. To test this hypothesis, a further cross-sectional study with 80 male MetS cases and 64 male references was undertaken. Negative association between the serum n-perfluorooctanoic acid (n-PFOA) with miR-140-5p was found [β = -0.772; 95% confidence interval (Cl), -0.244 to -0.300; p < 0.01, q < 0.05)] after adjusted with age. Higher levels of leptin and total bile acid were observed in the MetS group. The significantly positive associations between leptin with Cd (β = 1.015, p < 0.01, q < 0.05), Cu (β = 6.796, p < 0.05, q = 0.077) and Se (β = 7.633, p < 0.05, q = 0.060) were found; whereas total bile acid was significantly associated with Se (β = 8.954, p < 0.05, q = 0.140). Significantly positive associations between leptin and systolic/diastolic blood pressure were showed. Moreover, increased total bile acid concentrations were associated with hypertriglyceridemia [odds ratio (OR): 2.24 (95%Cl, 1.10-4.58) adjusted by age.		сс
D875	ヒト (代 謝)	Charles, Dolley; Berg, Vivian; Nø st, Therese H; Huber, Sandra; Sandanger, Torkjel M; Rylander, Charlotta	Pre- and post-diagnostic blood profiles of perfluoroalkyl acids in type 2 diabetes mellitus cases and controls	2020	Environ Int. 2020 Dec;145:106095. doi: 10.1016/j.envint.2020.106095. Epub 2020 Sep 9.	BACKGROUND: Studies exploring the associations between perfluoroalkyl acids (PFAAs) and type 2 diabetes mellitus (T2DM) are rather limited and have reported conflicting results. All studies to date, including prospective ones, have relied on a single blood sample to study this association. Similarly, studies investigating how T2DM status may influence the longitudinal changes in PFAA concentrations have not been previously performed. As PFAA concentrations in humans have changed considerably over the last two decades, and as individuals diagnosed with T2DM usually undergo lifestyle changes that could influence these concentrations, a single blood sample may not necessarily reflect the life-time exposure to PFAA concentrations. Hence, repeated measurements from the same individuals will extend our understanding of how PFAAs are associated with T2DM. The present study, therefore, aimed to explore associations between pre- and post-diagnostic PFAA blood profiles and T2DM and assess factors associated with longitudinal changes in PFAAs in T2DM cases and controls. METHODS: Questionnaire data and blood samples from women participating in the Norwegian Women and Cancer study were used to conduct a nested case-control study among 46 T2DM cases matched to 85 non-diabetic controls. PFAAs were measured in blood samples collected prior to (2001/02) and after (2005/6) T2DM diagnosis. We investigated the association between PFAAs and incident and prevalent T2DM using conditional logistic regression. We assessed the longitudinal changes in PFAA concentrations within and between pre-diagnostic PFAA concentrations and T2DM incidence. Similar results were observed for the post-diagnostic PFAA concentrations and T2DM incidence. Similar results were observed for PFOA and ΣPFOS concentrations and T2DM prevalence. Decrease over time in PFAA concentrations. Longitudinal trends in PFAA concentrations among T2DM cases were similar to the changes observed in controls. CONCLUSIONS: The study did not find evidence of association between		ВВ

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D876	ヒト (代 謝)	Osorio-Yáñez, Citlalli; Sanchez- Guerra, Marco; Cardenas, Andres; Lin, Pi-I D; Hauser, Russ; Gold, Diane R; Kleinman, Ken P; Hivert, Marie- France; Fleisch, Abby F; Calafat, Antonia M; Webster, Thomas F; Horton, Edward S; Oken, Emily	Per- and polyfluoroalkyl substances and calcifications of the coronary and aortic arteries in adults with prediabetes: Results from the diabetes prevention program outcomes study	2021	Environ Int. 2021 Jun;151:106446. doi: 10.1016/j.envint.2021.106446. Epub 2021 Feb 22.	BACKGROUND: Per- and polyfluoroalkyl substances (PFAS) are endocrine disrupting chemicals that have been associated with cardiovascular risk factors including elevated body weight and hypercholesterolemia. Therefore, PFAS may contribute to the development of atherosclerosis and cardiovascular disease (CVD). However, no previous study has evaluated associations between PFAS exposure and arterial calcification. METHODS AND RESULTS: This study used data from 666 prediabetic adults enrolled in the Diabetes Prevention Program trial who had six PFAS quantified in plasma at baseline and two years after randomization, as well as measurements of coronary artery calcium (CAC) and ascending (AsAC) and descending (DAC) thoracic aortic calcification 13-14 years after baseline. We performed multinomial regression to test associations between PFAS and CAC categorized according to Agatston score [low (<10), moderate (11-400) and severe (>400)]. We used logistic regression to assess associations between PFAS and presence of AsAC and DAC. We adjusted models for baseline sex, age, BMI, race/ethnicity, cigarette smoking, education, treatment assignment (placebo or lifestyle intervention), and statin use. PFAS concentrations were similar to national means; 53.9% of participants had CAC > 11, 7.7% had AsAC, and 42.6% had DAC. Each doubling of the mean sum of plasma concentrations of linear and branched isomers of perfluoroctane sulfonic acid (PFOS) was associated with 1.49-fold greater odds (95% CI: 1.01, 2.21) of severe versus low CAC. This association was driven mainly by the linear (n-PFOS) isomer [1.54 (95% CI: 1.05, 2.25) greater odds of severe versus low CAC]. Each doubling of mean plasma N-ethyl-perfluoroctane sulfonamido acetic acid concentration was associated with greater odds of CAC in a dose-dependent manner [OR = 1.26 (95% CI: 1.08, 1.47) for moderate CAC and OR = 1.37 (95% CI: 1.07, 1.74) for severe CAC, compared to low CAC)]. Mean plasma PFOS and n-PFOS were also associated with greater odds of AsAC [OR = 1.67 (95% CI		ВВ
D877	ヒト (代 謝)	Gui, Si-Yu; Qiao, Jian-Chao; Xu, Ke-Xin; Li, Ze- Lian; Chen, Yue- Nan; Wu, Ke-Jia; Jiang, Zheng- Xuan; Hu, Cheng-Yang	Association between per- and polyfluoroalkyl substances exposure and risk of diabetes: a systematic review and meta-analysis	2022	J Expo Sci Environ Epidemiol. 2022 Aug 15. doi: 10.1038/s41370-022-00464-3. Online ahead of print.	BACKGROUND: Emerging evidence suggests that per- and polyfluoroalkyl substances (PFAS) are endocrine disruptors and may contribute to the etiology of diabetes. OBJECTIVES: This study aimed to systematically review the epidemiological evidence on the associations of PFAS with mortality and morbidity of diabetes and to quantitatively evaluate the summary effect estimates of the existing literature. METHODS: We searched three electronic databases for epidemiological studies concerning PFAS and diabetes published before April 1, 2022. Summary odds ratio (OR), hazard ratio (HR), or <i>β</i> and their 95% confidence intervals (CIs) were respectively calculated to evaluate the association between PFAS and diabetes using random-effects model by the exposure type, and dose-response meta-analyses were also performed when possible. We also assessed the risk of bias of the studies included and the confidence in the body of evidence. RESULTS: An initial literature search identified 1969 studies, of which 22 studies were eventually included. The meta-analyses indicated that the observed statistically significant PFAS-T2DM associations were consistent in cohort studies, while the associations were almost non-significant in case-control and cross-sectional studies. Dose-response meta-analysis showed a "parabolic-shaped" association between perfluoroctanoate acid (PFOA) exposure and T2DM risk. Available evidence was rated with "low" risk of bias, and the level of evidence for PFAS and incident T2DM, and that PFOA may exert non-monotonic dose-response effect on T2DM risk. Considering the widespread exposure, peristence, and potential for adverse health effects of PFAS, further cohort studies with improvements in expanding the sample size, adjusting the covariates, and considering different types of PFAS exposure at various doses, are needed to elucidate the putative causal associations and potential mode of action of different PFAS on diabetes. IMPACT STATEMENT: A growing body of evidence suggests that per- and polyfluoroalkyl subst		B B
D878	ヒト(代 謝)	Lee, Sheng-Han; Tseng, Wei- Chen; Du, Zhi-Yi; Lin, Wan-Yu; Chen, Mei-Huei; Lin, Ching-Chun; Lien, Guang- Wen; Liang, Hao- Jan; Wen, Hui-Ju; Guo, Yue-Leon; Chen, Pau- Chung; Lin, Ching-Yu	Lipid responses to environmental perfluoroalkyl substance exposure in a Taiwanese Child cohort	2021	Environ Pollut. 2021 Aug 15;283:117007. doi: 10.1016/j.envpol.2021.117007. Epub 2021 Mar 24.	everywhere chemicals" may be an important preventative approach to reducing the risk of diabetes across the population. Although recent epidemiologic studies have focused on some of the health effects of perfluoroalkyl substance (PFASs) exposure in humans, the associations between PFASs exposure and the lipidome in children are still unclear. The purpose of this study was to assess lipid changes in children to understand possible molecular events of environmental PFASs exposure and suggest potential health effects. A total of 290 Taiwanese children (8-10 years old) were included in this study. Thirteen PFASs were analyzed in their serum by high-performance liquid chromatography-tandem mass spectrometry (LC-MS). MS-based lipidomic approaches were applied to examine lipid patterns in the serum of children exposed to different levels of PFASs. LC coupling with triple quadrupole MS technology was conducted to analyze phosphorylcholine-containing lipids. Multivariate analyses, such as partial least squares analysis along with univariate analyses, including multiple linear regression, were used to analyze associations between s exposure and unique lipid patterns. Our results showed that different lipid patterns were discovered in children exposed to different levels of specific PFASs, such as PFTrDA, PFOS, and PFDA. These changes in lipid levels may be involved in hepatic lipid metabolism, metabolic disorders, and PFASs-membrane interactions. This study showed that lipidomics is a powerful approach to identify critical PFASs that cause metabolite perturbation in the serum of children and suggest possible adverse health effects of these chemicals in children.		ВС

分野 タイトル 発行年 書誌情報 要旨 (原文) No 著者 (参考) BACKGROUND: Many studies have been published on the relationships between different e diabetes. In these studies, the environmental contaminants have most often been evaluated exposed to a mixture of contaminants that interact with each other. OBJECTIVE: The major mixture of contaminants could improve the prediction of incident diabetes, using machine le Investigation of the Vasculature in Uppsala (PIVUS) study (988 men and women aged 70 year contaminants from several chemical classes were measured at baseline. Incident diabetes v Lind. Lars: machine-learning models were used to predict prevalent diabetes (n = 115). The variables w Sci Total Environ. 2022 Nov 8;859(Pt 1):159993. doi: ヒト (代 Salihovic, used to predict incident diabetes (n = 83). RESULTS: Boosted regression trees performed be D879 Mixtures of environmental contaminants and diabetes Samira: Lind, P 10.1016/j.scitotenv.2022.159993. Online ahead of print. diabetes (area under the ROC-curve = 0.70). Following removal of correlated contaminants, Monica contaminants (Cd, Pb, Trans-nonachlor the phthalate MiBP, Hg, Ni, PCB126, PCB169 and PI improvement of 6.0 % of the ROC curve (from 0.66 to 0.72, p = 0.018) regarding incident dial baseline model including sex and BMI when the first 5 years of the follow-up was used. No seen over 15 years follow-up. The single contaminant being most closely related to incident (odds ratio 1.44 for a SD change, 95 % CI 1.05-1.95, p = 0.022). CONCLUSION: This study su was useful in finding a mixture of important contaminants that improved prediction of incide prediction was seen only during the first 5 years of follow-up. Schillemans, Tessa: Shi, Lin Perfluoroalkyl substances (PFAS) are widespread persistent environmental pollutants. Ther Donat-Vargas, metabolic perturbations in humans, but underlying mechanisms are still unknown. In this ex Carolina; related plasma metabolites for their associations with type 2 diabetes (T2D) to gain potentia Hanhineva, Kati perturbations. We used untargeted LC-MS metabolomics to find metabolites related to PFAS Tornevi, T2D (n = 187 matched pairs) nested within the Västerbotten Intervention Programme cohor analysis (PCA), six PFAS measured in plasma appeared in two groups: 1) perfluorononanoic Andreas: Johansson, perfluoroundecanoic acid and 2) perfluorohexane sulfonic acid, perfluorooctane sulfonic acid Plasma metabolites associated with exposure to ヒト (代 Ingegerd; 2021 Environ Int. 2021 Jan;146:106180. doi: 10.1016/j.envint.2020.106180. Epub 2020 Oct 25. random forest algorithm, we discovered metabolite features associated with individual PFAS D880 perfluoroalkyl substances and risk of type 2 diabetes Koponen, Jani: were subsequently investigated for associations with risk of T2D. PFAS levels correlated wit A nested case-control study Kiviranta, Hannu \leq 0.37, false discovery rate (FDR) adjusted p < 0.05). Out of these, 35 associated with T2D Rolandsson, multiple testing adjustment (FDR < 0.05). PCA of the 35 PFAS- and T2D-related metabolite Olov; Bergdahl, dominated by glycerophospholipids and diacylglycerols, with opposite T2D associations. The Ingvar A; positively with PFAS and associated inversely with risk for T2D (Odds Ratio (OR) per 1 stan Landberg, metabolite PCA pattern score = 0.2; 95% Confidence Interval (CI) = 0.1-0.4). The diacylglyce Rikard; Åkesson PFAS, but they associated with increased risk for T2D (OR per 1-SD = 1.9; 95% CI = 1.3-2.7Agneta; Brunius associate with two groups of lipid species with opposite relations to T2D risk. Carl OBJECTIVE: To summarize the application of non-targeted metabolomics in epidemiological metabolic pathway alterations associated with per- and polyfluoroalkyl substances (PFAS) ϵ human studies published before April 1st, 2021 were identified through database searches Core Collection, Embase, Scopus), and citation chaining (Citationchaser). The sample sizes 965, involving children and adolescents (n = 3), non-pregnant adults (n = 5), or pregnant wo chromatography-mass spectrometry was the primary analytical platform to measure both PF Guo, Pengfei; measured in either plasma (n = 6) or serum (n = 5), while metabolomic profiles were assess Furnary, Tristan 4), or urine (n = 1). Four types of PFAS (perfluorooctane sulfonate (n = 11), perfluorooctanoi Vasiliou, Vasilis Environ Int. 2022 Apr;162:107159. doi: Non-targeted metabolomics and associations with sulfonate (n = 9), perfluorononanoic acid (n = 5)) and PFAS mixtures (n = 7) were the most ヒト (代 Yan, Qi; Nyhan D881 per- and polyfluoroalkyl substances (PFAS) exposure tryptophan metabolism and the urea cycle were most reported PFAS-associated metabolom 10.1016/j.envint.2022.107159. Epub 2022 Feb 26. Kate: Jones. metabolites were also suggested to be associated with PFAS exposure, especially key metal in humans: A scoping review Dean P; Johnson metabolism which is critical for biological membrane functions, and fatty acids and carnitine Caroline H; Liew supply pathway of fatty acid oxidation. Other important metabolome changes reported inclusion Zeyan regarding energy generation, and purine and pyrimidine metabolism in cellular energy syster nterest in using non-targeted metabolomics to study the human physiological changes asso PFAS were reported to be associated with alterations in amino acid and lipid metabolism, bu predominant type of pathway analysis thus require further confirmation. Standardizing rese recommended to facilitate result comparison. Future studies should consider potential diffe prospective design, and influence from confounding bias and measurement errors.

	備考	出 対 象	ン 文 ① ラ	ン 文 ② ラ
environmental contaminants and l one by one, but in real life we are aim of this study was to see if a earning. METHODS: In the Prospective ars), circulating levels of 42 was followed for 15 years. Six different with top importance were thereafter est regarding prediction of prevalent the addition of nine selected FOS) resulted in a significant betes (n = 51) compared with a such improvement in prediction was diabetes over 5 years was Nickel upports the view that machine learning ent diabetes. This improvement in			С	С
e is evidence that PFAS induce ploratory study, we investigated PFAS- al mechanistic insight in these S exposures in a case-control study on t. Following principal component acid, perfluorodecanoic acid and d and perfluorooctanoic acid. Using a S and PFAS exposure groups which th 171 metabolite features (0.16 \leq r (p < 0.05), with 7 remaining after features revealed two patterns, e glycerophospholipids correlated dard deviation (1-SD) increase in erols also correlated positively with). These results suggest that PFAS			С	В
I studies that assessed metabolite and exposure. RECENT FINDINGS: Eleven (PubMed, Dimensions, Web of Science of these studies ranged from 40 to omen ($n = 3$). High-resolution liquid FAS and metabolome. PFAS were sed using plasma ($n = 6$), serum ($n =$ ic acid ($n = 10$), perfluorohexane studied. We found that alterations to ic signatures. Numerous lipid bolites in glycerophospholipid es which are relevant to the energy ded the tricarboxylic acid (TCA) cycle ms. CONCLUSIONS: There is growing bociated with PFAS exposure. Multiple ut these results are driven by one arch methods and reporting are rences in study methodology, use of			С	С

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 対報 象抽 ① ラ	ン 文 ② ラ
D882	ヒト (代 謝)	Iheagwam, Franklyn Nonso; Odiba, Joseph Kelechi; Iheagwam, Olawumi Toyin; Ogunlana, Olubanke Olujoke; Chinedu, Shalom Nwodo	Type 2 Diabetes Mellitus Mediation by the Disruptive Activity of Environmental Toxicants on Sex Hormone Receptors: In Silico Evaluation	2021	Toxics. 2021 Oct 8;9(10):255. doi: 10.3390/toxics9100255.	This study investigates the disruptive activity of environmental toxicants on sex hormone receptors mediating type 2 diabetes mellitus (T2DM). Toxicokinetics, gene target prediction, molecular docking, molecular dynamics, and gene network analysis were applied in silico techniques. From the results, permethrin, perfluorooctanoic acid, dichlorodiphenyltrichloroethane, O-phenylphenol, bisphenol A, and diethylstilbestrol were the active toxic compounds that could modulate androgen (AR) and estrogen- α and - β receptors (ER) to induce T2DM. Early growth response 1 (EGR1), estrogen receptor 1 (ESR1), and tumour protein 63 (TP63) were the major transcription factors, while mitogen-activated protein kinases (MAPK) and cyclin-dependent kinases (CDK) were the major kinases upregulated by these toxicants via interactions with intermediary proteins such as PTEN, AKT1, NfK β 1, SMAD3 and others in the gene network analysis to mediate T2DM. These toxicants pose a major challenge to public health; hence, monitoring their manufacture, use, and disposal should be enforced. This would ensure reduced interaction between people and these toxic chemicals, thereby reducing the incidence and prevalence of T2DM.		С	С
D883	ヒト (代 謝)	Margolis, Rachel; Sant, Karilyn E	Associations between Exposures to Perfluoroalkyl Substances and Diabetes, Hyperglycemia, or Insulin Resistance: A Scoping Review	2021	J Xenobiot. 2021 Sep 14;11(3):115-129. doi: 10.3390/jox11030008.	due to exposures via drinking water, surfactants used in consumer materials, and aqueous film-forming foams (AFFFs). PFAS exposure has been linked to adverse health effects such as low infant birth weights, cancer, and endocrine disruption, though increasingly studies have demonstrated that they may perturb metabolic processes and contribute to dysfunction. This scoping review summarizes the chemistry of PFAS exposure and the epidemiologic evidence for associations between exposure to per- and polyfluoroalkyl substances and the development of diabetes, hyperglycemia, and/or insulin resistance. We identified 11 studies on gestational diabetes mellitus, 3 studies on type 1 diabetes, 7 studies on type 2 diabetes, 6 studies on prediabetes or unspecified diabetes, and 15 studies on insulin resistance or glucose tolerance using the SCOPUS and PubMed databases. Approximately 24 reported positive associations, 9 negative associations, 2 non-linear associations, and 2 inverse associations, and 8 reported no associations found between PFAS and all diabetes search terms. Cumulatively, these data indicate the need for further studies to better assess these associations between PFAS exposure and diabetes.		В	С
D884	ヒト (代 謝)	Harada, Kouji H; Harada Sassa, Mariko	Potential confounders in the association between per- and polyfluoroalkyl substance exposure and diabetes	2022	Diabetologia. 2022 Oct;65(10):1745-1746. doi: 10.1007/s00125-022-05758-7. Epub 2022 Jul 16.	No abstract available		D	D
D885	ヒト(代 謝)	Park, Sung Kyun; Wang, Xin; Karvonen- Gutierrez, Carrie	Potential confounders in the association between per- and polyfluoroalkyl substance exposure and diabetes. Reply to Harada KH, Harada Sassa M [letter]	2022	Diabetologia. 2022 Oct;65(10):1747-1750. doi: 10.1007/s00125-022-05757-8. Epub 2022 Jul 18.	No abstract available		D	D
D886	ヒト (代 謝)	Roth, Katherine; Petriello, Michae C	Exposure to per- and polyfluoroalkyl substances (PFAS) and type 2 diabetes risk	2022	Front Endocrinol (Lausanne). 2022 Aug 5;13:965384. doi: 10.3389/fendo.2022.965384. eCollection 2022.	Per- and polyfluoroalkyl substances (PFAS) are ubiquitous man-made chemicals found in consumer products including fabrics, food packaging, non-stick coatings, and aqueous film-forming foams. PFAS are stable and extremely resistant to degradation, resulting in high persistence throughout the environment as well as in human blood. PFAS consist of a large family of synthetic chemicals, with over 4000 distinct varieties having been identified and around 250 currently being manufactured at globally relevant levels. Numerous epidemiological studies have linked exposure to PFAS with adverse health effects ranging from immunotoxicity, cardiometabolic disease, developmental and reproductive effects, cancer, and recently type 2 diabetes. Several studies have demonstrated associations between serum PFAS concentrations and glycemic indicators of type 2 diabetes including glucose, insulin, and HOMA-IR in adolescent and adult cohorts. In addition, some studies have shown positive associations with incident type 2 diabetes and multiple PFAS. However, the link between PFAS exposure and the development of diabetes continues to be a disputed area of study, with conflicting data having been reported from various epidemiological studies. In this mini review we will summarize the current state of the literature linking PFAS to type 2 diabetes and discuss important future directions including the use of more complex mixtures-based statistical analyses.		С	C
D887	ヒト (代 謝)	Inoue, Kosuke; Goto, Atsushi; Sugiyama, Takehiro; Ramlau-Hansen, Cecilia Høst; Liew, Zeyan	The Confounder-Mediator Dilemma: Should We Control for Obesity to Estimate the Effect of Perfluoroalkyl Substances on Health Outcomes?	2020	Toxics. 2020 Dec 20;8(4):125. doi: 10.3390/toxics8040125.	Confounding adjustment is important for observational studies to derive valid effect estimates for inference. Despite the theoretical advancement of confounding selection procedure, it is often challenging to distinguish between confounders and mediators due to the lack of information about the time-ordering and latency of each variable in the data. This is also the case for the studies of perfluoroalkyl substances (PFAS), a group of synthetic chemicals used in industry and consumer products that are persistent and have endocrine-disrupting properties on health outcomes. In this article, we used directed acyclic graphs to describe potential biases introduced by adjusting for or stratifying by the measure of obesity as an intermediate variable in PFAS exposure analyses. We compared results with or without adjusting for body mass index in two cross-sectional data analyses: (1) PFAS levels and maternal thyroid function during early pregnancy using the Danish National Birth Cohort and (2) PFAS levels and cardiovascular disease in adults using the National Health and Nutrition Examination Survey. In these examples, we showed that the potential heterogeneity observed in stratified analyses by overweight or obese status needs to be interpreted cautiously considering collider stratification bias. This article highlights the complexity of seemingly simple adjustment or stratification analyses, and the need for careful consideration of the confounding and/or mediating role of obesity in PFAS studies.		В	С

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 タ献 の す で 、 フ マ フ 、 フ マ フ マ フ マ フ マ フ マ フ マ フ マ フ	
D888	ヒト (代 謝)	Schillemans, T; Bergdahl, I A; Hanhineva, K; Shi, L; Donat- Vargas, C; Koponen, J; Kiviranta, H; Landberg, R; Å kesson, A; Brunius, C	Associations of PFAS-related plasma metabolites with cholesterol and triglyceride concentrations	2022	Environ Res. 2022 Oct 13;216(Pt 2):114570. doi: 10.1016/j.envres.2022.114570. Online ahead of print.	The wide-spread environmental pollutants per- and polyfluoroalkyl substances (PFAS) have repeatedly been associated with elevated serum cholesterol in humans. However, underlying mechanisms are still unclear. Furthermore, we have previously observed inverse associations with plasma triglycerides. To better understand PFAS-induced effects on lipid pathways we investigated associations of PFAS-related metabolite features with plasma cholesterol and triglyceride concentrations. We used 290 PFAS-related metabolite features that we previously discovered from untargeted liquid chromatography-mass spectometry metabolomics in a case-control study within the Swedish Västerbotten Intervention Programme cohort. Herein, we studied associations of these PFAS-related metabolite features with plasma cholesterol and triglyceride concentrations in plasma samples from 187 healthy control subjects collected on two occasions between 1991 and 2013. The PFAS-related features did not associate with cholesterol, but 50 features were associated with triglycerides. Principal component analysis on these features indicated that one metabolite pattern, dominated by glycerophospholipids, correlated with longer chain PFAS and associated inversely with triglycerides (both cross-sectionally and prospectively), after adjustment for confounders. The observed time-trend of the metabolite pattern resembled that of the longer chain PFAS affecting glycerophospholipid metabolism. If the results reflect a cause-effect association, as implied by the time-trend and prospective analyses, this may affect the general adult population.		СВ	
D889	ヒト(代 謝)	Liu, Huinian; Hu, Wenli; Li, Xin; Hu, Fangwen; Xi, Yanni; Su, Zhu; Huang, Yicai; Liu, Bo; Zhang, Chang	Do perfluoroalkyl substances aggravate the occurrence of obesity-associated glucolipid metabolic disease?	2021	Environ Res. 2021 Nov;202:111724. doi: 10.1016/j.envres.2021.111724. Epub 2021 Jul 19.	BACKGROUND: Since 2016, more and more studies have been conducted to explore the combination of obesity and perfluoroalkyl substances (PFASs) exposure, and the results indicate that PFASs may be connected with the occurrence of obesity-associated glucolipid metabolic disease (GLMD). OBJECTIVES: This article summarizes the epidemiological studies on PFASs and obesity-related GLMD, as well as relevant experimental evidence. RESULTS: (i) Both obesity and PFASs exposure can cause disorder of glucose and lipid metabolism (GLM). (ii) Obesity is a pivotal factor in the high incidence of GLMD induce by PFASs. (iii) PFASs are aggravating the occurrence of obesity-associated GLMD [e.g., diabetes, cardiovascular disease (CVD), and liver disease]. CONCLUSION: The paper fills the gaps among environmental chemistry/epidemiology/toxicology area research. More importantly, PFASs should be taken into account to explain the high-prevalence of obesity-related GLMD. FUTURE DIRECTION: Three research programs are proposed to explore the synergistic mechanism of PFASs and obesity. In addition, three suggestions are recommended to solve the harm of PFASs pollutants to human beings.		СС	
D890	ヒト (代 謝)	Fine, Anne Marie; Patrick, Lyn	Environmental Medicine: Exploring the Pollutome for Solutions to Chronic Diseases	2022	Phys Med Rehabil Clin N Am. 2022 Aug;33(3):719-732. doi: 10.1016/j.pmr.2022.04.010. Epub 2022 Jun 23.	Environmental toxicant exposure, according to many researchers in the field, is the leading cause of chronic disease and premature death globally. For the purposes of this review, we will use obesity and type 2 diabetes as examples of toxicant-induced chronic diseases. Endocrine Disrupting chemicals (EDCs) such as phthalates and bisphenols, per- and polyfluoroalkyl substances (PFAS), and persistent organic pollutants (POPs) have been linked to increased risk for obesity and type 2 diabetes in both animal and large epidemiologic studies. These two conditions are well-documented examples of evidence for mechanisms of both adipose metabolism disruption and pancreatic cell dysfunction. The implications for health care directives to both identify, prevent, and treat these exposures are reviewed.		сс	
D891	ヒト (代 謝)	Boland, Mary Regina; Davidson, Lena M; Canelón, Silvia P; Meeker, Jessica; Penning, Trevor; Holmes, John H; Moore, Jason H	Harnessing electronic health records to study emerging environmental disasters: a proof of concept with perfluoroalkyl substances (PFAS)	2021	NPJ Digit Med. 2021 Aug 11;4(1):122. doi: 10.1038/s41746- 021-00494-5.	Environmental disasters are anthropogenic catastrophic events that affect health. Famous disasters include the Seveso disaster and the Fukushima-Daiichi nuclear meltdown, which had disastrous health consequences. Traditional methods for studying environmental disasters are costly and time-intensive. We propose the use of electronic health records (EHR) and informatics methods to study the health effects of emergent environmental disasters in a cost-effective manner. An emergent environmental disaster is exposure to perfluoroalkyl substances (PFAS) in the Philadelphia area. Penn Medicine (PennMed) comprises multiple hospitals and facilities within the Philadelphia Metropolitan area, including over three thousand PFAS-exposed women living in one of the highest PFAS exposure areas nationwide. We developed a high-throughput method that utilizes only EHR data to evaluate the disease risk in this heavily exposed population. We replicated all five disease/conditions implicated by PFAS exposure, including hypercholesterolemia, thyroid disease, proteinuria, kidney disease and colitis, either directly or via closely related diagnoses. Using EHRs coupled with informatics enables the health impacts of environmental disasters to be more easily studied in large cohorts versus traditional methods that rely on interviews and expensive serum-based testing. By reducing cost and increasing the diversity of individuals included in studies, we can overcome many of the hurdles faced by previous studies, including a lack of racial and ethnic diversity. This proof-of-concept study confirms that EHRs can be used to study human health and disease impacts of environmental disasters and produces equivalent disease-exposure knowledge to prospective epidemiology studies while remaining cost-effective.		C C	
No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 対報 象抽 ① ラ	ン文 く ク献 ; ② ラ
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D892	ヒト (代 謝)	Bessonneau, Vincent; Gerona, Roy R; Trowbridge, Jessica; Grashow, Rachel; Lin, Thomas; Buren, Heather; Morello-Frosch, Rachel; Rudel, Ruthann A	Gaussian graphical modeling of the serum exposome and metabolome reveals interactions between environmental chemicals and endogenous metabolites	2021	Sci Rep. 2021 Apr 7;11(1):7607. doi: 10.1038/s41598-021- 87070-9.	Given the complex exposures from both exogenous and endogenous sources that an individual experiences during life, exposome- wide association studies that interrogate levels of small molecules in biospecimens have been proposed for discovering causes of chronic diseases. We conducted a study to explore associations between environmental chemicals and endogenous molecules using Gaussian graphical models (GGMs) of non-targeted metabolomics data measured in a cohort of California women firefighters and office workers. GGMs revealed many exposure-metabolite associations, including that exposures to mono- hydroxyisononyl phthalate, ethyl paraben and 4-ethylbenzoic acid were associated with metabolites involved in steroid hormone biosynthesis, and perfluoroalkyl substances were linked to bile acids-hormones that regulate cholesterol and glucose metabolism- and inflammatory signaling molecules. Some hypotheses generated from these findings were confirmed by analysis of data from the National Health and Nutrition Examination Survey. Taken together, our findings demonstrate a novel approach to discovering associations between chemical exposures and biological processes of potential relevance for disease causation.		С	С
D893	ヒト(心 血管系)	Zhang, Zefang; Wang, Fei; Zhang, Ying; Yao, Jinqiu; Bi, Jiao; He, Jia; Zhang, Shiyang; Wei, Yue; Guo, Huan; Zhang, Xiaomin; He, Meian	Associations of serum PFOA and PFOS levels with incident hypertension risk and change of blood pressure levels	2022	Environ Res. 2022 Sep;212(Pt B):113293. doi: 10.1016/j.envres.2022.113293. Epub 2022 Apr 12.	Evidence on the associations of perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS) with hypertension or blood pressure (BP) levels was limited and inconsistent. The present prospective study aims to evaluate the longitudinal associations of serum levels of PFOA and PFOS with incident hypertension, cardiovascular disease, diabetes, and cancer were followed up for nearly 5 years. Baseline serum levels of PFOA and PFOS were measured with ultra-performance liquid chromatography-tandem mass spectrometry (UPLC-MS). Hypertension was defined as any of (1) self-reported physician-diagnosed hypertension (2) use of hypotension drugs (3) measured systolic BP \geq 140 mmHg or diastolic BP \geq 90 mmHg. Change of BP was evaluated as a difference between twice measurements (BP at follow-up visit – BP at baseline). After adjustment for multiple covariates, serum PFOS levels were negatively correlated with risk of hypertension [RR per Ig-unit = 0.94 (95% CI: 0.88, 0.99)] and change of systolic BP [β = -1.48 (95% CI: -2.56, -0.41)]. The highest vs lowest quartiles of PFOS concentration was negatively associated with hypertension risk. Compared with Q1, the RRs (95% CIs) for Q2, Q3, and Q4 were 0.83 (0.67-0.98), 0.81 (0.67-0.97), and 0.81(0.67-0.97), respectively (p for trend = 0.016). The negative associations remained in females but not in males (p for interaction = 0.44). No significant association of PFOA with hypertension risk was observed. Further studies are needed to validate our findings.		В	C
D894	ヒト(心 血管系)	Abdullah Soheimi, Siti Suhana; Abdul Rahman, Amirah; Abd Latip, Normala; Ibrahim, Effendi; Sheikh Abdul Kadir, Siti Hamimah	Understanding the Impact of Perfluorinated Compounds on Cardiovascular Diseases and Their Risk Factors: A Meta-Analysis Study	2021	Int J Environ Res Public Health. 2021 Aug 6;18(16):8345. doi 10.3390/ijerph18168345.	Perfluorinated compounds (PFCs) are non-biodegradable synthetic chemical compounds that are widely used in manufacturing many household products. Many studies have reported the association between PFCs exposure with the risk of developing cardiovascular diseases (CVDs). However, those reports are still debatable, due to their findings. Thus, this review paper aimed to analyse the association of PFCs compound with CVDs and their risk factors in humans by systematic review and meta-analysis. Google Scholar, PubMed and ScienceDirect were searched for PFCs studies on CVDs and their risk from 2009 until present. The association of PFCs exposure with the prevalence of CVDs and their risk factors were assessed by calculating the quality criteria, odds ratios (ORs), and 95% confidence intervals (Cls). CVDs risk factors were divided into serum lipid profile (main risk factor) and other known risk factors. The meta-analysis was then used to derive a combined OR test for heterogeneity in findings between studies. Twenty-nine articles were included. Our meta-analysis indicated that PFCs exposure could be associated with CVDs (Test for overall effect: $z = 2.2$, $p = 0.02$; Test for heterogeneity: $I(2) = 91.6\%$, $CI = 0.92-1.58$, $p < 0.0001$) and their risk factors (Test for overall effect: $z = 4.03$, $p < 0.0001$; Test for heterogeneity: $I(2) = 85.8\%$, $CI = 1.00-1.14$, $p < 0.0001$). In serum lipids, total cholesterol levels are frequently reported associated with the exposure of PFCs. Among PFCs, perfluoroctanoic acid (PFOA) and perfluoroctane sulfonic acid (PFOS) exposure increased the risk of CVDs than other types of PFCs. Although the risk of PFOA and PFOS were positively associated with CVDs and their risk factors, more observational studies shall be carried out to identify the long-term effects of these contaminants in premature CVDs development in patients.		В	В
D895	ヒト(心血管系)	Maranhao Neto, Geraldo A; Polcrova, Anna Bartoskova; Pospisilova, Anna; Blaha, Ludek; Klanova, Jana; Bobak, Martin; Gonzalez-Rivas, Juan P	Associations between Per- and Polyfluoroalkyl Substances (PFAS) and Cardiometabolic Biomarkers in Adults of Czechia: The Kardiovize Study	2022	Int J Environ Res Public Health. 2022 Oct 26;19(21):13898. doi: 10.3390/ijerph192113898.	Even though there is evidence of decreasing trends of per- and polyfluoroalkyl substances (PFAS) in Czechia, there are still major sources of PFAS pollution. Regarding the still-inconsistent results of the relationship between cardiometabolic health and PFAS, the present study sought to determine the association between PFAS levels and the presence of cardiometabolic biomarkers, including blood pressure and dysglycemia drivers in the Czech population. A cross-sectional study with 479 subjects (56.4% women, median: 53 years, range: 25-89) was conducted. Four PFAS were measured in serum: perfluorooctanoic acid (PFOA), perfluorononanoic acid (PFNA), perfluorodecanoic acid (PFDA), and perfluorooctane sulfonate (PFOS). The associations between natural log (In)-transformed PFAS and cardiometabolic biomarkers were assessed through generalized additive models using linear regression and smoothing thin plate splines, adjusted for potential confounders. There were positive and significant (p &It 0.05) associations between the In-transformed PFOA and glucose ($\beta = 0.01$), systolic ($\beta = 0.76$) and diastolic blood pressure ($\beta = 0.65$); total cholesterol ($\beta = 0.07$) and LDL-c ($\beta = 0.04$); and PFOS with glucose ($\beta = 0.03$), BMI ($\beta = 2.26$), waist circumference ($\beta = 7.89$), systolic blood pressure ($\beta = 1.18$), total cholesterol ($\beta = 0.13$), and HDL-c ($\beta = 0.04$). When significant, the correlations of PFNA and PFDA were negative. Of the four PFAS, only PFOA and PFOS showed a positive association, even in serum levels not as high as the values from the literature.		В	В

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No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨 (原文)	備考	出 情 対 報 象 抽	ン 文 ク 献 ① ラ	ン 文 ク 献 ② ラ
D896	ヒト(心 血管系)	Lin, Chien-Yu; Lee, Hui-Ling; Chen, Ching- Way; Wang, Chikang; Sung, Fung-Chang; Su, Ta-Chen	Global DNA methylation mediates the association between serum perfluorooctane sulfonate and carotid intima-media thickness in young and middle-aged Taiwanese populations	2022	Ecotoxicol Environ Saf. 2022 Aug;241:113782. doi: 10.1016/j.ecoenv.2022.113782. Epub 2022 Jun 23.	PURPOSE: Perfluoroalkyl and polyfluoroalkyl substances (PFAS) are a group of synthetic chemicals used in the manufacture of many everyday products. Previous reports have shown PFAS exposure may contribute to cardiovascular diseases (CVD). Recent studies have also identified a critical role for DNA methylation, a model of epigenetic regulation, in the pathogenesis of CVD. Additionally, PFAS has been shown to affect DNA methylation. Our previous study reported the positive association between serum perfluorooctane sulfonate (PFOS) levels and mean carotid intima-media thickness (CIMT), a biomarker of arteriosclerosis, in a cohort composed of adolescent and young adult Taiwanese. However, the contribution of DNA methylation in the mechanism of PFOS-induced arteriosclerosis has never been explored in previous literature. APPROACH AND RESULTS: In this cross-sectional study, we included 1425 young and middle-aged Taiwanese individuals (12-63 years) to investigate the correlation between serum PFOS levels, 5mdC/dG (a global DNA methylation marker) and the mean CIMT. We showed that the positive association between serum PFOS levels, 5mdC/dG, and mean CIMT. The regression coefficients of mean CIMT with a one-unit increase in In-PFOS concentration were higher when the levels of 5mdC/dG were above the 50th percentile in the multiple regression analysis. In the structural equation model (SEM), the results showed that serum PFOS levels were directly correlated with mean CIMT and indirectly correlated with CIMT through 5mdC/dG. CONCLUSIONS: Our results showed that PFOS exposure has direct associations on arteriosclerosis and indirect direct associations on arteriosclerosis in the study subjects. Additional works are required to understand the causal inference between PFOS, DNA methylation, and arteriosclerosis.			с	В
D897	ヒト(心 血管系)	Khalil, Naila; Ducatman, Alan M; Sinari, Shripad; Billheimer, Dean; Hu, Chengcheng; Littau, Sally; Burgess, Jefferey L	Per- and Polyfluoroalkyl Substance and Cardio Metabolic Markers in Firefighters	2020	J Occup Environ Med. 2020 Dec;62(12):1076-1081. doi: 10.1097/JOM.000000000002062.	OBJECTIVE: To evaluate if serum polyfluoroalkyl substances (PFAS) were associated with cardiometabolic markers. METHODS: Serum PFAS were evaluated in 38 Arizona firefighters and 49 participants from the 2009 to 2010 National Health and Nutrition Examination Survey (NHANES). Cardiometabolic markers including carotid intima-medial thickness (CIMT) were measured in the firefighters. RESULTS: Firefighters had elevated perfluorohexane sulfonic acid (PFHxS) and lower perfluorononanoic acid (PFNA) and perfluoroundecanoic acid (PFUA) compared to NHANES participants; for nine of the other 12 PFAS the values were not significantly different. There were significant negative associations among firefighters between perfluorodecanoic acid (PFDeA) and total cholesterol and PFUA and interleukin-6. PFAS concentrations were not associated with CIMT. CONCLUSION: PFHxS levels were elevated in firefighters compared to NHANES subjects. Serum PFAS concentrations were not associated with increased cardiometabolic risk measures in this population of firefighters.			С	С
D898	ヒト(心 血管系)	Feng, Xinghui; Long, Guangfeng; Zeng, Guowei; Zhang, Qi; Song, Binqian; Wu, Kai-Hong	Association of increased risk of cardiovascular diseases with higher levels of perfluoroalkylated substances in the serum of adults	2022	Environ Sci Pollut Res Int. 2022 Dec;29(59):89081-89092. doi: 10.1007/s11356-022-22021-z. Epub 2022 Jul 18.	Evidence showing the association of perfluoroalkylated substance (PFAS) exposure with CVD risk is scarce. The objective of this study was to explore the relationships of CVD risk with mixed or individual serum PFAS levels among general adults. We analyzed combined data of 7904 adults who participated in the National Health and Nutrition Examination Survey 2003-2012 with a Bayesian kernel machine regression (BKMR) to examine the relationships of individual or mixed PFAS exposure with total CVD risk. A logistic regression model and restricted cubic spline (RCS) regression with multivariate adjustment were conducted to assess the relationships between individual serum PFAS levels and the risk of total CVD or its subtypes. A mediation model was applied to investigate how C-reactive protein (CRP) levels mediate the strength of the association. The BKMR results indicated a positive relationship between mixed PFAS exposure and total CVD risk; among the PFASs, perfluorooctane sulfonic acid (PFOS) had the highest posterior inclusion probability. As determined by logistic regression, a log-unit change in PFOS levels was positively related to a higher risk of heart attack and stroke in males (both P < 0.05). A nonlinear relationship was found between PFOS levels mediated 8% and 1.2% of the relationship between serum PFOS and PFNA levels, respectively, and the prevalence of stroke. A significant relationship between higher serum PFAS concentrations and an increased risk of CVD was observed, mainly in males.			В	В
D899	ヒト(心血管系)	Ding, Ning; Karvonen- Gutierrez, Carrie A; Mukherjee, Bhramar; Calafat, Antonia M; Harlow, Siobá n D; Park, Sung Kyun	Per- and Polyfluoroalkyl Substances and Incident Hypertension in Multi-Racial/Ethnic Women: The Study of Women's Health Across the Nation	2022	Hypertension. 2022 Aug;79(8):1876-1886. doi: 10.1161/HYPERTENSIONAHA.121.18809. Epub 2022 Jun 13	BACKGROUND: Perfluoroalkyl and polyfluoroalkyl substances (PFAS) are ubiquitous synthetic chemicals that may disrupt blood pressure controls; however, human evidence to support this hypothesis is scant. We examined the association between serum concentrations of PFAS and risks of developing hypertension. METHODS: This study included 1058 midlife women initially free of hypertension from the multiracial and multiethnic SWAN (Study of Women's Health Across the Nation) with annual follow-up visits between 1999 and 2017. Hypertension was defined as blood pressure ≥140 mm Hg systolic or ≥90 mm Hg diastolic or receiving antihypertensive treatment. Cox proportional hazards models were utilized to calculate hazard ratios and 95% Cls. Quantile g-computation was implemented to evaluate the joint effect of PFAS mixtures. RESULTS: During 11 722 person-years of follow-up, 470 participants developed incident hypertension (40.1 cases per 1000 person-years). Compared with the lowest tertile, women in the highest tertile of baseline serum concentrations had adjusted hazard ratios of 1.42 (95% Cl, 1.19-1.68) for perfluorooctane sulfonate (P trend=0.01), 1.47 (95% Cl, 1.24-1.75) for linear perfluoroctanoate (P trend=0.01), and 1.42 (95% Cl, 1.19-1.70) for 2-(N-ethyl-perfluorooctane sulfonamido) acetate (P trend=0.01). No significant associations were observed for perfluorononanoate and perfluorohexane sulfonate. In the mixture analysis, women in the highest tertile of overall PFAS concentrations had a hazard ratio of 1.71 (95% Cl, 1.15-2.54; P trend=0.008), compared with those in the lowest tertile. CONCLUSIONS: Several PFAS showed positive associations with incident hypertension. These findings suggest that PFAS might be an underappreciated contributing factor to women's cardiovascular disease risk.			В	В

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No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 対 象 抽	ン 文 ク 献 ① ラ	ン 文 ② ラ
D900	ヒト (心 血管系)	0	Per- and Polyfluoroalkyl Substance and Cardio Metabolic Markers in Firefighters: Erratum	2022	J Occup Environ Med. 2022 Feb 1;64(2):182. doi: 10.1097/JOM.000000000002498.	No abstract available			С	С
D901	ヒト(心 血管系)	Meneguzzi, Alessandra; Fava, Cristiano; Castelli, Marco; Minuz, Pietro	Exposure to Perfluoroalkyl Chemicals and Cardiovascular Disease: Experimental and Epidemiological Evidence	2021	Front Endocrinol (Lausanne). 2021 Jul 9;12:706352. doi: 10.3389/fendo.2021.706352. eCollection 2021.	Polyfluoro- and perfluoro-alkyl substances (PFAS) are organic chemicals extensively used worldwide for industry and consumer products. Due to their chemical stability, PFAS represent a major cause of environmental pollution. PFAS accumulate in animal and human blood and tissues exerting their toxicity. We performed a review of the epidemiological studies exploring the relationship between exposure to PFAS and thromboembolic cardiovascular disease. An increase in cardiovascular disease or death related to PFAS exposure has been reported from cross-sectional and longitudinal observational studies with evidence concerning the relation with early vascular lesions and atherosclerosis. Several studies indicate an alteration in lipid and glucose metabolism disorders and increased blood pressure as a possible link with cardiovascular thromboembolic events. We also examined the recent evidence indicating that legacy and new PFAS can be incorporated in platelet cell membranes giving a solid rationale to the observed increase risk of cardiovascular events in the populations exposed to PFAS by directly promoting thrombus formation. Exposure to PFAS has been related to altered plasma membrane fluidity and associated with altered calcium signal and increased platelet response to agonists, both in vitro and ex vivo in subjects exposed to PFAS. All the functional responses are increased in platelets by incorporation of PFAS: adhesion, aggregation, microvesicles release and experimental thrombus formation. These findings offer mechanistic support the hypothesis that platelet-centred mechanisms may be implicated in the increase in cardiovascular events observed in populations chronically exposed to PFAS.			С	С
D902	ヒト(心 血管系)	Wittkopp, Sharine; Wu, Fen; Windheim, Joseph; Robinson, Morgan; Kannan, Kurunthachalam; Katz, Stuart D; Chen, Yu; Newman, Jonathan D	Vascular endothelium as a target for perfluroalkyl substances (PFAs)	2022	Environ Res. 2022 Sep;212(Pt B):113339. doi: 10.1016/j.envres.2022.113339. Epub 2022 Apr 18.	INTRODUCTION: Perfluoroalkyl substances (PFAs) are ubiquitous, anthropogenic organic compounds that have been linked with cardiovascular disease and cardiovascular risk factors. Older, long-chain PFAs have been phased out due to adverse cardiometabolic health effect and replaced by newer short-chain PFAs. However, emerging research suggests that short-chain PFAs may also have adverse cardiovascular effects. Non-invasive measures of vascular function can detect preclinical cardiovascular disease and serve as a useful surrogate for early CVD risk. We hypothesized that serum concentrations of PFAs would be associated with noninvasive measures of vascular function, carotid-femoral pulse wave velocity (PWV) and brachial artery reactivity testing (BART), in adults with non-occupational exposure to PFAs. METHODS: We measured serum concentrations of 14 PFAs with hybrid solid-phase extraction and ultrahigh-performance liquid chromatography-tandem mass spectrometry in 94 adult outpatients with no known cardiovascular disease. We collected clinical and demographic data; and measured vascular function, PWV and BART, using standard protocols. We assessed associations of individual PFAs with log-transformed BART and PWV. RESULTS: Ten PFAs were measured above the limit of detection in >50% of participants. Each standard deviation increase in concentration of perfluoroheptanoic acid (PFHpA) was associated with 15% decrease in BART (95% CI: -28.5, -0.17). The weighted index of a mixture of PFAs with correlated concentrations was inversely associated with BART: each tertile increase in the weighted PFA mixture was associated with 25% lower BART, with 73% of the effect driven by PFHpA. In contrast, no PFAs or mixtures were associated with PWV. CONCLUSIONS: Serum concentration of PFHpA, a new, short-chain PFA, was associated with impaired vascular function among outpatients without CVD. Our findings support a potential adverse cardiovascular effect of newer, short-chain PFAs.			С	С
D903	ヒト(心 血管系)	Schillemans, Tessa; Donat- Vargas, Carolina; Lindh, Christian H; de Faire, Ulf; Wolk, Alicja; Leander, Karin; Å kesson, Agneta	Per- and Polyfluoroalkyl Substances and Risk of Myocardial Infarction and Stroke: A Nested Case- Control Study in Sweden	2022	Environ Health Perspect. 2022 Mar;130(3):37007. doi: 10.1289/EHP9791. Epub 2022 Mar 14.	BACKGROUND: Per- and polyfluoroalkyl substances (PFAS) are widespread and persistent pollutants that have been associated with elevated cholesterol levels. However, data on incident cardiovascular disease (CVD) is lacking. OBJECTIVES: We investigated the association of exposure to PFAS with risk of myocardial infarction and stroke and, subsidiary, with baseline blood lipids. METHODS: This population-based nested case-control study included first incident myocardial infarction and stroke cases with matched controls from two Swedish cohorts: the Swedish Mammography Cohort-Clinical (SMC-C) and the Cohort of 60-year-olds (60YO). Baseline blood sampling occurred during 2003-2009 and 1997-1999 with follow-up through 2017 and 2014 for the SMC-C and the 60YO, respectively. Eight plasma PFAS concentrations were measured using targeted liquid chromatography-triple quadrupole mass spectrometry. Five of these were quantifiable in both cohorts; individual values and their standardized sum were categorized into tertiles based on the controls. First incident myocardial infarction (n = 345) and ischemic stroke (n = 354) cases were ascertained via linkage to the National Inpatient Register and the Cause of Death Register. Controls were randomly selected from each cohort after matching for age, sex, and sample date. Baseline blood lipids were measured in plasma or serum after overnight fasting. RESULTS: Among the 1,528 case-control subjects, the mean (standard deviation) age was 66 (7.7) y and 67% of them were women. In multivariable-adjusted analyses, the third tertile of the standardized sum of five PFAS associated with higher cholesterol and lower triglyceride levels among controls at baseline (n = 631). The corresponding results were odds ratios = 0.70 [95% confidence interval (CI): 0.53, 0.93] for CVD, 0.60 (95% CI: 0.39, 0.92) for myocardial infarction, and 0.83 (95% CI: 0.46, 1.50) for stroke. DISCUSSION: This study indicated that exposure to PFAS, although associated with increased cholesterol levels, did not associate w			В	В

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No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン 文 ン 文 ク 献 ク 献 ① ラ ② ラ
D904	ヒト(免疫毒性)	Omoike, Ogbebor Enaholo; Pack, Robert P; Mamudu, Hadii M; Liu, Ying; Strasser, Sheryl; Zheng, Shimin; Okoro, Joy; Wang, Liang	Association between per and polyfluoroalkyl substances and markers of inflammation and oxidative stress	2021	Environ Res. 2021 May;196:110361. doi: 10.1016/j.envres.2020.110361. Epub 2020 Oct 23.	OBJECTIVES: This study aimed to examine the association of Per and Polyfluoroalkyl substances (PFAS) and markers of chronic inflammation and oxidative stress. METHODS: Using data ($n = 6652$) from the National Health and Nutrition Examination Survey (NHANES) 2005-2012, generalized linear models were used to examine the association between PFAS and inflammatory (ferritin, alkaline phosphatase, C-reactive protein, absolute neutrophil count and lymphocyte count) and oxidative stress (serum bilirubin, albumin and iron) per unit exposure to PFAS while adjusting for covariates. Study participants were those \geq 20 years of age. Outcome variables were markers of chronic inflammation and oxidative stress and exposure variables were PFAS. RESULLTS: Percentage change in Perfluorohexane sulfonic acid (PFHAS), Perfluorononanoic acid (PFNA), Perfluorooctane caid (PFOA), Perfluorooctane sulfonic acid (PFOS), and Perfluorodecanoic acid (PFDA) were all significantly associated with percentage increases in lymphocyte counts, beta (95% confidence interval); 0.04(0.02,0.05), 0.04(0.02,0.05), 0.05(0.03, 0.07), 0.04(0.03,0.05), 0.03(0.13,1.23) and with percentage increases in serum iron 0.07(0.05,0.09), 0.04(0.02,0.07), 0.10(0.07,0.12), 0.05(0.03,0.07), 0.04(0.02,0.06) and increased serum albumin 0.02(0.02,0.02), 0.02(0.02,0.03), 0.03(0.03,0.04), 0.02(0.017, 0.025), 0.01 (0.01, 0.05). Only PFHxS, PFNA, PFOA and PFOS were associated with percentage increases in serum total bilirubin 0.04(0.03,0.05), 0.02(0.00,0.03), 0.06(0.04,0.08), 0.03(0.2,0.05). Similar results were obtained for categorical quintile analysis with PFOA showing a significant trend (P < 0.001) with lymphocyte count, serum iron, serum total bilirubin and serum albumin. Trend for neutrophil count was not significant ($p = 0.183$). CONCLUSION: Per and Polyfluoroalkyl substances are associated with markers of chronic inflammation and oxidative stress.			В
D905	ヒト(免疫毒性)	Liu, Junling; Liu, Si; Huang, Zhiwen; Fu, Yang; Fei, Jian; Liu, Xin; He, Zhenyu	Associations between the serum levels of PFOS/PFOA and IgG N-glycosylation in adult or children	2020	Environ Pollut. 2020 Oct;265(Pt A):114285. doi: 10.1016/j.envpol.2020.114285. Epub 2020 Mar 18.	BACKGROUND: Perfluorooctanoic acid (PFOA) and perfluorooctanoic sulfonate (PFOS) have been shown to be associated with disease development. Immunoglobulin G (IgG) N-glycosylation plays a vital role in human immune system and inflammatory activities. Altered IgG glycosylation was one of the molecular markers of various disorders. However, whether the chemicals affect IgG glycosylation has not been investigated. METHODS: Serum samples of 190 individuals including 95 adults and 95 children were selected based on the sex, age and PFOA/PFOS concentration. IgG N-glycome profile was obtained from glycan release, derivatization, and MALDI-MS analysis. One-factor ANOVA test was performed to analyze the association between different levels of PFOS/PFOA and IgG glycosylation changes. Evaluation of the diagnostic performance of significantly changed IgG glycosylation by 3D-nonlinear regression analysis. RESULTS: 10 of the 28 individual IgG glycans were significantly altered between different levels of PFOS/PFOA in adult serum. Among children with high serum levels of PFOS or PFOA, a total of 12 IgG N-glycans were markedly different from those with lower serum PFOS/PFOA. The glycan derived traits for adults with higher serum PFOS or PFOA were marked by significant alterations in IgG digalactosylation, agalactosylation, fucosylation and total sialylation, and disialylation. Similarly, pronounced changes in agalactosylation, digalactosylation, mono-sialylation and total sialylation, as well as neutral and sialo bisection, were associated with elevated serum PFOS or PFOA in children. Several glycans gained moderately accurate scores of area under the curve for diagnosis of PFOS or PFOA pollution. Nonlinear surface fitting showed the independent or coordinate effect of PFOS or PFOA on the expression of IgG glycosylation. CONCLUSIONS: High levels of PFOS or PFOA in human serum were strongly associated with altered IgG glycosylation and therefore are a potential risk factor for the development of diseases.			В
D906	ヒト(免疫毒性)	Lopez-Espinosa, Maria-Jose; Carrizosa, Christian; Luster, Michael I; Margolick, Joseph B; Costa, Olga; Leonardi, Giovanni S; Fletcher, Tony	Perfluoroalkyl substances and immune cell counts in adults from the Mid-Ohio Valley (USA)	2021	Environ Int. 2021 Nov;156:106599. doi: 10.1016/j.envint.2021.106599. Epub 2021 May 13.	BACKGROUND: Although perfluoroalkyl substances (PFASs) may be immunotoxic, evidence for this in humans is scarce. We studied the association between 4 PFASs (perfluorohexane sulfonate [PFHxS], perfluorooctanoic acid [PFOA], perfluorooctane sulfonate [PFOS] and perfluorononanoic acid [PFNA]) and circulating levels of several types of immune cells. METHODS: Serum PFASs and white blood cell types were measured in 42,782 (2005-2006) and 526 (2010) adults from an area with PFOA drinking water contamination in the Mid-Ohio Valley (USA). Additionally, the major lymphocyte subsets were measured in 2010. Ln(cell counts) and percentages of cell counts were regressed on serum PFAS concentrations (In or percentiles). Adjusted results were expressed as the percentage difference (95% CI) per interquartile range (IQR) increment of each PFAS concentration. RESULTS: Generally positive monotonic associations between total lymphocytes and PFHxS, PFOA, and PFOS were found in both surveys (difference range: 1.12-7.33% for count and 0.36-1.77 for percentage, per PFAS IQR increment), and were stronger for PFHxS. These associations were reflected in lymphocyte subset counts but not percentages, with PFHxS positively and monotonically associated with T, B, and natural killer (NK) cell counts (range: 5.51-8.62%), PFOA and PFOS with some T-cell phenotypes, and PFOS with NK cells (range: 3.12-12.21%), the associations being monotonic in some cases. Neutrophils, particularly percentage (range: -1.74 to -0.36), showed decreasing trends associated with PFASs. Findings were less consistent for monocytes and eosinophils. CONCLUSION: These results suggest an association between PFHxS and, less consistently, for PFOA and PFOS, and total lymphocytes (although the magnitudes of the differences were small). The increase in absolute lymphocyte count appeared to be evenly distributed across lymphocyte subsets since associations with their percentages were not significant.			В

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン文 ン文 ク献 ① ラ ② ラ
D907	ヒト(免疫毒性)	Luo, Yuehua; Deji, Zhuoma; Huang, Zhenzhen	Exposure to perfluoroalkyl substances and allergic outcomes in children: A systematic review and meta- analysis	2020	Environ Res. 2020 Dec;191:110145. doi: 10.1016/j.envres.2020.110145. Epub 2020 Aug 30.	BACKGROUND: Perfluoroalkyl substances (PFASs) are persistent organic pollutants and widespread throughout the environment. Although exposure to PFASs may contribute to the development of allergic diseases in children, evidence about this association remains inconclusive. OBJECTIVE: To conduct a systematic review and meta-analysis to assess the association between PFASs exposure and allergic diseases in children based on current evidence. METHODS: The databases including PubMed, EMBASE, and Web of Science were searched to identify all observational studies that examined the association between PFASs exposure and the risk of childhood allergic diseases. The Newcastle-Ottawa Scale was used to evaluate the quality of case-crossover studies, and a previously validated quality assessment framework was used for observational studies lacking control groups. Random-effects meta-analysis models were applied to pool odds ratio (OR) with 95% confidence intervals (CIs). RESULTS: From an initial 94 articles (after duplicate removal), 13 studies through full-text assessment were included for quantitative assessment and descriptive synthesis. They are ten cohort studies, two cross-sectional studies, and one case-control study. The pooled estimates showed that perfluorononanoic acid (PFNA) was associated with eczema (OR = 0.89, 95% CI = 0.80-0.99), perfluorooctanesulfonic acid (PFOS) with atopic dermatitis (OR = 1.26, 95% CI = 1.01-1.58), and perfluorooctanoic acid (PFOA) with allergic rhinitis (OR = 1.33, 95% CI = 1.13-1.56). However, no such significant associations were found for wheeze and asthma. CONCLUSIONS: The meta-analysis results suggest that PFASs exposure could potentially be associated with eczema, atopic dermatitis, and allergic rhinitis during childhood, but not with childhood asthma or wheeze. Future studies are needed to verify these findings.		1	A
D908	ヒト(免疫毒性)	Dalsager, Louise; Christensen, Nikolas; Halekoh, Ulrich; Timmermann, Clara Amalie Gade; Nielsen, Flemming; Kyhl, Henriette Boye; Husby, Steffen; Grandjean, Philippe; Jensen, Tina Kold; Andersen, Helle Raun	Exposure to perfluoroalkyl substances during fetal life and hospitalization for infectious disease in childhood: A study among 1,503 children from the Odense Child Cohort	2021	Environ Int. 2021 Apr;149:106395. doi: 10.1016/j.envint.2021.106395. Epub 2021 Jan 25.	INTRODUCTION: The immunosuppressive properties of PFASs are widely recognized. Early-life exposure to PFAS has been linked to reduced immune response to childhood vaccinations and increased rates of common infectious diseases, but implications for hospitalizations are unclear. OBJECTIVES: To investigate the association between maternal serum concentrations of five PFASs during pregnancy and the child's rate of hospitalization due to common infectious diseases between birth and 4 years of age. METHODS: Serum samples from first trimester pregnant women from the Odense Child Cohort (OCC) collected in 2010-2012 were analyzed for concentrations of perfluorooctanesulfonic acid (PFOS), perfluorooctanoic acid (PFOA) and three other PFASs. Data on child hospitalizations with an ICD-10 code for infectious disease was obtained from the Danish National Patient Register. The following were identified: upper respiratory tract infections (URTI), lower respiratory tract infections (LRTI), gastrointestinal infections (GI), and other infections. The Andersen-Gill Cox proportional hazard model for recurrent events was used to investigate the association between PFAS exposure and hospitalizations. The resulting estimates were hazard ratios (HRS), which express the relative change in the instantaneous risk of hospitalizations. The resulting estimates were hazard ratios (HRS), which express the relative change in the instantaneous risk of hospitalization with a doubling in maternal PFAS concentration. RESULTS: A total of 1,503 mother-child pairs were included, and 26% of the children were hospitalization due to any infectious disease. A doubling in maternal PFOS concentration was associated with a 23% increase in the risk of hospitalization due to any infections (HR: 1.23 (95% CI: 1.05, 1.44). There was indication of an interaction between child sex and PFOS (p = 0.07) and PFDA (p = 0.06), although in opposite directions. Further, every doubling of PFOA or PFOS increased the risk of LRTI by 27% (HR: 1.27 (1.01, 1.59)) and 54% (HR: 1			в

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No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 対報 象抽 ① ラ	ン 文 ク 献 ② ラ
D909	ヒト(免疫毒性)	Zhang, Yu; Mustieles, Vicente; Sun, Yang; Oulhote, Youssef; Wang, Yi-Xin; Messerlian, Carmen	Association between serum per- and polyfluoroalkyl substances concentrations and common cold among children and adolescents in the United States	2022	Environ Int. 2022 Jun;164:107239. doi: 10.1016/j.envint.2022.107239. Epub 2022 Apr 9.	BACKGROUND: Per- and polyfluoroalkyl substances (PFAS) exert immunosuppressive effects in experimental animals. Few epidemiologic studies investigated PFAS exposure and immune-related clinical outcomes such as common cold, especially during childhood when the immune system is developing. METHODS: This study used data from the National Health and Nutrition Examination Survey and included 517 children 3-11 years (2013-2014 cycle) and 2732 adolescents 12-19 years (2003-2016 cycles). Serum concentrations of perfluorooctanoic acid (PFOA), perfluorooctane sulfonic acid (PFOS), perfluorononanoic acid (PFNA) and perfluorohexane sulfonic acid (PFHXS) were quantified. Common cold was self-reported by the participant or parent as having a head cold or chest cold in the last month. Multivariable logistic regression models were applied to examine the covariate-adjusted odds ratios (ORs) between individual PFAS concentrations and common cold incidence in the past month. The joint effect of PFAS mixtures was evaluated using Probit Bayesian Kernel Machine Regression (BKMR). RESULTS: A doubling of serum PFHxS concentration was associated with a 31% higher odds (OR = 1.31, 95% Cl: 0.67, 2.62) concentrations were also related to common cold among children. Serum PFNA (OR = 1.36, 95% Cl: 0.93, 1.98) and PFOA (OR = 1.32, 95% Cl: 0.67, 2.62) concentrations were also related to common cold among children, as were serum PFOS concentrations among adolescents (OR = 1.13, 95% Cl: 0.96, 1.32). ORs were higher in male than female children and adolescents. BKMR showed a clear increasing trend of common cold estimates across quantiles of the total PFAS mixture concentrations of PFAS mixtures, especially PFHxS and PFNA, were associated with higher odds of common cold. Among adolescents, PFOS was associated with increased common cold in the last month. This study contributes to the existing evidence supporting the immunotoxicity of PFAS in childhood and adolescence.		В	
D910	ヒト(免疫毒性)	Li, Rong; Guo, Chao; Lin, Xiao; Chan, Ting Fung; Lai, Keng Po; Chen, Jian	Integrative omics analyses uncover the mechanism underlying the immunotoxicity of perfluorooctanesulfonate in human lymphocytes	2020	Chemosphere. 2020 Oct;256:127062. doi: 10.1016/j.chemosphere.2020.127062. Epub 2020 May 13.	Perfluorooctanesulfonate (PFOS) is a man-made chemical widely used in industrial products. Due to its high persistence, PFOS has been detected in most animal species including the human population, wild animals, and aquatic organisms. Both cross-sectional studies and laboratory animal studies have shown hepatotoxicity, renal toxicity, and reproductive toxicity caused by PFOS exposure. Recently, a limited number of PFOS studies have raised concerns about its potential immune system effects. However, the molecular mechanism underlying the immunotoxicity of PFOS remains unknown. In this study, we used primary human lymphocytes as a model, together with integrative omics analyses, including the transcriptome and lipidome, and bioinformatics analysis, to resolve the immune toxicity effects of PFOS. Our results demonstrated that PFOS could alter the production of interleukins in human lymphocytes. Additionally, PFOS exposure could dysregulate clusters of genes and lipids that play important roles in immune functions, such as lymphocyte differentiation, inflammatory response, and immune response. The findings of this study offer novel insight into the molecular mechanisms underlying the immunotoxicity of PFOS, and open the potential of using the identified PFOS-responsive genes and lipids as biomarkers for risk assessment.		В	
D911	ヒト(免 疫毒性)	Jones, Laura E; Ghassabian, Akhgar; Lawrence, David A; Sundaram, Rajeshwari; Yeung, Edwina; Kannan, Kurunthachalam; Bell, Erin M	Exposure to perfluoroalkyl substances and neonatal immunoglobulin profiles in the upstate KIDS study (2008-2010)	2022	Environ Pollut. 2022 Sep 1;308:119656. doi: 10.1016/j.envpol.2022.119656. Epub 2022 Jul 1.	Intant exposure to per/polyfluoroalkyl compounds is associated with immune disruption. We examined associations between neonatal concentrations of perflurooctanoic acid (PFOA) and perfluorooctanesulfonic acid (PFOS) and immunoglobulin (Ig) isotype profiles in a prospective cohort of infants. We measured Ig isotypes, including IgA, IgE, IgM and the IgG subclasses IgG(1), IgG(2), IgG(3), and IgG(4,) and PFOA and PFOS in newborn dried bloodspots from N = 3175 infants in the Upstate KIDS Study (2008-2010). We examined the association between newborn Ig isotype levels and individual PFOS and PFOA concentrations using mixed effects regression models with a random intercept to account for twins among study participants. We assessed the joint effect PFOA and PFOS with quantile-based g-computation on all singletons and one randomly selected twin (N = 2901), with Ig categorized as above or below median value. Models were adjusted for infant sex, and maternal pre-pregnancy body mass index, race, parity, age and infertility treatment. In adjusted models, PFOA was inversely associated with IgE (coefficient = -0.12 per unit increase in PFOA, 95% CI: -0.065, -0.17), whereas IgG(2), IgM, and IgA were positively associated with PFOA (coefficient for IgG(2) = 0.22, 95% CI: 0.15, 0.27; coefficient for IgM = 0.11, 95% CI: 0.08, 0.15; and coefficient for IgA = 0.15, 95% CI: 0.07, 0.18). There was no relation between PFOS and Ig isotypes. Analysis of the joint effect of PFOA and PFOS showed an OR of 1.12 (95% CI: 1.00, 1.24) for IgG(2) levels above the median for every quartile increase. PFOA levels were significantly associated with elevated IgA, IgM, IgG(2), and reduced levels of IgE in single-pollutant models. A small but significant joint effect of PFOA and PFOS was observed. Our results suggest that early exposure to PFOA and PFOS may disrupt neonatal immunoglobulin levels.		1 A	

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D912	ヒト (免 疫毒性)	Houck, Keith A; Friedman, Katie Paul; Feshuk, Madison; Patlewicz, Grace; Smeltz, Marci; Clifton, M Scott; Wetmore, Barbara A; Velichko, Sharlene; Berenyi, Antal; Berg, Ellen L	Evaluation of 147 perfluoroalkyl substances for immunotoxic and other (patho)physiological activities through phenotypic screening of human primary cells	2022	ALTEX. 2022 Sep 15. doi: 10.14573/altex.2203041. Online ahead of print.	A structurally diverse set of 147 per- and polyfluoroalkyl substances (PFAS) were screened in a panel of 12 human primary cell systems, measuring 148 biomarkers relevant to (patho)physiological pathways to inform hypotheses about potential mechanistic effects of data-poor PFAS in human model systems. This analysis focused on immunosuppressive activity, which was previously reported as an in vivo effect of perfluorooctanoic acid (PFOA) and perfluorooctanesulfonic acid (PFOS), by comparing PFAS responses to four pharmacological immunosuppressants. The PFOS response profile had little correlation with reference immunosuppressants, suggesting in vivo activity does not occur by similar mechanisms. The PFOA response profile did share features with the profile of dexamethasone although some distinct features were lacking. Other PFAS, including 2,2,3,3-tetrafluoropropyl acrylate, demonstrated more similarity to the reference immunosuppressants but with additional activities not found in the reference immunosuppressive drugs. Correlation of PFAS profiles with a database of environmental chemical responses and pharmacological probes identified potential mechanisms of bioactivity for some PFAS, including responses similar to ubiquitin ligase inhibitors, deubiquitylating enzyme (DUB) inhibitors, and thioredoxin reductase inhibitors. Approximately 21% of the 147 PFAS with confirmed sample quality were bioactive at nominal testing concentrations in the 1-60 micromolar range in these human primary cell systems. These data provide new hypotheses for mechanisms of action for a subset of PFAS and may further aid in development of a PFAS categorization strategy useful in safety assessment.		С
D913	ヒト(免疫毒性)	Porter, Anna K; Kleinschmidt, Sarah E; Andres, Kara L; Reusch, Courtney N; Krisko, Ryan M; Taiwo, Oyebode A; Olsen, Geary W; Longnecker, Matthew P	Antibody response to COVID-19 vaccines among workers with a wide range of exposure to per- and polyfluoroalkyl substances	2022	Environ Int. 2022 Nov;169:107537. doi: 10.1016/j.envint.2022.107537. Epub 2022 Sep 21.	Per- and polyfluoroalkyl substances (PFAS) are a broad class of synthetic chemicals; some are present in most humans in developed countries. Several studies have shown associations between certain PFAS, such as perfluorocctanoic acid (PFOA) and perfluorocctane sulfonic acid (PFOS), and reduced antibody concentration after vaccination against diseases such as Tetanus. Recent studies have reported associations between COVID-19 occurrence and exposure to certain types of PFAS. However, studies of antibody concentration after COVID-19 vaccination in relation to PFAS serum concentrations have not been reported. We examined COVID-19 antibody responses to vaccines and PFAS serum concentrations among employees and retirees from two 3M facilities, one of which historically manufactured PFOS, PFOA, and perfluorohexane sulfonic acid (PFHxS). Participants completed enrollment and follow-up study visits in the Spring of 2021, when vaccines were widely available. In total 415 participants with 757 observations were included in repeated measures analyses. Log-transformed concentrations of anti-spike lgG and neutralizing antibodies were modeled in relation to concentration of PFAS at enrollment after adjusting for antigenic stimulus group (9 groups determined by COVID-19 history and number and type of vaccination) and other variables. The fully adjusted IgG concentration was 3.45 percent lower (95% CI -7.03, 0.26) per 14.5 ng/mL (interquartile range) increase in PFOS; results for neutralizing antibody and PFOS were similar. For PFOA, PFHxS, and perfluoronanoic acid (PFNA), the results were comparable to those for PFOS, though of smaller magnitude. In our study data, the fully adjusted coefficients relating concentration of vaccineinduced antibodies to COVID-19 and interquartile range difference in serum concentration of PFOS, PFOA, PFHxS, and PFNA were inverse but small with confidence intervals that included zero. Our analysis showed that the coefficient for the four PFAS examined in detail was considerably affected by adju		В
D914	ヒト(免疫毒性)	Zhao, Yun; Jin, Hangbiao; Qu, Jianli; Zhang, Sunzhao; Hu, Shilei; Xue, Jing; Zhao, Meirong	The influences of perfluoroalkyl substances on the rheumatoid arthritis clinic	2022	BMC Immunol. 2022 Mar 4;23(1):10. doi: 10.1186/s12865- 022-00483-7.	BACKGROUND: The effect of environmental factors on genetically susceptible individuals is a basic link in the pathogenesis of rheumatoid arthritis. Perfluoroalkyl substances (PFASs) are a class of synthetic organic fluorine chemicals, which have been mass-produced and widely used in the past 60 years, and also have been shown to be one of the major pollutants affecting human health. The impact of fluoride on the development of Rheumatoid Arthritis (RA) is unclear. This study explored the relationship between common fluoride and clinical manifestations of rheumatoid arthritis. RESULTS: A cohort of 155 patients with RA and 145 health controls in Second Affiliated Hospital of Zhejiang University School of Medicine were investigated. Serum concentrations of all fluoride detected were higher in RA patients than in healthy controls. There were 43 male patients and 112 female patients in the RA cohort. Some of perfluoroalkyl substances (perfluoroctanoate (PFOA), perfluoronanoate (PFNA), perfluorotrdecanoate (PFTrA), perfluoroctanesulfonate (PFOS)) were correlated negatively with the Body Mass Index (BMI); some of them (PFOA, PFNA, PFTrA, PFOS, 8:2 Chlorinated polyfluorinated ether sulfonate (8:2CI-PFESA)) were correlated positively with the Disease Activity Score 28 (DAS28); two (PFOA, PFOS) of them were correlated positively with the white blood cell count, and one (Perfluoroundecanoate (PFUnA)) of them was correlated negatively with the hemoglobin; two (Perfluorodecanoate (PFDA), PFUA) of them were correlated negatively with the presence of interstitial lung disease. CONCLUSION: These data suggest that exposure to perfluoroalkyl substances may promote the disease activity of rheumatoid arthritis and the visceral lesions.		В

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン 文 ン 文 ク 献 ク 献 ① ラ ② ラ
D915	ヒト(免疫毒性)	Bulka, Catherine M; Avula, Vennela; Fry, Rebecca C	Associations of exposure to perfluoroalkyl substances individually and in mixtures with persistent infections: Recent findings from NHANES 1999-2016	2021	Environ Pollut. 2021 Apr 15;275:116619. doi: 10.1016/j.envpol.2021.116619. Epub 2021 Jan 30.	Certain viruses and parasites can cause persistent infections that often co-occur and have been associated with substantial morbidity and mortality. Separate lines of research indicate exposures to per- and polyfluoroalkyl substances (PFAS) suppress the immune system. We hypothesized that PFAS exposures might systematically increase susceptibility to persistent infections resulting in a higher pathogen burden. We used data from 8778 individuals (3189 adolescents, 5589 adults) in the nationally-representative U.S. National Health and Nutrition Examination Survey (NHANES) 1999-2016 to examine cross-sectional associations between serum concentrations of four highly detected PFAS (PFOS, PFOA, PFHxS, PFNA) with the presence of antibodies to cytomegalovirus, Epstein Barr virus, hepatitis C and E, herpes simplex 1 and 2, HIV, T. gondii, and Toxocara spp. Seropositivity was summed to calculate a pathogen burden score reflecting the total number of infections. Separate survey-weighted multivariable regression models were fitted to analyze PFAS individually and quantile g-computation was used to analyze PFAS mixtures. Among adolescents, 38.7% had at least one persistent infection while 14.9% had two or more; among adults, these percentages were 48.0% and 19.7%. Each PFAS was individually associated with significantly higher pathogen burdens and the most pronounced associations were observed in adolescents [e.g., among adolescents, a doubling of PFOS was associated with 30% (95% CI: 25-36%) higher pathogen burden]. Quantile g-computation revealed PFAS mixtures as a whole were also associated with higher pathogen burdens. Taken together, these results suggest PFAS exposure may increase susceptibility to and foster the clustering of persistent infections, particularly among adolescents. Since persistent infections are important contributors to long-term health, prospective data are needed to confirm these findings.			В
D916	ヒト(免疫毒性)	Wang, Zixia; Shi, Rong; Ding, Guodong; Yao, Qian; Pan, Chengyu; Gao, Yu; Tian, Ying	Association between maternal serum concentration of perfluoroalkyl substances (PFASs) at delivery and acute infectious diseases in infancy	2022	Chemosphere. 2022 Feb;289:133235. doi: 10.1016/j.chemosphere.2021.133235. Epub 2021 Dec 9.	BACKGROUND: Perfluoroalkyl substances (PFASs) are persistent and bio-accumulative compounds that have been recognized as important immune hazards by animal studies. However, epidemiological studies regarding the impact on infant infections were inconsistent. OBJECTIVES: We investigated the associations between prenatal exposure to PFASs and acute infectious diseases including common cold, bronchitis/pneumonia, and diarrhea in early childhood. METHODS: Participating 235 mother-infant pairs were recruited from the Laizhou Wan (Bay) birth cohort (LWBC), a prospective study in Shandong, China between September 2010 and 2013. Ten selected PFASs congeners including PFOA, PFOS, PFNA, PFDA, PFUA, PFDoA, PFHxS, PFBS, PFHpA, and PFOSA were measured from maternal serum by HPLC-MS/MS. Detailed information on parent-reported frequency of acute infectious diseases was collected from questionnaires at 1-year follow-up, which was confirmed by the medical records. Logistic and Poisson regression models were used on binary health outcomes (yes/no) and the number of episodes of outcomes, which were reported as odds ratio (OR) and incidence rate-ratio (IRR), respectively. RESULTS: The risk of diarrhea increased by 4.99 (95% CI = 1.86, 13.39) per log-unit increase in PFOA. The frequencies of diarrhea increased by 97%-116% for each 10-fold increase in PFOA, PFAS exposure on diarrhea were more pronounced among the breastfed infants. There were no associations between prenatal PFASs exposure and common cold or bronchitis/pneumonia. CONCLUSIONS: Exposure to PFASs was associated with increased risks of diarrhea during the first year of life, and these effects were stronger among the breastfed infants. Due to the small sample size, our results should be interpreted with caution and additional studies on larger populations are needed to confirm our findings.			В
D917	ヒト(免疫毒性)	Zhao, Yun; Liu, Wenqi; Qu, Jianli; Hu, Shilei; Zhang, Li; Zhao, Meirong; Wu, Pengfei; Xue, Jing; Hangbiao, Jin	Per-/polyfluoroalkyl substance concentrations in human serum and their associations with immune markers of rheumatoid arthritis	2022	Chemosphere. 2022 Jul;298:134338. doi: 10.1016/j.chemosphere.2022.134338. Epub 2022 Mar 15.	Per-/polyfluoroalkyl substances (PFASs) are ubiquitous in the environment and have been proved to be immunotoxic to humans. However, it remains unclear whether exposure to PFASs affects the risk of rheumatoid arthritis (RA). In this study, nine PFASs were determined in human serum collected from 280 health populations and 294 RA patients in a cohort enrolled between 2018 and 2020 in Hangzhou, China, and were examined their correlations with immune marker levels. Perfluorooctanoate (PFOA), perfluorooctane sulfonate (PFOS), and 6:2 chlorinated polyfluorinated ether sulfonate (6:2 CI-PFESA) were the predominant PFASs in human serum, with median (mean) concentrations of 5.4 (7.6), 2.8 (3.5), and 1.9 (2.5) ng/mL, respectively. Serum PFOA and 6:2 CI-PFESA concentrations were positively correlated with anti-cyclic citrullinated peptide antibody (ACPA) (β (PFOA) = 0.59, 95% confidence interval (CI): 0.37, 0.81; β (6:2 CI-PFESA) = 0.48, 95% CI: 0.29, 0.66), immunoglobulin G (β (PFOA) = 0.25, 95% CI: 0.21, 0.29; β (6:2 CI-PFESA) = 0.16, 95% CI: 0.12, 0.19) as well as rheumatoid factors (RF) (β (PFOA) = 0.57, 95% CI: 0.34, 0.80; β (6:2 CI-PFESA) = 0.54, 95% CI: 0.36, 0.72). The correlations between serum PFOS levels and RF (β = 0.52, 95% CI: 0.28, 0.77), ACPA (β = 0.48, 95% CI: 0.23, 0.73), as well as immunoglobulin M (β = -0.24, 95% CI: 0.64, 0.15) respectively were statistically stronger. We also found PFOA concentrations in serum were associated with the level of C-reactive protein (β = 0.52, 95% CI: 0.40, 0.65). To our knowledge, this is the first study reporting significant associations between several PFASs and change of specific immune marker levels, suggesting that PFAS exposure may increase the risk of RA in adults.			В

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン 文 ク 献 ① ラ ② ラ
D918	ヒト(免 疫毒性)	Salihovic, S; Lind, L; Larsson, A; Lind, P M	Plasma perfluoroalkyls are associated with decreased levels of proteomic inflammatory markers in a cross- sectional study of an elderly population	2020	Environ Int. 2020 Dec;145:106099. doi: 10.1016/j.envint.2020.106099. Epub 2020 Sep 8.	Perfluoroalkyl substances (PFAS) have been linked to immunotoxicity in experimental studies. Although PFAS exposure is associated with altered immune response in epidemiological studies of children, it is less known whether this is observed also in elderly adults. Eight PFAS and 86 proteins were measured in plasma from 965 elderly individuals from Sweden (all aged 70, 50% women). PFAS were measured using isotope-dilution ultra-pressure liquid chromatography coupled to tandem mass spectrometry. Proteins were measured using a multiplex proximity extension assay (PEA) and covered among others inflammatory marker proteins such as monocyte chemoattractant proteins, tumor necrosis factors, and interleukins. We examined cross-sectional associations using multivariable linear regression at two levels of adjustment. We observed significant decreases in levels of 24 proteins in relation to a ln-unit increase in PFAS concentrations following adjustment for sex, sample storage time in freezer, and correction for multiple testing. Associations of PFAS and hepatocyte growth factor (HGF) and macrophage colony-stimulating factor 1 (CSF-1) remained significant (p-value <0.05) following full covariate adjustment for smoking, exercise habits, education, energy, and alcohol intake, body mass index (BMI), glomular filtration rate (GFR) as well as corticoid- and COX-inhibitor treatment. CSF-1 was inversely associated with perfluorohexane sulfonic acid (PFHxS) β : -0.08: 95% confidence interval (CI); -0.13, -0.02), perfluorooctanoic acid (PFOA) β : -0.04: 95% CI; -0.07, -0.006, perfluoronnanoic acid (PFUNDA) β : -0.04: 95% CI; -0.07, -0.006, perfluoronnanoic acid (PFUNDA) β : -0.04: 95% CI; -0.08, -0.003, and perfluoroudecanoic acid (PFUNDA) β : -0.05: 95% CI; -0.08, -0.02. The magnitude and direction of PFAS vs protein relationships were similar also for HGF. Our findings implicate PFAS exposure with decreased levels of proteomic markers of inflammation in elderly humans.			В
D919	ヒト(免疫毒性)	von Holst, Haley; Nayak, Pratibha; Dembek, Zygmunt; Buehler, Stephanie; Echeverria, Diana; Fallacara, Dawn; John, Lisa	Perfluoroalkyl substances exposure and immunity, allergic response, infection, and asthma in children: review of epidemiologic studies	2021	Heliyon. 2021 Oct 12;7(10):e08160. doi: 10.1016/j.heliyon.2021.e08160. eCollection 2021 Oct.	BACKGROUND: Increased exposure to perfluoroalkyl substances (PFAS) potentially affects infant and childhood health through immunosuppression. Given rapidly evolving research on PFAS, it is important to comprehensively examine the impact of PFAS exposure among the pediatric population as new research becomes available due to potential fragility of the developing immune system. OBJECTIVES: This review assessed the effects of PFAS fetal, infant and childhood exposures upon the development of immune function during early life stages. METHODS: Researchers completed a literature review, searching PubMed for human studies published since 2010 for PFAS and health outcomes among infants and children. Included articles incorporated key search terms in the title or abstract; non-research reports and non-English papers were excluded. The search identified 518 studies for possible inclusion. Following hands-on review, 34 were determined relevant. Subsequent analyses found 8 additional relevant articles, totaling 42 studies. RESULTS: Major immune-related sequelae from PFAS exposures on infant and childhood antibody response to vaccination, particularly with PFOA, PFOS and PFHxS exposures.• Some indication of increased risks of childhood infectious diseases/infections, particularly from PFOS exposures.• Limited indication of an effect of PFAS exposure on allergic reactions/allergen specific IgE antibodies.• Limited indication of an effect of PFAS exposure on allergic reactions/allergen specific lgE antibodies.• Limited indication. CONCLUSION: This review summarizes recent findings of PFAS effects on infant and childhood immune health. Evidence of immunosuppression, diminished vaccine efficacy, and increased risk of infections, allergies, asthma and AD were described following in utero, infant, and early childhood PFAS exposures. Further investigation is warranted to characterize PFAS exposure pathways and potential modes of action in relation to PFAS effects on the developing immune system. Incontrovertible pr			A
D920	ヒト(免疫毒性)	Dangudubiyyam, Sri Vidya; Mishra, Jay S; Zhao, Hanjie; Kumar, Sathish	Perfluorooctane sulfonic acid (PFOS) exposure during pregnancy increases blood pressure and impairs vascular relaxation mechanisms in the adult offspring	2020	Reprod Toxicol. 2020 Dec;98:165-173. doi: 10.1016/j.reprotox.2020.09.008. Epub 2020 Sep 24.	Perfluorooctanesulfonate (PFOS) is a persistent environmental agent. We examined whether PFOS exposure during pregnancy alters blood pressure in male and female offspring, and if this is related to sex-specific changes in vascular mechanisms. PFOS was administered through drinking water (50 μ g/mL) to pregnant Sprague-Dawley rats from gestational day 4 until delivery. PFOS-exposure decreased maternal weight gain but did not significantly alter feed and water intake in dams. The male and female pups born to PFOS mothers were smaller in weight by 29 % and 27 %, respectively. The male PFOS offspring remained smaller through adulthood, but the female PFOS offspring exhibited catch-up growth. The blood pressure at 12 and 16 weeks of age was elevated at similar magnitude in PFOS males and females than controls. Mesenteric arterial relaxation to acetylcholine was reduced in both PFOS males and females, but the extent of decrease was greater in females. Relaxation to sodium-nitroprusside was reduced in PFOS females but unaffected in PFOS males. Vascular eNOS expression was not changed, but phospho(Ser(1177))-eNOS was decreased in PFOS males. In PFOS females, both total eNOS and phospho(Ser(1177))-eNOS expression were reduced. In conclusion, PFOS exposure during prenatal life (1) caused low birth weight followed by catch-up growth only in females (2) lead to hypertension of similar magnitude in both males and females; (2) decreased endothelium-dependent vascular relaxation in males but suppressed both endothelium-dependent and -independent relaxation in females. The endothelial dysfunction is associated with reduced activity of eNOS in males and decreased expression and activity of eNOS in females.			В

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D921	ヒト(免疫毒性)	Timmermann, Clara Amalie Gade; Pedersen, Henning Sloth; Weihe, Pál; Bjerregaard, Peter; Nielsen, Flemming; Heilmann, Carsten; Grandjean, Philippe	Concentrations of tetanus and diphtheria antibodies in vaccinated Greenlandic children aged 7-12 years exposed to marine pollutants, a cross sectional study	2022	Environ Res. 2022 Jan;203:111712. doi: 10.1016/j.envres.2021.111712. Epub 2021 Jul 31.	Previous studies have shown immunotoxic effects of environmental chemicals, and the European Food Safety Authority (EFSA) recently identified a need for more studies on PFAS immunotoxicity in different populations. In the Arctic, populations are exposed to several environmental chemicals through marine diet, and the objective of this study was therefore to examine the association between Greenlandic children's exposure to major environmental chemicals and their concentrations of diphtheria and tetanus vaccine antibodies after vaccination. The study includes cross-sectional data from Greenlandic children aged 7-12 years examined during 2012-2015. A total of 338 children were eligible for the study, and 175 of these had available vaccination records. A parent or guardian participated in a structured interview, and a blood sample from the child was analyzed for specific antibodies against diphtheria and tetanus as well as perfluoroalkyl substances (PFASs), polychlorinated biphenyls (PCBs) and total mercury. Furthermore, for a subgroup, blood samples from pregnancy were available and analyzed for environmental contaminants. The associations between the environmental exposures and antibody concentrations and odds of having antibody concentrations of some of the contaminants were associated with higher concentrations of diphtheria and tetanus antibodies, but the associations were eversed when adjusting for area of residence, and duration of being breastfed and including children with a known vaccination date only. Each 1 ng/mL increase in serum concentrations of perfluorohexane sulfonic acid (PFAS) and perfluorootane sulfonic acid (PFHxS) and perfluorootane sulfonic acid (PFOS) was associated with decreases of 78 % (95 % CI: 2-594 %) and 9 % (95 % CI: 2-16 %), respectively, in diphtheria antibody concentrations. Exposure to PCBs and all PFASs was associated with markedly increased odds of having diphtheria antibody concentrations. Exposure to PCBs and all PFAS, PFOS, perfluoronanoic acid (PFNA), and perfluorodecanoic		в
D922	ヒト(免 疫毒性)	Dembek, Zygmunt F; Lordo, Robert A	Influence of Perfluoroalkyl Substances on Occurrence of Coronavirus Disease 2019	2022	Int J Environ Res Public Health. 2022 Apr 28;19(9):5375. doi: 10.3390/ijerph19095375.	Epidemiologic evidence indicates exposure to polyfluoroalkyl substances (PFAS) influences immunosuppression, with diminished vaccination response. The relationship between PFAS blood levels and coronavirus disease 2019 (COVID-19) occurrence by age warrants further examination. This assessment identified blood PFAS exposure levels in discrete populations. Recent PFAS population studies summarizing age and gender results were identified and included. Geographically corresponding COVID-19 incidence data were determined for selected counties in North Carolina (NC) and Ohio (OH), and the state of New Jersey (NJ). Centers for Disease Control and Prevention COVID-19 databases were accessed for national incidence data by age groupings. We assessed associations between blood PFAS concentrations, COVID-19 incidence rates, and key demographic characteristics, within subpopulations. COVID-19 incidence counts and blood PFAS concentration were obtained for each age group, along with estimated U.S. Census total population. A general trend observed is higher PFAS levels in older age groups. Younger age groups contained fewer COVID-19 cases. Global COVID-19 mortality is highest in elderly populations with hospitalization and death greatly increasing from age 50. PFAS exposures occurring early in life may cause deleterious health effects later in life, including decreased antibody response and reduced disease resistance. Highest levels of both PFAS exposure and COVID-19 were found in the oldest populations. While this does not determine causality, such associations should help promote further study.		В
D923	ヒト(免 疫毒性)	Fart, Frida; Salihović, Samira; McGlinchey, Aidan; Gareau, Melanie G; Oreši č, Matej; Halfvarson, Jonas; Hyötylä inen, Tuulia; Schoultz, Ida	Perfluoroalkyl substances are increased in patients with late-onset ulcerative colitis and induce intestinal barrier defects ex vivo in murine intestinal tissue	2021	Scand J Gastroenterol. 2021 Nov;56(11):1286-1295. doi: 10.1080/00365521.2021.1961306. Epub 2021 Aug 12.	BACKGROUND: Environmental factors are strongly implicated in late-onset of inflammatory bowel disease. Here, we investigate whether high levels of perfluoroalkyl substances are associated with (1) late-onset inflammatory bowel disease, and (2) disturbances of the bile acid pool. We further explore the effect of the specific perfluoroalkyl substance perfluoroctanoic acid on intestinal barrier function in murine tissue. METHODS: Serum levels of perfluoroalkyl substances and bile acids were assessed by ultra-performance liquid chromatography coupled to a triple-quadrupole mass spectrometer in matched samples from patients with ulcerative colitis (n = 20) and Crohn's disease (n = 20) diagnosed at the age of \geq 55 years. Age and sex-matched blood donors (n = 20), were used as healthy controls. Ex vivo Ussing chamber experiments were performed to assess the effect of perfluoroctanoic acid on ileal and colonic murine tissue (n = 9). RESULTS: The total amount of perfluoroalkyl substances was significantly increased in patients with ulcerative colitis compared to healthy controls and patients with Crohn's disease (p < .05). Ex vivo exposure to perfluoroctanoic acid induced a significantly altered ileal and colonic barrier function. The distribution of bile acids, as well as the correlation pattern between (1) perfluoroalkyl substances and (2) bile acids, differed between patient and control groups. DISCUSSION: Our results demonstrate that perfluoroalkyl substances levels are increased in patients with late-onset ulcerative colitis and may contribute to the disease by inducing a dysfunctional intestinal barrier.		В

分野 タイトル 発行年 要旨(原文) No 著者 書誌情報 (参考) Per- and polyfluoroalkyl substances (PFASs) are highly persistent in the environment and m Previous studies have linked PFAS exposure to lower vaccine responses in children, but res the present study evaluated the associations between exposure to PFASs and serum antibo Shih, Yu-Hsuan; at age 28 years in the Faroe Islands. PFAS concentrations were determined from cord-blood Blomberg, collected at ages 7, 14, 22, and 28 years. Serum antibody concentrations against hepatitis to Annelise J; Bind were analyzed from blood samples collected about 6 mo after the first vaccine inoculation a Marie-Abèle nodels were used to estimate changes in antibody concentration for each doubling of PFAS Holm, Dorte: Serum vaccine antibody concentrations in adults ヒト (免 J Immunotoxicol. 2021 Dec;18(1):85-92. doi: modification by sex was assessed by including an interaction term between PFAS and sex. \imath D924 Nielsen. 2021 exposed to per- and polyfluoroalkyl substances: A 疫毒性) 10.1080/1547691X.2021.1922957. contain the null value, inverse trends were observed between serum perfluorooctanoate (PF Flemming; birth cohort in the Faroe Islands hepatitis type A antibody (anti-HAV) concentrations, as revealed by an estimated decrease Heilmann, (95% CI: -0.59, 0.10) signal-to-cutoff ratio for each doubling of exposure, respectively. Inverse Carsten: Weihe serum PFOA at ages 22 and 28 years and hepatitis type B antibody (anti-HBs) concentratio Pál; Grandjean (95% CI: -42.20%, 7.34%) and of 17% (95% CI: -35.47%, 7.35%) in anti-HBs for each doubling Philippe specific associations with anti-HAV were observed for cord-blood PFASs and serum PFAS c No inverse associations of PFAS exposure were found with diphtheria and tetanus antibody needed to confirm these findings and further investigate the effects of PFASs on adult immu BACKGROUND: Per- and polyfluoroalkyl substances (PFASs) are widespread and persistent Exposure to several PFASs has been associated with altered immune function in humans, in impaired response to vaccination. However, changes to the profile of inflammatory biomarke peen extensively described. OBJECTIVE: To estimate cross-sectional associations between nflammation among adults in a population exposed to aqueous film forming foam (AFFF)-co Barton, Kelsey E; METHODS: We quantified concentrations of 48 PFASs in non-fasting serum samples from 2 Zell-Baran, serum samples, we measured concentrations of ten pro- and anti-inflammatory cytokines. W Lauren M: detected in ≥85% of participants and the following four cytokines detected in ≥30% of partic DeWitt, Jamie C 10, and tumor necrosis factor [TNF]- α . We fit multiple linear regression or logistic regression Brindley, Cross-sectional associations between serum PFASs ヒト (免 Int J Hyg Environ Health. 2022 Mar;240:113905. doi: confounders, to estimate associations between concentrations of each PFAS and either con D925 2022 Stephen: and inflammatory biomarkers in a population exposed 疫毒性) 10.1016/j.ijheh.2021.113905. Epub 2022 Jan 19 limit of detection) concentrations of each cytokine. We additionally applied Bayesian kernel McDonough, to AFFF-contaminated drinking water combined effect of the PFAS mixture on each cytokine outcome. RESULTS: Certain PFAS co Carrie A; Higgins elevated compared to a US nationally representative sample; median levels of PFHxS, Σ PFC Christopher P; 13.8, 2.1 and 1.7 times higher, respectively, than medians observed in the U.S. SAMPLE: Hig Adgate, John L; were significantly associated with lower odds of detectable IL-1eta . Weaker associations wer Starling, Anne P general, perfluoroalkyl carboxylic acids had inverse associations with TNF- α , whereas the p positive associations. CONCLUSIONS: We observed preliminary evidence of altered inflamm elevated serum concentrations of PFASs due to contaminated drinking water. Modifications mechanism by which PFAS exposures produce adverse health effects in humans, but this fir longitudinal studies as well as phenotypic anchoring to immune function outcomes. Vaccines are essential for children to defend against infection. Per- and polyfluoroalkyl subs contaminants with the characteristics of persistence and bioaccumulation. PFAS exposure c endocrine, and immune system of animals and humans. We aimed to conduct a systematic epidemiological studies investigating potential relationships between PFAS exposure and va whether PFAS would affect vaccine response in healthy children. A literature search was co Zhang, Xin; Xue and Scopus databases up to February 2022. We chose studies that measured serum vaccine Liang; Deji, concentrations of the participants. Essential information, including mean difference of perce Effects of exposure to per- and polyfluoroalkyl Zhuoma; Wang, odds ratio, Spearman correlation coefficient, and 95% confidence intervals, were extracted f ヒト(免 Environ Pollut. 2022 Aug 1;306:119442. doi: substances on vaccine antibodies: A systematic D926 Xin; Liu, Peng; 2022 descriptive analysis and meta-analysis where appropriate. The qualities of these studies we 疫毒性) 10.1016/j.envpol.2022.119442. Epub 2022 May 11 review and meta-analysis based on epidemiological Lu, Jing; Zhou, epidemiological studies about children met our inclusion criteria. A high degree of heteroge studies Ruke; Huang, preastfeeding time, confounder control, and detection method. Exposure to perfluorooctano Zhenzhen acid is negatively associated with tetanus antibody level in children without heterogeneity by and exposure to perfluorohexane sulfonate is negatively associated with tetanus antibody le This comprehensive review suggests that PFAS can have adverse health effects on children vaccine antibodies. There are some consistent and negative associations between children antibody level. The association of the other four vaccines (measles, rubella, mumps, and inf because very few studies are available. Further studies are needed to validate the possible

	備考	出 情 対 報 象 抽	ン 文 ク 献 ① ラ	ン 文 ク 献 ② ラ
ay cause depressed immune function. earch in adults is limited. Therefore, dy concentrations in adults vaccinated d collected at birth and serum samples ype A and B, diphtheria, and tetanus at age 28 years. Linear regression concentration. Potential effect Although the 95% confidence intervals TOA) at ages 14 and 28 years and of 0.71 (95% CI: -1.52, 0.09) and 0.24 se trends were also observed between n, with an estimated decrease of 21% g of exposure, respectively. Sex- oncentrations at ages 7 and 14 years. concentrations. Future studies are une function.			В	
t environmental contaminants. Including autoimmune disease and ers in adults exposed to PFASs has not serum PFASs and markers of contaminated drinking water. 12 non-smoking adults. In the same Ve restricted analysis to seven PFASs cipants: interleukin [IL]-1 β , IL-6, IL- on models, adjusted for potential tinuous or categorical (above vs below machine regression to describe the oncentrations in this sample were CDS and Σ PFOA in this sample were ther concentrations of multiple PFASs re observed with other cytokines. In perfluoroalkyl sulfonic acids showed natory profiles among adults with to inflammatory pathways may be one anding requires verification in			В	
stances (PFAS) are emerging can affect the function of the nervous, review and meta-analysis of the accine antibody levels, and assessed inducted in PubMed, Web of Science, es antibodies and PFAS entage change, regression coefficient, rom the selected studies to conduct are evaluated as well. Finally, nine heity is observed in terms of ic acid and perfluorohexane sulfonic y Cochran's Q test ($p = 0.26$; $p = 0.55$), evel but with heterogeneity ($p = 0.04$). by hindering the production of exposure to certain PFAS and tetanus luenza) with PFAS remains uncertain, associations.		1	A	

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D927	ヒト(免疫毒性)	Catelan, Dolores; Biggeri, Annibale; Russo, Francesca; Gregori, Dario; Pitter, Gisella; Da Re, Filippo; Fletcher, Tony; Canova, Cristina	Exposure to Perfluoroalkyl Substances and Mortality for COVID-19: A Spatial Ecological Analysis in the Veneto Region (Italy)	2021	Int J Environ Res Public Health. 2021 Mar 8;18(5):2734. doi: 10.3390/ijerph18052734.	BACKGROUND: In the context of the COVID-19 pandemic, there is interest in assessing if per- and polyfluoroalkyl substances (PFAS) exposures are associated with any increased risk of COVID-19 or its severity, given the evidence of immunosuppression by some PFAS. The objective of this paper is to evaluate at the ecological level if a large area (Red Zone) of the Veneto Region, where residents were exposed for decades to drinking water contaminated by PFAS, showed higher mortality for COVID-19 than the rest of the region. METHODS: We fitted a Bayesian ecological regression model with spatially and not spatially structured random components on COVID-19 mortality at the municipality level (period between 21 February and 15 April 2020). The model included education score, background all-cause mortality (for the years 2015-2019), and an indicator for the Red Zone. The two random components are intended to adjust for potential hidden confounders. RESULTS: The COVID-19 crude mortality rate ratio for the Red Zone was 1.55 (90% Confidence Interval 1.25; 1.92). From the Bayesian ecological regression model adjusted for education level and baseline all-cause mortality, the rate ratio for the Red Zone was 1.60 (90% Credibility Interval 0.94; 2.51). CONCLUSION: In conclusion, we observed a higher mortality risk for COVID-19 in a population heavily exposed to PFAS, which was possibly explained by PFAS immunosuppression, bioaccumulation in lung tissue, or pre-existing disease being related to PFAS.		в
D928	ヒト(免疫毒性)	Wang, Huan; Gong, Zekun; Zhang, Lei	Association of Polyfluoroalkyl Substances and Allergy in US Adolescents: Results From NHANES 2005 to 2006	2022	J Occup Environ Med. 2022 Sep 1;64(9):737-741. doi: 10.1097/JOM.0000000000002560. Epub 2022 Jun 9.	OBJECTIVE: The aim of this study was to investigate association between polyfluoroalkyl substances (PFASs) and allergy in US adolescents. METHODS: This study was conducted in the National Health and Nutrition Examination Survey 2005-2006. PFAS as a universal pollutant can be obtained directly from laboratory data files. Allergy included current allergic symptoms and allergen sensitization. The aim of the study was to investigate the association between PFAS and allergy in US adolescents. RESULTS: Multivariate regression models showed that PFAS was positively associated with current allergic symptoms (adjusted odds ratio, 1.01; 95% confidence interval [CI], 1-1.03). With PFAS as a categorical variable, compared with the lowest tertile, the adjusted odds ratios with increasing tertiles were 1.21 (95% CI, 0.74-1.96) and 1.67 (95% CI, 1.01-2.74). CONCLUSIONS: Our study shows that PFASs are associated with increased incidence of current allergic symptoms in US adolescents. More prospective studies are needed to provide evidences.		В
D929	ヒト(免疫毒性)	Antoniou, Evangelia; Colnot, Thomas; Zeegers, Maurice; Dekant, Wolfgang	Immunomodulation and exposure to per- and polyfluoroalkyl substances: an overview of the current evidence from animal and human studies	2022	Arch Toxicol. 2022 Aug;96(8):2261-2285. doi: 10.1007/s00204-022-03303-4. Epub 2022 Jun 13.	Per- and polyfluoroalkyl substances (PFAS) have been widely used and represent a class of environmental persistent chemicals. An association of a reduction of vaccination efficacy with PFAS serum levels in humans was used by the European Food Safety Authority as a key effect for PFAS risk assessment. The data support for using this association is reviewed by a critical analysis of the respective human epidemiology and the available animal studies on the immunomodulation of PFAS. Based on an analysis of the available human epidemiology, the overall level of evidence regarding associations between PFAS serum levels and reduced antibody response remains weak. Absence of an association between an increase in clinical infections and PFAS serum levels and the limited understanding of the importance of antibody levels as an isolated data point further support this conclusion. Animal toxicity studies with PFAS focusing on immunomodulation also provide only limited support for immunomodulation as an important endpoint in PFAS toxicity. While immunomodulation is observed after PFAS administration, generally at blood concentrations several orders of magnitude above those seen in environmentally exposed humans, the relevance of these observation is hampered by the high doses required to influence immune endpoints, the limited number of endpoints assessed, and inconsistent results. The limitations of the current database on associations of human PFAS exposures outlined here indicate that more evidence is required to select immunomodulation as a critical endpoint for human PFAS risk assessment.		В
D930	ビト (免 疫毒性)	Shen, Minxue; Xiao, Yi; Huang, Yuzhou; Jing, Danrong; Su, Juan; Luo, Dan; Duan, Yanying; Xiao, Shuiyuan; Li, Jie; Chen, Xiang	Perfluoroalkyl substances are linked to incident chronic spontaneous urticaria: A nested case-control study	2022	Chemosphere. 2022 Jan;287(Pt 3):132358. doi: 10.1016/j.chemosphere.2021.132358. Epub 2021 Sep 24.	Previous studies suggested immunotoxicity of perfluoroalkyl substances (PFASs), but contradictory findings were reported for the associations of PFASs with allergies. The current study aimed to investigate the association of serum PFASs with incident chronic spontaneous urticaria (CSU) in adults. A nested case-control study within a longitudinal cohort of 7051 government employees in China was conducted. Participants with urticaria at the baseline were excluded. During the first follow-up, 70 incident CSU cases were included, and 70 matched healthy controls were randomly selected. In serum samples collected at the baseline, eight PFASs were determined using the UHPLC-MS/MS approach. The median serum concentrations of perfluorobutanoic acid (PFBA) and perfluoroheptanoic acid (PFHpA) were significantly higher in participants with incident CSU. The area under the receiver operating characteristic curve was 0.714 (95% CI: 0.60-0.83) based on the joint prediction by PFBA and PFHpA. The Bayesian kernel machine regression showed a nonlinear positive overall effect of the mixture of PFASs, and identified significant single effects of PFBA and PFHpA. Serum interleukin-4 was significantly higher in the case group at baseline, and was positively associated with PFHpA (r = 0.24). Causal mediation analysis indicated interleukin-4 as a partial mediator (14.8%) in the association of PFHpA with CSU. In conclusion, serum PFASs are associated with an increased risk of incident CSU, and PFBA and PFHpA might be the effective compounds.		В

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 村 報 教 抽	ン 文 ン 文 ク 献 ク 献 ① ラ ② ラ
D931	ヒト(免疫毒性)	Huang, Heyu; Yu, Kan; Zeng, Xinxin; Chen, Qian; Liu, Quanhua; Zhao, Yanjun; Zhang, Jun; Zhang, Xi; Huang, Lisu	Association between prenatal exposure to perfluoroalkyl substances and respiratory tract infections in preschool children	2020	Environ Res. 2020 Dec;191:110156. doi: 10.1016/j.envres.2020.110156. Epub 2020 Aug 30.	BACKGROUND: Prenatal exposure to perfluoroalkyl substances (PFAS) is considered to affect adversely the immune function. However, the effect of prenatal PFAS exposure on respiratory tract infections (RTIs) in children is unclear. Thus, we evaluated whether cord blood PFAS levels were associated with RTI in the first 5 years of life. METHODS: The Shanghai Prenatal Cohort is an on-going birth cohort, which included all the mothers during pregnancy. Children were followed by paediatricians once a year after birth. The levels of 10 PFAS in cord blood were tested using liquid chromatography-mass spectrometry. RTIs were diagnosed based on face-to-face interviews with the parents and review of medical records. Immunoglobulin G (IgG) and immunoglobulin E (IgE) levels, as biomarkers of humoral immunity, were assessed using enzyme-linked immunosorbent assay at age 5 years. Multivariable logistic and linear regression models were applied to study the association between prenatal PFAS exposure and RTIs. RESULTS: A total of 743 children completed the follow-up, 344 of them had detail information of cord blood PFAS, IgG, and IgE concentrations. Eight PFAS were detected in more than 90% of the cord blood samples, except for perfluoroheptanoic acid (PFHpA) and perfluorooctane sulfonamide (FOSA). During the 5-year follow-up period, the frequency of RTIs increased with age, reaching a peak at age 4. Moreover, 20.6% of the children were diagnosed with recurrent RTIs. Children with recurrent RTIs had higher prenatal perfluorobutane sulfonic acid (PFBS) concentration. Higher prenatal PFBS were more vulnerable to RTIs in early life, which may be attributed to immunosuppression of IgG production. These findings need to be further verified in larger prospective studies.			В
D932	ヒト(免疫毒性)	Nielsen, Christel; Jõud, Anna	Susceptibility to COVID-19 after High Exposure to Perfluoroalkyl Substances from Contaminated Drinking Water: An Ecological Study from Ronneby, Sweden	2021	Int J Environ Res Public Health. 2021 Oct 12;18(20):10702. doi: 10.3390/ijerph182010702.	There is concern that immunotoxic environmental contaminants, particularly perfluoroalkyl substances (PFAS), may play a role in the clinical course of COVID-19 and epidemiologic studies are needed to answer if high-exposed populations are especially vulnerable in light of the ongoing pandemic. The objective was, therefore, to determine if exposure to highly PFAS-contaminated drinking water was associated with an increased incidence of COVID-19 in Ronneby, Sweden, during the first year of the pandemic. We conducted an ecological study determining the sex- and age-standardized incidence ratio (SIR) in the adult population relative to a neighboring reference town with similar demographic characteristics but with only background levels of exposure. In Sweden, COVID-19 is subject to mandatory reporting, and we retrieved aggregated data on all verified cases until 3 March 2021 from the Public Health Agency of Sweden. The SIR in Ronneby was estimated at 1.19 (95% CI: 1.12; 1.27). The results suggest a potential link between high PFAS exposure and susceptibility to COVID-19 that warrants further research to clarify causality.			В
D933	ヒト(免疫毒性)	Quinete, Natalia; Hauser-Davis, Rachel Ann	Drinking water pollutants may affect the immune system: concerns regarding COVID-19 health effects	2021	Environ Sci Pollut Res Int. 2021 Jan;28(1):1235-1246. doi: 10.1007/s11356-020-11487-4. Epub 2020 Nov 6.	The current coronavirus pandemic is leading to significant impacts on the planet, changing our way of life. Although the COVID-19 virus mechanisms of action and pathogenesis are still under extensive research, immune system effects are evident, leading, in many cases, to respiratory distress. Although apparent pollution reduction has been noticed by the population, environmental and human health impacts due to the increased use of plastic waste and disinfectants is concerning. One of the main routes of human exposure to pollutants is through drinking water. Thus, this point of view discusses some major contaminants in drinking water known to be immunotoxic, exploring sources and drinking water routes and emphasizing the known mechanisms of action that could likely compromise the effective immune response of humans, particularly raising concerns regarding people exposed to the COVID-19 virus. Based on a literature review, metals, plastic components, plasticizers, and per- and polyfluoroalkyl substances may display the potential to exacerbate COVID-19 respiratory symptoms, although epidemiological studies are still required to confirm the synergistic effects between these pollutants and the virus.			В
D934	ヒト(免疫毒性)	Mattila, Tiina; Santonen, Tiina; Andersen, Helle Raun; Katsonouri, Andromachi; Szigeti, Tamás; Uhl, Maria; Wą sowicz, Wojciech; Lange, Rosa; Bocca, Beatrice; Ruggieri, Flavia; Kolossa-Gehring, Marike; Sarigiannis, Denis A; Tolonen, Hanna	Scoping Review-The Association between Asthma and Environmental Chemicals	2021	Int J Environ Res Public Health. 2021 Feb 1;18(3):1323. doi: 10.3390/ijerph18031323.	Asthma is one of the most common chronic diseases worldwide affecting all age groups from children to the elderly. In addition to other factors such as smoking, air pollution and atopy, some environmental chemicals are shown or suspected to increase the risk of asthma, exacerbate asthma symptoms and cause other respiratory symptoms. In this scoping review, we report environmental chemicals, prioritized for investigation in the European Human Biomonitoring Initiative (HBM4EU), which are associated or possibly associated with asthma. The substance groups considered to cause asthma through specific sensitization include: diisocyanates, hexavalent chromium Cr(VI) and possibly p-phenylenediamine (p-PDA). In epidemiological studies, polyaromatic hydrocarbons (PAHs) and organophosphate insecticides are associated with asthma, and phthalates, per- and polyfluoroalkyl substances (PFASs), pyrethroid insecticides, mercury, cadmium, arsenic and lead are only potentially associated with asthma. As a conclusion, exposure to PAHs and some pesticides are associated with increased risk of asthma. Diisocyanates and Cr(VI) cause asthma with specific sensitization. For many environmental chemicals, current studies have provided contradicting results in relation to increased risk of asthma. Therefore, more research about exposure to environmental chemicals and risk of asthma is needed.			В

分野 著者 タイトル 発行年 書誌情報 要旨 (原文) No. (参考) ペルフルオロオクタン酸(PFOA)およびペルフルオロオクタンスルホン酸(PFOS)をはじめ は、化学的に安定であり、はっ水剤や難燃剤として広く使用されてきた。一方で、PFCsは環境 湖沼, 土壌のみならずヒトや野生動物からも検出されている. PFCs製造工場の退職者の追跡調 ≤ト(免│川畑 公平(城西大│環境・衛生 有機フッ素系化合物PFOAはヒトの抗体産 ファルマシア(0014-8601)50巻10号 Page1028(2014.10), doi: 2014 10.14894/faruawpsj.50.10_1028 D935 の血清中濃度半減期はそれぞれ約3.8年および5.4年と推定されており,長期残留による毒性 疫毒性) 学 薬学部) 生を抑制する に基づいて,その研究成果を紹介するものである. 1) Olsen G. W. et al., Environ. Health Perspect., 115, 1298-1305 (2007). 2) DeWitt J. C. et al 3) Grandjean P. et al., JAMA, 307, 391-397 (2012). 4) Looker C. et al., Toxicol. Sci., 138, 76-BACKGROUND: Although an alteration in sex hormones has been linked to perfluoroalkyl su women and girls, whether such associations exist in postmenopausal women remains uncer associations between serum PFAS concentrations and sex hormone levels in postmenopaus National Health and Nutrition Examination Survey (NHANES) 2013-2016 waves were used. with information on serum PFAS [perfluorohexane sulfonic acid (PFHxS), pefluorodecanoic (PFNA); linear perfluorooctanoate (n-PFOA); linear perfluorooctane sulfonate (n-PFOS); mo (Sm-PFOS)], sex hormones indicators [e.g., total testosterone (TT), estradiol (E(2)) and sex well as selected covariates were included. An indicator of circulating free testosterone (FT), Wang, Yuqing; generated. Multiple linear regression accounting for the primary sampling unit, strata, and er Aimuzi, PFAS was used for association analyses. Effect modification by obesity and type of menopal 2021 Environ Int. 2021 Apr;149:106408. doi: - ト (内 Ruxianguli; Nian, Perfluoroalkyl substances and sex hormones in analyses as well as the testing of interaction terms. Principal component analysis (PCA) and D936 分泌系) Min: Zhang, Yu: postmenopausal women: NHANES 2013-2016 10.1016/j.envint.2021.106408. Epub 2021 Feb 3. (BKMR) were conducted to assess these relationships in a multiple PFAS exposure setting. Luo, Kai; Zhang, confounders, total perfluorooctanoate (TPFOA: n-PFOA + Sb-PFOA) and total perfluoroocta PFOS), and their linear and branched isomers were positively associated with two androgen Jun results revealed that the principal component (PC) composed of n-PFOA was positively asso confidential interval (CI): 0.02, 0.16; per In-ng/mL increase in exposure, and In (FT) ($\beta = 0$. overweight/obese [body mass index (BMI) $\ge 25 \text{ kg/m}(2)$] women, but not in those with BMI overweight/obese women, PFHxS was positively associated with androgens and negatively 0.12, -0.01). The PC composed of Sm-PFOS, n-PFOS, and PFHxS was positively associated overweight/obese women. Results from BKMR also confirmed the findings on n-PFOA and F indicates that n-PFOA and PFHxS were positively associated with levels of several androger women, particularly among overweight/obese ones. Given the higher risk of cardiometabolic BACKGROUND: There is increasing global concern regarding the health impacts of perfluorc (PFAS), which are emerging environmental endocrine disruptors. Results from previous epid Xie, Xin; Weng, associations between PFAS exposure and sex hormone levels are inconsistent. OBJECTIVE: Xueqiong; Liu, between serum PFAS compounds (PFDeA, PFHxS, PFNA, PFOA, PFOS) and sex hormones, Shan; Chen, testosterone (FT), estrogen (E), and serum hormone binding globulin (SHBG). RESULTS: Aft Jingmin; Guo, PFDeA, PFOS, and PFHxS exposures were significantly associated with increased serum tes Perfluoroalkyl and Polyfluoroalkyl substance exposure 2021 Environ Sci Eur. 2021;33(1):69. doi: 10.1186/s12302-021-00508-9. Epub 2021 Jun 6. ヒト (内 Xinrong; Gao, D937 and association with sex hormone concentrations: PFDeA, PFOA, and PFOS exposures were positively correlated with FT levels in 20-49 years 分泌系) Xinyu; Fei, Results from the NHANES 2015-2016 negatively associated with TT levels in 12-19 years old girls. PFAS exposure was negatively Qiaoyuan; Hao, including: PFDeA in all females, PFHxS, PFNA, PFOS, and PFOA in 12-19 years old girls, PF Guang; Jing, PFOA in 12-19 years old boys while PFDeA and PFOS exposures were positively associated Chunxia; Feng, PFOS exposure was positively associated with SHBG levels in men older than 20 and in all f Liping cohort of males and females aged from 12-80, we found that PFAS exposure appears to disr and compound-specific manner. Future work is warranted to clarify the causality and mecha

	備考	出	ン 文 ク 献 ① ラ	ン 文 ク 献 ② ラ
とする有機フッ素系化合物 (PFCs) 中では分解されにくく,近年では河川や 査により,ヒトにおけるPFOA・PFOS が懸念される.なお,本稿は下記の文献 I., Toxicol. Pathol., 40, 300-311 (2012). 88 (2014).			В	
bstances (PFAS) in premenopausal tain. OBJECTS: To examine the cal women. METHODS: Data from the A total of 706 postmenopausal women acid (PFDA); perfluorononanoic acid nomethyl branched isomers of PFOS hormone binding globulin (SHBG)] as and ratio of TT to E(2) (TT/E(2)) were nvironmental sampling weights of use was explored via stratified I Bayesian kernel machine regression RESULTS: After adjusting for potential ne sulfonate (TPFOS: n-PFOS + Sm- indicators (i.e., TT and FT). PCA bociated with In (TT) [β = 0.09, 95% .12, 95% CI: 0.05, 0.2) in < 25 kg/m(2). Additionally, among with In (SHBG) (β = -0.06, 95% CI: - with In (TT) levels among PFHxS. CONCLUSIONS: Our study n indicators in postmenopausal diseases associated with elevated			В	В
palkyl and polyfluoroalkyl substances emiological studies on the We examined the associations including total testosterone (TT), free ter adjusting for potential confounders, stosterone concentrations in males. old women while PFOS exposure was associated with estradiol levels NA in women above 50 years old, and with estradiol levels in these boys. n- emales. CONCLUSIONS: Using a large rupt sex hormones in a gender-, age-, misms involved.			В	В

別添-2 文献データベース文献リスト

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン文ン文 ク献 りず ②う
D938	ヒト(内 分泌系)	Sarzo, Blanca; Ballesteros, Virginia; Iñiguez, Carmen; Manzano- Salgado, Cyntia B; Casas, Maribel; Llop, Sabrina; Murcia, Mario; Guxens, Mònica; Vrijheid, Martine; Marina, Loreto Santa; Schettgen, Thomas; Espada, Mercedes; Irizar, Amaia; Fernandez- Jimenez, Nora; Ballester, Ferran; Lopez-Espinosa, Maria-Jose	Maternal Perfluoroalkyl Substances, Thyroid Hormones, and DIO Genes: A Spanish Cross-sectional Study	2021	Environ Sci Technol. 2021 Jul 27. doi: 10.1021/acs.est.1c01452. Online ahead of print.	Results of studies on perfluoroalkyl substances (PFASs) and thyroid hormones (THs) are heterogeneous, and the mechanisms underlying the action of PFASs to target THs have not been fully characterized. We examined the relation between first-trimester maternal PFAS and TH levels and the role played by polymorphisms in the iodothyronine deiodinase 1 (DIO1) and 2 (DIO2) genes in this association. Our sample comprised 919 pregnant Spanish women (recruitment = 2003-2008) with measurements of perfluorohexanesulfonic acid (PFHXS), perfluoroctanoic acid (PFOA), perfluoroncansulfonic acid (PFAS), perfluoroncanoic acid (PFNA), thyroid-stimulating hormone (TSH), total triiodothyronine (TT3), and free thyroxine (FT4), and we genotyped for single-nucleotide polymorphisms in the DIO1 (rs2235544) and DIO2 (rs12885300) genes. We performed multivariate regression analyses between PFASs and THs and included the interaction term PFAS-genotypes in the models. PFHxS was associated with an increase in TSH (% change in outcome [95% CI] per 2-fold PFAS increase = 6.09 [-0.71, 13.4]), and PFOA and PFNA were associated with a decrease in TT3 (-7.17 [-13.5, -0.39] and -6.28 [-12.3, 0.12], respectively). We found stronger associations between PFOA, PFNA, and TT3 for DIO1-CC and DIO2-CT genotypes, although interaction p-values were not significant. In conclusion, this study found evidence of an inverse association between PFOA and TT3 levels. No clear effect modification by DIO enzyme genes was observed.		1	A A
D939	ヒト(内 分泌系)	Li, Juan; Cao, Huiming; Feng, Hongru; Xue, Qiao; Zhang, Aiqian; Fu, Jianjie	Evaluation of the Estrogenic/Antiestrogenic Activities of Perfluoroalkyl Substances and Their Interactions with the Human Estrogen Receptor by Combining In Vitro Assays and In Silico Modeling	2020	Environ Sci Technol. 2020 Nov 17;54(22):14514-14524. doi: 10.1021/acs.est.0c03468. Epub 2020 Oct 28.	The potential estrogenic activities of perfluoroalkyl substances (PFASs) are controversial. Here, we investigated the estrogenic/antiestrogenic activities of PFASs and explored the corresponding interaction mode of PFASs with the estrogen receptor (ER) by combining in vitro assays and in silico modeling. We found that three PFASs (perfluorobutanoic acid, perfluorobutane sulfonate, and perfluoropentanoic acid) exerted antiestrogenic effects by inhibiting luciferase activity, whereas perfluorohexane sulfonate (PFHxS) and perfluorocatane sulfonate (PFOS) exerted estrogenic effects by inducing luciferase activity; unexpectedly, each PFAS could further attenuate the luciferase activity generated by the cotreatment with ICI 182,780 and E2, with a minimal effective concentration comparable to that found in human serum. PFHxS and PFOS significantly induced the gene expression of TFF1; additionally, all PFASs inhibited the E2-induced gene expression of TFF1 and EGR3. Furthermore, the results of the blind docking analyses suggested that the interaction with the coactivator-binding region on the ER surface should be included as a pathway through which PFASs exert estrogenic and antiestrogenic activities. Finally, we revealed the critical molecular property of the zero-order molecular connectivity index (MCI) ((0) χ) that affects the antiestrogenic activity of PFASs.			ВВ
D940	ヒト(内 分泌系)	van Gerwen, Maaike; Alpert, Naomi; Alsen, Mathilda; Ziadkhanpour, Kimia; Taioli, Emanuela; Genden, Eric	The Impact of Smoking on the Association between Perfluoroalkyl Acids (PFAS) and Thyroid Hormones: A National Health and Nutrition Examination Survey Analysis	2020	Toxics. 2020 Dec 9;8(4):116. doi: 10.3390/toxics8040116.	Perfluoroalkyl acids (PFAS) are known endocrine disrupting chemicals, potentially affecting thyroid function. Smoking has been associated with PFAS levels as well as with thyroid function. The impact of smoking on the association between PFAS and thyroid function remains to be elucidated, so the objective was to assess the effect of PFAS exposure on thyroid function in the general population, stratified by smoking status, using the National Health and Nutrition Examination Survey (NHANES). NHANES adult participants who were part of the 2011-2012 laboratory subsample and had PFAS and thyroid function measured were included (n = 1325). Adjusted linear regression models and stratified analyses were performed. There was a significant positive association between perfluorooctanesulfonic acid (PFOS) ($p = 0.003$), perfluorononanoic acid (PFNA) ($p = 0.014$), total PFAS ($p = 0.004$) concentrations and free T4 (FT4). No significant associations were found between perfluorooctanoic acid (PFOA), PFOS, perfluorohexane sulfonate (PFHxS), PFNA, total PFAS and total T4 (TT4) or thyroid stimulating hormone (TSH). In non-smokers, a significant positive association was found between PFOS ($p = 0.003$), PFHxS ($p = 0.034$), PFNA ($p = 0.012$), total PFAS ($p = 0.003$) and FT4 while no significant associations were found in smokers. The present study showed that increased PFAS exposure was associated with increased FT4 in non-smokers, while no association was found in smokers. These results confirm that smoking modifies the association between PFAS exposure and thyroid function.			ВВ

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨 (原文)	備考	出 情 対 報 象 抽	ン文 ク献 ① ラ ② ラ
D941	ヒト(内 分泌系)	Gallo, Elisa; Barbiellini Amidei, Claudio; Barbieri, Giulia; Fabricio, Aline S C; Gion, Massimo; Pitter, Gisella; Daprà, Francesca; Russo, Francesca; Gregori, Dario; Fletcher, Tony; Canova, Cristina	Perfluoroalkyl substances and thyroid stimulating hormone levels in a highly exposed population in the Veneto Region	2022	Environ Res. 2022 Jan;203:111794. doi: 10.1016/j.envres.2021.111794. Epub 2021 Aug 3.	BACKGROUND: Per- and poly-fluoroalkyl substances (PFAS) are persistent and widespread environmental pollutants. People living in Veneto Region (Italy) have been exposed from the late 1970s to 2013 to elevated concentrations of PFAS through drinking water. The effect of PFAS on thyroid function is still controversial and studies focusing on thyroid stimulating hormone (TSH) have shown inconsistent results. The aim of this study was to evaluate the association between serum PFAS and TSH levels and its dose-response relationship in a large population of highly exposed individuals. METHODS: A cross-sectional study was conducted on 21,424 individuals aged 14-39 living in the contaminated area. In the main analysis, participants with prevalent thyroid disease and pregnant women were excluded. Serum levels of perfluorooctanoic acid (PFOA), perfluorooctanesulfonic acid (PFOS), perfluorohexanesulfonic acid (PFHxS) and perfluorononanoic acid (PFNA) were measured. Generalized Additive Models were used to evaluate the association between TSH levels and serum PFAS, using thin plate spline smooth terms to model the potential non-linear relationship. Models were stratified by sex and age group and adjusted for potential confounders. A secondary analysis was conducted to evaluate the association between PFAS with prevalent self-reported thyroid disorders. RESULTS: We found no association between TSH and any type of PFAS among adolescents or women. A decrease in TSH concentration was observed in association with an IQR increase in PFHxS and a mild decrease in TSH at low levels of PFOA, PFOS and PFHxS among male adults. Self-reported thyroid disease was more common among women with higher levels of PFNA concentrations, whereas all other PFAS were not associated with thyroid diseases regardless of sex or age. CONCLUSIONS: Overall there is no evidence of an association between TSH and PFAS. However, some results are suggestive of a possible inverse association of TSH with PFOA, PFOS and PFHxS among adult males.			ВВ
D942	ヒト(内 分泌系)	Tian, Youping; Luan, Min; Zhang, Junguo; Yang, Haifeng; Wang, Yuting; Chen, Huimin	Associations of single and multiple perfluoroalkyl substances exposure with folate among adolescents in NHANES 2007-2010	2022	Chemosphere. 2022 Nov;307(Pt 3):135995. doi: 10.1016/j.chemosphere.2022.135995. Epub 2022 Aug 15.	BACKGROUND: The accumulation of perfluoroalkyl substances (PFAS) in human body has raised concerns about the potential health impacts on children and adolescents. However, no study has evaluated the associations of PFAS exposure with folate concentrations among adolescents. METHODS: In the present study, we mainly used three statistical approaches, namely multiple linear regression, Bayesian Kernel Machine Regression (BKMR), and quantile-based g-computation (Q-gcomp) models, to evaluate associations of individual PFAS and their mixtures with serum and red blood cell (RBC) folate concentrations in a sample of 721 adolescents from the NHANES 2007-2010. RESULTS: In multiple linear regression models, for per unit increase in Intransformed perfluorooctane sulfonate (PFOS), perfluorocancic acid (PFOA), and perfluorononancic acid (PFDA) concentrations, RBC folate concentrations decreased by 72.4 (95% confidence interval (CI): -112.7, -32.2), 58.3 (95% CI: -115.0, -1.6), 60.7 (95% CI: -107.5, -13.8), and 76.5 (95% CI: -119.0, -33.9) nmol/L, respectively. A similar significant inverse association was also observed between In-transformed PFDA and serum folate. BKMR models further confirmed inverse associations of serum PFOS and PFDA with RBC folate, and serum PFDA with serum folate. However, the inverse associations of PFOA and PFNA with RBC folate shown in multiple linear regression model were not observed or less evident in BKMR analyses. We observed interactions of PFOA with PFOS, PFNA, and PFDA on RBC folate in BKMR models, with the negative slopes for PFOS, PFNA, and PFDA increased when PFOA concentration increased from the 10th percentile to the 90th percentile. Both BKMR and Q-gcomp models suggested that the mixtures of five PFAS showed inverse overall associations with RBC folate concentration. CONCLUSIONS: The present study revealed that adolescent exposure to PFAS might affect serum and RBC folate concentrations.			ВВ
D943	ヒト(内 分泌系)	Li, Qing-Qing; Liu, Jiao-Jiao; Su, Fan; Zhang, Yun- Ting; Wu, Lu-Yin; Chu, Chu; Zhou, Yuanzhong; Shen, Xubo; Xiong, Shimin; Geiger, Sarah Dee; Qian, Zhengmin Min; McMillin, Stephen Edward; Dong, Guang- Hui; Zeng, Xiao- Wen	Chlorinated Polyfluorinated Ether Sulfonates and Thyroid Hormone Levels in Adults: Isomers of C8 Health Project in China	2022	Environ Sci Technol. 2022 May 17;56(10):6152-6161. doi: 10.1021/acs.est.1c03757. Epub 2022 Apr 5.	Chlorinated polyfluorinated ether sulfonates (CI-PFESAs) are one kind of replacement chemistry for perfluorooctanesulfonate (PFOS). Recent studies have shown that CI-PFESAs could interfere with thyroid function in animal models. However, epidemiological evidence on the link between CI-PFESAs and thyroid function remains scarce. In this study, we focused on two representative legacy perfluoroalkyl substances (PFAS), including PFOS and perfluorooctanoic acid (PFOA), and two PFOS alternatives (6:2 and 8:2 CI-PFESAs) in the general adult population from a cross-sectional study, the "Isomers of C8 Health Project in China". Three serum thyroid hormones (THs), thyroid stimulating hormone (TSH), free triiodothyronine (FT3), and free thyroxine (FT4), were measured. We fitted generalized linear regression, restricted cubic spline regression, and Bayesian kernel machine regression models to assess associations of individual CI-PFESAs, legacy PFAS, and PFAS mixtures with THs, respectively. We found individual PFAS and their mixtures were nonlinearly associated with THs. The estimated changes of the TSH level (µ IU/mL) at the 95th percentile of 6:2 CI-PFESA and PFOS against the 5th percentile were -0.74 (95% CI: -0.94, -0.54) and -1.18 (95% CI: -1.37, -0.98), respectively. The present study provided epidemiological evidence for the association of 6:2 CI-PFESA with thyroid hormone levels in the general adult population.			ССС

No.	分野 (参考)	著者	タイトル	発行年書誌情報	要旨 (原文)	備考	出 情 対 報 象 抽	ン 文 献 ① ラ	ン 文 ク 献 ② ラ
D944	ヒト (内 分泌系)	Ding, Ning; Harlow, Siobán D; Randolph, John F; Mukherjee, Bhramar; Batterman, Stuart; Gold, Ellen B; Park, Sung Kyun	Perfluoroalkyl Substances and Incident Natural Menopause in Midlife Women: The Mediating Role of Sex Hormones	Am J Epidemiol. 2022 Jun 27;191(7):1212-1223. doi: 10.1093/aje/kwac052.	Perfluoroalkyl and polyfluoroalkyl substances (PFAS) have been associated with earlier natural menopause; however, the underlying mechanisms are not well understood, particularly the extent to which this relationship is mediated by sex hormones. We analyzed data (1999-2017) on 1,120 premenopausal women from the Study of Women's Health Across the Nation (SWAN). Causal mediation analysis was applied to quantify the degree to which follicle-stimulating hormone (FSH) and estradiol levels could mediate the associations between PFAS and incident natural menopause. Participants with higher PFAS concentrations had shorter times to natural menopause, with a relative survival of 0.82 (95% confidence interval (CI): 0.69, 0.96) for linear perfluorooctane sulfonate (n-PFOS), 0.84 (95% CI: 0.69, 1.00) for sum of branched-chain perfluorooctane sulfonate (Sm-PFOS), 0.79 (95% CI: 0.66, 0.93) for linear-chain perfluorooctanoate (n-PFOA), and 0.84 (95% CI: 0.71, 0.97) for perfluorononanoate (PFNA), comparing the highest tertile of PFAS concentrations with the lowest. The proportion of the effect mediated through FSH was 8.5% (95% CI: -11.7, 24.0) for n-PFOS, 13.2% (95% CI: 0.0, 24.5) for Sm-PFOS, 26.9% (95% CI: 15.6, 38.4) for n-PFOA, and 21.7% (6.8, 37.0) for PFNA. No significant mediation by estradiol was observed. The effect of PFAS on natural menopause may be partially explained by variations in FSH concentrations.			С	С
D945	ヒト(内 分泌系)	Li, Ying; Xu, Yiyi; Fletcher, Tony; Scott, Kristin; Nielsen, Christel; Pineda, Daniela; Lindh, Christian H; Olsson, Daniel S; Andersson, Eva M; Jakobsson, Kristina	Associations between perfluoroalkyl substances and thyroid hormones after high exposure through drinking water	2021 Environ Res. 2021 Mar;194:110647. doi: 10.1016/j.envres.2020.110647. Epub 2020 Dec 29.	BACKGROUND: The reported associations for several per- and polyfluoroalkyl substance (PFAS) with thyroid hormones are inconsistent in epidemiological studies. The purpose of the current study was to investigate the possible association of thyroid hormones in relation to serum levels of perfluorohexane sulfonate, perfluorooctane sulfonate and perfluorooctanoic acid, in a Swedish general population, highly exposed through contaminated drinking water, and if the associations with PFAS remained in a comparison to a reference group based only on residency in areas with contrasting PFAS levels. METHOD: 3297 participants from Ronneby, a municipality with drinking water highly contaminated by PFAS (exposed group), and a reference group (N = 226) from a nearby municipality with non-contaminated drinking water supply were included. Regression analysis was used to investigate the associations between PFAS exposure, assessed as exposure groups (Ronneby and reference groups) and measured serum PFAS levels, and thyroid hormone levels, with adjustments for age, sex and BMI. RESULT: No cross-sectional associations were found between PFAS and thyroid hormones in adults and seniors except for a positive association between PFAS and fT4 in males over 50. Higher thyroid hormone levels were found in the preteen children from Ronneby compared to the reference group. In contrast, within Ronneby, there was weak evidence of associations between increased PFAS levels and decreased fT3 in preteen boys, and decreased TSH in teenage males. No such pattern was found in preteen and teenage girls. CONCLUSION: The present study found no consistent evidence to support association of PFAS with thyroid hormones.			В	В
D946	ヒト(内 分泌系)	Carwile, Jenny L; Seshasayee, Shravanthi M; Aris, Izzuddin M; Rifas-Shiman, Sheryl L; Claus Henn, Birgit; Calafat, Antonia M; Sagiv, Sharon K; Oken, Emily; Fleisch, Abby F	Prospective associations of mid-childhood plasma per- and polyfluoroalkyl substances and pubertal timing	2021 10.1016/j.envint.2021.106729. Epub 2021 Jun 23.	BACKGROUND: Exposure to per- and polyfluoroalkyl substances (PFAS) may disrupt pubertal timing. Higher PFAS plasma concentrations have been associated with later pubertal timing in girls, but cross-sectional findings may be explained by reverse causation. OBJECTIVES: To assess prospective associations between PFAS plasma concentrations in mid-childhood and markers of pubertal timing in male and female adolescents. METHODS: We studied 640 children in Project Viva, a Boston-area prospective cohort. We examined associations of plasma concentrations of 6 PFAS measured at mean 7.9 (SD 0.8) years (2007-2010) with markers of pubertal timing. Parents reported a 5-item pubertal development score at early adolescence (mean 13.1 (SD 0.8) years) and reported age at menarche annually. We calculated age at peak height velocity using research and clinical measures of height. We used sex-specific linear and Cox proportional hazards regression to estimate associations of single PFAS with outcomes, and we used Bayesian Kernel Machine Regression (BKMR) to estimate associations of the PFAS mixture with outcomes. RESULTS: Plasma concentrations were highest for perfluorooctane sulfonate (PFOS) [median (IQR) 6.4(5.6) ng/mL], followed by perfluoroctanoate (PFOA) [4.4(3.0) ng/mL]. In early adolescence, girls were further along in puberty than boys [pubertal development score mean (SD) 2.9 (0.7) for girls and 2.2(0.7) for boys; age at peak height velocity mean (SD) 11.2y (1.0) for girls and 13.1y (1.0) for boys]. PFAS was associated with later markers of pubertal timing in girls only. For example, each doubling of PFOA was associated with lower pubertal development score (-0.18 units; 95% CI: -0.30, -0.06) and older age at peak height velocity (0.23 years; 95% CI: 0.06, 0.40)]. We observed similar associations for PFOS, perfluorodecanoate (PFDA), and the PFAS mixture. PFAS plasma concentrations were not associated with age at menarche or markers of pubertal timing in boys. DISCUSSION: Higher PFAS plasma concentrations in mid-childhood w			В	В
D947	ヒト(内 分泌系)	Liu, Mei; Zhang, Gaoxin; Meng, Lingling; Han, Xu; Li, Yingming; Shi, Yali; Li, An; Turyk, Mary E; Zhang, Qinghua; Jiang, Guibin	Associations between Novel and Legacy Per- and Polyfluoroalkyl Substances in Human Serum and Thyroid Cancer: A Case and Healthy Population in Shandong Province, East China	2022 Environ Sci Technol. 2022 May 17;56(10):6144-6151. doi: 10.1021/acs.est.1c02850. Epub 2021 Oct 7.	Per- and polyfluoroalkyl substances (PFASs) are widely detected in the environment and may cause adverse human health effects after exposure. Studies on the effect of PFASs on some health end points, including cancer, are still limited and show inconsistent results. In this research, 319 participants were recruited from Shandong Province, East China, consisting of patients with thyroid cancer and healthy controls. Seven novel and legacy PFASs were frequently detected (detection rate > 75%) in the serum samples of the participants. The concentrations of perfluorooctanoic acid (PFOA) were the highest in the case and control groups. Males showed significantly higher concentrations of PFASs than females. Exposure to PFASs was inversely associated with the risk of thyroid cancer. In the control group, we identified significant positive associations between PFASs and free thyroxine (FT4) as well as between PFOA and thyroid stimulating hormone (TSH) in females. A significant negative association between perfluorononanoic acid (PFNA) and triiodothyronine (T3) was observed in males. Our results suggest that exposure to certain PFASs could interfere with thyroid function. To our knowledge, this is the first case-control study demonstrating associations between prove and legacy PFASs in human and thyroid cancer.			В	С

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン 文 ク 献 ① ラ	ン 文 ク 献 ② う
D948	ヒト(内 分泌系)	Luo, Dan; Wu, Weixiang; Pan, Yanan; Du, Bibai; Shen, Mingjie; Zeng, Lixi	Associations of Prenatal Exposure to Per- and Polyfluoroalkyl Substances with the Neonatal Birth Size and Hormones in the Growth Hormone/Insulin- Like Growth Factor Axis	2021	Environ Sci Technol. 2021 Sep 7;55(17):11859-11873. doi: 10.1021/acs.est.1c02670. Epub 2021 Aug 11.	Toxicological data suggest a significant developmental toxicity of per- and polyfluoroalkyl substances (PFASs); however, evidence in humans remains inconclusive. Furthermore, the effects of prenatal exposure to PFASs on hormones in the growth hormone (GH)/insulin-like growth factor (IGF) axis of newborns remain largely unclear. We aimed to investigate the associations of prenatal exposure to PFASs with the neonatal birth size, GH, IGF-1, and IGF-binding protein 3 (IGFBP-3). The concentrations of 22 PFASs were measured in the plasma of 224 pregnant women collected within 3 days before delivery (39.3 weeks) in Guangzhou, China, and the anthropometric data were gathered from medical records. Paired cord blood was collected at delivery to determine GH, IGF-1, and IGFBP-3 levels. Multivariable linear regression models revealed the inverse associations of several long-chain PFASs with birth weight and ponderal index as well as the significant associations of perfluorobutanoic acid and perfluorooctanoic acid (PFOA) with IGFBP-3 levels. The Bayesian kernel machine regression confirmed the association of perfluorooctane sulfonate with birth weight and ponderal index and of PFOA with IGFBP-3 and identified an inverse joint effect of exposure to a mixture of multiple PFASs on birth weight. The findings provide the first comprehensive evidence on the individual and joint effects of multiple PFASs on the neonatal birth size and hormones in the GH/IGF axis, which requires further confirmation.			В	В
D949	ヒト(内 分泌系)	Alam, Md Nur; Han, Xuejingping; Nan, Bingru; Liu, Liangpo; Tian, Meiping; Shen, Heqing; Huang, Qingyu	Chronic low-level perfluorooctane sulfonate (PFOS) exposure promotes testicular steroidogenesis through enhanced histone acetylation	2021	Environ Pollut. 2021 Sep 1;284:117518. doi: 10.1016/j.envpol.2021.117518. Epub 2021 Jun 4.	Perfluorooctane sulfonate (PFOS), an artificial perfluorinated compound, has been associated with male reproductive disorders. Histone modifications are important epigenetic mediators; however, the impact of PFOS exposure on testicular steroidogenesis through histone modification regulations remains to be elucidated. In this study, we examined the roles of histone modifications in regulating steroid hormone production in male rats chronically exposed to low-level PFOS. The results indicate that PFOS exposure significantly up-regulated the expressions of StAR, CYP11A1 and 3β -HSD, while CYP17A1 and 17β -HSD were down- regulated, thus contributing to the elevated progesterone and testosterone levels. Furthermore, PFOS significantly increased the histones H3K9me2, H3K9ac and H3K18ac while reduced H3K9me3 in rat testis. It is known that histone modifications are closely involved in gene transcription. Therefore, to investigate the association between histone modifications and steroidogenic gene regulation, the levels of these histone marks were further measured in steroidogenic gene promoter regions by ChIP. It was found that H3K18ac was augmented in Cyp11a1 promoter, and H3K9ac was increased in Hsd3b after PFOS exposure, which is proposed to result in the activation of CYP11A1 and 3β -HSD, respectively. To sum up, chronic low-level PFOS exposure activated key steroidogenic gene expression through enhancing histone acetylation (H3K9ac and H3K18ac), ultimately stimulating steroid hormone biosynthesis in rat testis.			С	В
D950	ヒト(内 分泌系)	Carwile, Jenny L; Seshasayee, Shravanthi M; Ahrens, Katherine A; Hauser, Russ; Driban, Jeffrey B; Rosen, Clifford J; Gordon, Catherine M; Fleisch, Abby F	Serum PFAS and Urinary Phthalate Biomarker Concentrations and Bone Mineral Density in 12-19 Year Olds: 2011-2016 NHANES	2022	J Clin Endocrinol Metab. 2022 Jul 14;107(8):e3343-e3352. doi: 10.1210/clinem/dgac228.	CONTEXT: Per- and polyfluoroalkyl substances (PFAS) and phthalates are 2 families of environmental endocrine disruptors that may be associated with areal lower bone mineral density (aBMD). OBJECTIVE: To examine associations between serum PFAS and urinary phthalate biomarker concentrations and their mixtures with aBMD Z-scores in adolescents. DESIGN, PATIENTS, AND MEASURES: We examined serial cross-sectional data from male (n = 453) and female (n = 395) 12- to 19-year-old participants in the 2011 through 2016 National Health and Nutrition Examination Survey with measures of serum PFAS, urinary phthalate metabolites, and dual-energy X-ray absorptiometry aBMD Z-scores (total body less head). In sex-specific models, we used linear regression to examine associations of individual PFAS and phthalate biomarkers with aBMD Z-scores, and Bayesian kernel machine regression to examine the association of the overall PFAS/phthalate biomarker mixture with aBMD Z-scores. We replicated the analysis, stratifying by race/ethnicity. RESULTS: Participants were (mean \pm SD) 15 \pm 2.1 years of age. In males, each doubling of serum perfluorooctanoate (PFOA), perfluorooctane sulfonate, urinary mono-isobutyl phthalate (MiBP), mono-n- butyl phthalate, and the overall PFAS/phthalate mixture was associated with a lower aBMD Z-scores (eg, for PFOA: -0.24; 95% CI, -0.41 to -0.06). Serum PFOA and urinary MiBP were associated with higher aBMD Z-scores in females (eg, for PFOA: 0.09; 95% CI, -0.07 to 0.25). Findings did not differ by race/ethnicity. CONCLUSIONS: Certain PFAS and phthalates may be associated with reduced bone mineral density in adolescent males. Bone mineral density tracks across the life course, so if replicated in longitudinal cohorts, this finding may have implications for lifelong skeletal health.			В	В

分野 タイトル 発行年 書誌情報 要旨 (原文) No 著者 (参考) BACKGROUND: Previous epidemiological studies on the relationship between per- and poly exposure and male reproductive hormones were mainly limited to a few legacy PFAS and igr OBJECTIVES: To assess the associations of PFAS mixture, branched isomers and emerging reproductive hormones. METHODS: A total of 902 men (mean age: 31.3 years) were recruite quantified 24 targeted PFAS, including 7 branched PFOS isomers, 2 branched PFOA isomers plasma. Five reproductive hormones, including total testosterone (TT), estradiol (E(2)), follic luteinizing hormone (LH) and insulin like factor 3 (INSL3), and sex hormone binding globulin Luo, Kai; Liu, Xiaotu; Nian, Associations were first assessed by confounder-adjusted multiple linear regression while co Min: Wang. Bavesian kernel machine regression (BKMR) and adaptive elastic net (AENET) were further ヒト (内 Environ Int. 2021 Jul;152:106496. doi: Environmental exposure to per- and polyfluoroalkyl D951 Yuqing; Qiu, Jin; 2021 the adjusted exposure response (ER) relationship of individual PFAS. RESULTS: After adjust 分泌系) 10.1016/j.envint.2021.106496. Epub 2021 Mar 18. substances mixture and male reproductive hormones Yu, Hao; Chen, PFAS mixture was significantly and inversely associated with E(2) and E(2)/TT, with perfluo Xiangfeng; the major contributor. Although the associations between PFAS mixture and other hormone Zhang, Jun ndividual PFAS presented significant associations. Notably, perfluoro-n-tridecanoic acid (Pl acid (PFDoA) were found to be significantly and inversely associated with INSL3, a unique i Meanwhile, significant positive associations were found between perfluorobutane sulfonic a PFuDA and LH. But the associations with branched isomers or F-53B were sporadic and inc findings provided the evidence that PFAS mixture may reduce E(2) level, and certain PFAS (negative effects on Leydig cells function among young men. Additional studies are much ne elucidate potential mechanisms. OBJECTIVES: To investigate the association of exposure to per- and polyfluoroalkyl substan Derakhshan with markers of the maternal thyroid system. METHODS: Serum concentrations of seven PF Arash; normone (TSH), free and total thyroxine (FT4 and TT4), free and total triiodothyronine (FT3 women in early pregnancy in the Swedish Environmental Longitudinal, Mother and child, Ast Kortenkamp Andreas; Shu, Outcomes were concentrations of TSH and thyroid hormones, FT4/FT3 or TT4/TT3 ratios, T negative feedback loop, TT4/FT4 or TT3/FT3 ratios as markers of the binding of thyroid hor Huan; Broeren Maarten A C; The study population comprised 2,008 women with median (95% range) gestational age of 1 Lindh, Christian association between PFAS and TSH. Higher PFNA, PFDA, PFHpA and PFOA levels were ass Association of per- and polyfluoroalkyl substances ヒト (内 Environ Int. 2022 Sep;167:107420. doi: D952 H; Peeters, with thyroid homeostasis during pregnancy in the effect estimate for PFDA: β [95% CI]: 0.27 [0.10 to 0.45], P = 0.002). Higher PFUnDA levels. 分泌系) 10.1016/j.envint.2022.107420. Epub 2022 Jul 16. Robin P: SELMA study with a lower FT3 (β [95% CI]: -0.05 [-0.09 to -0.01], P = 0.005). Higher PFUnDA levels were CI]: -1.58 [-3.07 to -0.09]) and there was an inverted U-shaped association of PFOS with TT Bornehag, Carl-Gustaf; PFHpA levels were associated with a lower TT3. Overall, higher PFAS concentrations were a Demeneix and a higher TT4/TT3 ratio. There was no association of PFAS with the TSH/FT4 ratio. High were associated with lower TT4/FT4 and TT3/FT3 ratios. CONCLUSIONS: These findings tr Barbara; Korevaar, Tim I studies suggesting that exposure to PFAS may interfere with the thyroid system during preg should take into account human evidence to better understand the potential underlying mec exposure BACKGROUND: Evidence of associations between prenatal exposure to perfluoroalkyl subst hormones (THs) is controversial, and few studies have estimated the associations, while ad multiple PFASs. We aimed to examine the associations between prenatal PFAS exposure an cord blood. METHODS: A total of 300 mother-infant pairs from the Shanghai-Minhang Birth measured the concentrations of eight PFASs in maternal plasma samples collected at 12-16 Liang, Hong; of total thyroxine (T4), free T4 (FT4), total triiodothyronine (T3), free T3 (FT3), and thyroid s Wang, Ziliang; plasma. We estimated the associations between maternal PFAS concentrations and TH con-Miao, Maohua; and Bayesian kernel machine regression (BKMR) models. RESULTS: In BKMR models, high Environ Health. 2020 Nov 26;19(1):127. doi: 10.1186/s12940-associated with increased T3 concentrations, and there were suggestive associations with i Tian, Youping: Prenatal exposure to perfluoroalkyl substances and トト (内 D953 Zhou, Yan; Wen thyroid hormone concentrations in cord plasma in a 分泌系) 020-00679-7. single-exposure effects in BKMR models, a change in PFDA, PFUdA, and PFOA concentratic Sheng; Chen, Chinese birth cohort was associated with a 0.04 (95%Crl: - 0.01, 0.09), 0.02 (95%Crl: - 0.03, 0.07), and 0.03 (95% Yao: Sun. T3 concentrations, respectively. PFOA, PFNA, and PFDA were the predominant compounds Xiaowei; Yuan, corresponding estimates were 0.11 (95% Crl: 0.02, 0.19), - 0.17 (95% Crl: - 0.28, - 0.07), and Wei respectively. A change in PFNA and PFOA concentrations from the 25th to 75th percentile w \pm 2.98, - 0.41) μ IU/mL decrease and a 1.51 (95% Crl: 0.48, 2.55) μ IU/mL increase in TSH PFOA and PFNA with T3/FT3 were more pronounced in boys, while those with TSH were m Our results suggest that prenatal exposure to multiple PFASs was associated with thyroid h individual PFAS had varied effects-differing in magnitude and direction-on fetal thyroid hori

	備考	出 対 象 抽	ン 文 ク 献 ① ラ	ン 文 ク 献 ② ラ
fluoroalkyl substances (PFAS) nored the possible mixture effects. alternatives of PFAS with male ed in this cross-sectional study. We s and 2 components of F-53B, in blood cular stimulating hormone (FSH), or (SHBG) were measured in serum. orrecting for multiple comparisons. used to assess mixture effects and ting for confounders, we found that ro-n-undecanoic acid (PFuDA) being as were non-significant, certain FTrDA) and perfluoro-n-dodecanoic indicator of Leydig cells function. icid (PFBS) and FSH and between onsistent. CONCLUSIONS: Our i.e., PFTrDA and PFDoA) may have eded to confirm our results and			В	В
ces (PFAS) during early pregnancy AS as well as thyroid stimulating and TT3) were measured in pregnant thma and allergy (SELMA) study. 'SH/FT4 ratio as a marker of the mones to binding proteins. RESULTS: 0 (6-14) weeks. There was no tociated with a higher FT4 (largest , but no other PFAS, were associated e associated with lower TT4 (β [95% '4 (P = 0.03). Higher PFDA, PFUnDA, associated with a higher FT4/FT3 ratio her concentrations of several PFAS anslate results from experimental nancy. Further experimental studies thanisms of thyroid disruption by PFAS			В	A
cances (PFASs) and fetal thyroid dressing the high correlations among id thyroid hormone concentrations in Cohort Study were included. We is gestational weeks, as well as those timulating hormone (TSH) in cord centrations using linear regression er PFAS mixture concentrations were increased FT3 concentrations. For cons from the 25th to 75th percentile Crl: - 0.001, 0.06) nmol/L increase in in PFASs-FT3 associations, and the d 0.12 (95% Crl: - 0.004, 0.24) pmol/L, vas associated with a - 1.69 (95% Crl: concentrations. The associations of ore pronounced in girls. CONCLUSION: ormones in cord blood. However, mones.			В	В

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 対報 ク献 象抽 ① ラ	ン 文 ク 献 ② ラ
D954	ヒト(内 分泌系)	Guo, Jianqiu; Zhang, Jiming; Wang, Zheng; Zhang, Lei; Qi, Xiaojuan; Zhang, Yubin; Chang, Xiuli; Wu, Chunhua; Zhou, Zhijun	Umbilical cord serum perfluoroalkyl substance mixtures in relation to thyroid function of newborns: Findings from Sheyang Mini Birth Cohort Study	2021	Chemosphere. 2021 Jun;273:129664. doi: 10.1016/j.chemosphere.2021.129664. Epub 2021 Jan 18.	BACKGROUND: The epidemiological evidence on the associations between prenatal exposure to perfluoroalkyl substances (PFAS) and thyroid hormones in newborns was inconclusive. OBJECTIVES: We aimed to estimate associations of fetal exposure to PFAS individually and in mixtures with thyroid function of newborns. METHODS: A total of 490 mother-newborn pairs were included from Sheyang Mini Birth Cohort Study (SMBCS), a prospective cohort that recruited between June 2009 and January 2010. 12 PFAS and 7 thyroid function indicators were quantified in umbilical cord serum. We examined associations of prenatal exposure to individual and a mixture of PFAS with thyroid function indicators using multivariable linear regression and weighted quantile sum (WQS) regression models with adjustment for potential confounders, respectively. RESULTS: Higher cord serum concentrations of PFAS mixtures were related to increases in TT4 and FT4 levels, and reductions in TSH concentrations of newborns. Combining single-chemical models with multiple-chemical models, PFOS, PFNA and PFUnDA were associated with increased TT4 levels with contributing to the mixture effects of 46.4%, 22.8%, and 16.7%, respectively. PFOS exposure was in positive association with cord serum FT4 concentrations and contributed 28.9% to the joint effects of mixtures. PFNA and PFHpA were the most important contributors to the decreases of TSH levels of newborns with 46.3% and 45.0% among the mixtures, respectively. CONCLUSIONS: The current findings indicated the thyroid disruption of individual PFAS and their mixtures in cord serum. Additional studies are warranted to explore the underlying biological mechanisms, particularly for PFAS mixtures.		В	A
D955	ヒト(内 分泌系)	Yao, Qian; Gao, Yu; Zhang, Yan; Qin, Kaili; Liew, Zeyan; Tian, Ying	Associations of paternal and maternal per- and polyfluoroalkyl substances exposure with cord serum reproductive hormones, placental steroidogenic enzyme and birth weight	2021	Chemosphere. 2021 Dec;285:131521. doi: 10.1016/j.chemosphere.2021.131521. Epub 2021 Jul 12.	BACKGROUND: Maternal per- and polyfluoroalkyl substances (PFAS) exposure has been associated with placental function and fetal growth measures. However, few studies have simultaneously investigated paternal and maternal exposure effects. OBJECTIVES: We evaluated the associations of paternal or maternal PFAS levels with placental function and fetal growth measures. METHODS: We studied six PFAS measured in matched parental serums collected within 3 days before delivery in a birth cohort from LaiZhouWan, China. Outcomes evaluated include cord serum estradiol (n = 351), testosterone (n = 349), placental P450aromatase (n = 125), and birth weight (n = 369). Multiple linear regression was applied to estimate the associations for these outcomes according to paternal or maternal PFAS level after adjusting for socio-demographic confounders. Co-adjustment analysis of both paternal and maternal PFAS in the same model was performed. RESULTS: Maternal and paternal PFAS levels were correlated (Spearman's r = 0.23-0.45). Maternal PFAS were associated with increased estradiol (e.g., PFOA: β = 0.03, 95%CI: 0.00, 0.07), testosterone (e.g., PFUA: β = 0.14, 95%CI: 0.00, 0.27), and P450aromatase (e.g., PFOA: β = 0.13, 95%CI: 0.04, 0.22). Maternal PFAS were also associated with a lower mean of birth weight but the estimated 95% CI included the null. Paternal PFAS were not associated with any of the outcomes evaluated. CONCLUSIONS: Several maternal PFAS were associated with fetal steroid hormones and placental enzymes. Despite a correlation of PFAS level within the couples, no association was found for paternal PFAS exposure on these outcomes. The findings suggest the intrauterine PFAS exposure effect on fetal endocrine hormones and growth is unlikely to be confounded by exposure sources or familial factors shared within the couples.		В	A
D956	ヒト (内 分泌系)	Criswell, Rachel; Crawford, Kathryn A; Bucinca, Hana; Romano, Megan E	Endocrine-disrupting chemicals and breastfeeding duration: a review	202(Curr Opin Endocrinol Diabetes Obes. 2020 Dec;27(6):388- 395. doi: 10.1097/MED.000000000000577.	PURPOSE OF REVIEW: The purpose of this review is to describe epidemiologic and toxicological literature investigating how endocrine-disrupting chemicals (EDCs) affect mammary gland development and function, thereby impacting lactation duration. RECENT FINDINGS: Perfluoroalkyl and polyfluoroalkyl substances appear to reduce breastfeeding duration through impaired mammary gland development, lactogenesis, and suppressed endocrine signaling. Halogenated aromatic hydrocarbons have differing associations with lactation duration, likely because of the variety of signaling pathways that they affect, pointing to the importance of complex mixtures in epidemiologic studies. Although epidemiologic literature suggests that pesticides and fungicides decrease or have no effect on lactation duration, toxicology literature suggests enhanced mammary gland development through estrogenic and/or antiandrogenic pathways. Toxicological studies suggest that phthalates may affect mammary gland development via estrogenic pathways but no association with lactation duration has been observed. Bisphenol A was associated with decreased duration of breastfeeding, likely through direct and indirect action on estrogenic pathways. SUMMARY: EDCs play a role in mammary gland development, function, and lactogenesis, which can affect breastfeeding duration. Further research should explore direct mechanisms of EDCs on lactation, the significance of toxicant mixtures, and transgenerational effects of EDCs on lactation.		c	С

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン 文 ク 献 ① ラ	ン 文 ク 献 ② ラ
D957	ヒト(内 分泌系)	Ding, Ting; Yan, Wei; Zhou, Ting; Shen, Wei; Wang, Tian; Li, Milu; Zhou, Su; Wu, Meng; Dai, Jun; Huang, Kecheng; Zhang, Jinjin; Chang, Jiang; Wang, Shixuan	Endocrine disrupting chemicals impact on ovarian aging: Evidence from epidemiological and experimental evidence	2022	Environ Pollut. 2022 Jul 15;305:119269. doi: 10.1016/j.envpol.2022.119269. Epub 2022 Apr 8.	Endocrine-disrupting chemicals (EDCs) are ubiquitous in daily life, but their harmful effects on the human body have not been fully explored. Recent studies have shown that EDCs exposure could lead to infertility, menstrual disorder and menopause, resulting in subsequent effects on female health. Therefore, it is of great significance to clarify and summarize the impacts of EDCs on ovarian aging for explaining the etiology of ovarian aging and maintaining female reproductive health. Here in this review, we focused on the impacts of ten typical environmental contaminants on the progression of ovarian aging during adult exposure, including epidemiological data in humans and experimental models in rodents, with their clinical phenotypes and underlying mechanisms. We found that both persistent (polychlorinated biphenyls, perfluoroalkyl and polyfluoroalkyl substances) and non-persistent (phthalates) EDCs exposure could increase an overall risk of ovarian aging, leading to the diminish of ovarian reserve, decline of fertility or fecundity, irregularity of the menstrual cycle and an earlier age at menopause, and/or premature ovarian insufficiency/failure in epidemiological studies. Among these, the loss of follicles can also be validated in experimental studies of some EDCs, such as BPA, phthalates, parabens and PCBs. The underlying mechanisms may involve the impaired ovarian follicular development by altering receptor-mediated pro-apoptotic pathways, inducing signal transduction and cell cycle arrest and epigenetic modification. However, there were inconsistent results in the impacts on fertility/fecundity, menstrual/estrous cycle and hormone changes response to different EDCs, and differences between human and animal studies. Our review summarizes the current state of knowledge on ovarian disrupters, highlights their risks to ovarian aging and identifies knowledge gaps in humans and animals. We therefore propose that females adopt healthy lifestyle changes to minimize their exposure to both persistent and non-persis			С	С
D958	ヒト(内 分泌系)	Yang, Jiaqi; Wang, Hexing; Du, Hongyi; Fang, Hongji; Han, Minghui; Wang, Yuanping; Xu, Linji; Liu, Shuping; Yi, Jianping; Chen, Yue; Jiang, Qingwu; He, Gengsheng	Exposure to perfluoroalkyl substances was associated with estrogen homeostasis in pregnant women	2022	Sci Total Environ. 2022 Jan 20;805:150360. doi: 10.1016/j.scitotenv.2021.150360. Epub 2021 Sep 16.	Previous studies have suggested that perfluoroalkyl substances (PFASs) can act as endocrine disruptors, but few studies have investigated the effects of serum PFASs on estrogen homeostasis during pregnancy. The present study included 557 pregnant women in Tangshan City, North China, and determined 11 serum PFASs in the early term of pregnancy and three typical estrogens (estrone (E(1)), estradiol (E(2)) and estriol (E(3))) in the early (n = 557), middle (n = 339), and late (n = 286) terms of pregnancy. Sociodemographic factors and diet information were obtained by structured questionnaires. After adjusting for potential confounders, multiple linear regression model demonstrated negative associations of natural logarithmic transformed serum perfluoroundecanoic acid (Ln PFUdA) with Ln E(1)and Ln E3 in the early term of pregnancy with β coefficients of -0.060 (95% confidence interval (CI): -0.101 to -0.019) and -0.041 (95% CI: -0.070 to -0.011), respectively. Ln perfluorodecanoic acid (PFDA) was negatively associated with averaged E1 in the early and middle (EM) terms of pregnancy with a β coefficient of -0.205 (95% CI: -0.357 to -0.053). Ln perfluoronanoic acid (PFNA) tended to be negatively associated with E(2) in the late term of pregnancy with a β coefficient of -0.134 (95% CI: -0.253 to -0.016) although p-value was slightly greater than 0.05 after false discovery rate (FDR) correction. Mixed effect model found that serum PFDA was negatively associated with E(1) (β = -0.123, 95% CI: -0.235 to -0.012) during the entire pregnancy. These findings suggested that exposure to PFASs disturbed estrogen homeostasis in pregnant women and the effects varied with the terms of pregnancy.			С	С
D959	ヒト(内 分泌系)	Nielsen, Christel; Li, Ying; Lewandowski, Magdalena; Fletcher, Tony; Jakobsson, Kristina	Breastfeeding initiation and duration after high exposure to perfluoroalkyl substances through contaminated drinking water: A cohort study from Ronneby, Sweden	Construction Construction<				С	С	
D960	ヒト(内 分泌系)	Kobayashi, Sumitaka; Harada, Kouji H	Comment on "Maternal Perfluoroalkyl Substances, Thyroid Hormones, and DIO Genes: A Spanish Cross- sectional Study": Predictability of Multiple Imputations for Large Amounts of Missing Data	2022	Environ Sci Technol. 2022 Apr 19;56(8):5276-5277. doi: 10.1021/acs.est.1c08598. Epub 2022 Mar 8.	No abstract available			D	D

分野 発行年 著者 タイトル 書誌情報 要旨 (原文) No. (参考) Placenta contains 3β -hydroxysteroid dehydrogenase/steroid Δ (5,4)-isomerase (HSD3B), v progesterone for maintaining pregnancy. Perfluoroalkyl carbonic acids (PFC) are subclass of 4-14 carbons (C4-C14) in the carbon backbone and are potential endocrine disruptors. Whe activity relationship (SAR) remains unclear. Herein, we screened 11 PFC for inhibiting huma Wang, Shaowei; IV HSD3B (HSD3B4) activities and determined SAR and mode of inhibition. HSD3B was me Zhang, Bingru; progesterone assisted by NAD(+) in placental microsomes. Of the 11 PFC, C9-C14 significa Zhai, Yingna; at 100 μ M. Half-maximal inhibitory concentration (IC(50)) values of C9-C14 compounds we Tang, Yunbing; Structure-activity relationship analysis of 2022 Toxicology. 2022 Oct;480:153334. doi: ヒト (内 \pm 0.65, 20.88 \pm 0.41, 118.35 \pm 0.16, and 149.26 \pm 21.67 μ M, respectively. We determined D961 Lou. Yuzhen: perfluoroalkyl carbonic acids on human and rat 分泌系) 10.1016/j.tox.2022.153334. Epub 2022 Sep 16. three most potent PFC (C10-C12), and found that they were mixed inhibitors against pregne Zhu, Yang; placental 3 β -hydroxysteroid dehydrogenase activity 2.04 ± 2.26 , and 9.93 ± 7.71 , respectively. Docking analysis showed that they bound steroi Wang, Yiyan; Ge, placental HSD3B4 were performed. Of the 11 PFC, C10-C12 significantly inhibited rat HSD3 Ren-Shan; Li, C10-C12 compounds were 45.85 \pm 1.49, 36.08 \pm 1.50, and 88.74 \pm 1.99 μ M, respectively. F Huitao three most potent PFC (C10-C12) were studied. It was found that they were mixed inhibitor of 48.16 \pm 20.44, 36.28 \pm 53.07, and 91.79 \pm 21.75 μ M, respectively. Docking analysis sho site of rat HSD3B4. In conclusion, PFC showed significant SAR differences. The potency of from C9 to C11, and then declined. Human HSD3B1 was more sensitive to the inhibition of \imath Schildroth. Samantha; Wise Black women are exposed to multiple endocrine-disrupting chemicals (EDCs), but few studi Lauren A; exposure to EDC mixtures. We identified biomarker profiles and correlates of exposure to EL Wesselink, analysis of data from a prospective cohort study of 749 Black women aged 23-35 years. We Amelia K: De La polychlorinated biphenyls (PCBs), polybrominated diphenyl ethers (PBDEs), organochlorine Cruz, Payton; polyfluoroalkyl substances (PFAS) in nonfasting samples collected at baseline. Demographi Bethea, Traci N: Correlates of Persistent Endocrine-Disrupting covariates were also collected at baseline. We used k-means clustering and principal compo 2021 Environ Sci Technol. 2021 Oct 19;55(20):14000-14014. doi: 10.1021/acs.est.1c02549. Epub 2021 Sep 30. ヒト (内 D962 Weuve, Jennifer; Chemical Mixtures among Reproductive-Aged Black concentration profiles of EDC mixtures (17 PCBs, 6 PBDEs, 4 OCPs, 6 PFAS), followed by m 分泌系) Fruh, Victoria; inear regression to estimate mean differences in PCA scores (β) and odds ratios (ORs) of Women Botelho, Julianne respective 95% confidence intervals (CIs). Older age (per 1 year increase: $\beta = 0.47$, CI = 0.3 C; Sjodin, lower body mass index (per 1 kg/m(2) increase: β = -0.14, Cl = -0.17, -0.12; OR = 0.91, Cl Andreas; Calafat cigarettes/day vs never smokers: β = 1.37, CI = 0.20, 2.55; OR = 2.63, CI = 1.07, 6.50) were Antonia M; Bairc by higher concentrations of all EDCs. Other behaviors and traits, including dietary factors ar Donna D: Claus associated with EDC mixtures. Henn, Birgit Sarzo, Blanca; Ballesteros, Virginia; Iñiguez Carmen: Manzano-Salgado, Cyntia B; Casas, Maribel; Llop, Sabrina; Murcia Response to "Comment on Maternal Perfluoroalkyl Mario: Guxens. Substances, Thyroid Hormones, and DIO Genes: A Environ Sci Technol. 2022 Apr 19;56(8):5278-5282. doi: ヒト (内 Mónica; Vrijheid 2022 10.1021/acs.est.2c01177. Epub 2022 Mar 9. D963 Spanish Cross-sectional Study: Predictability of No abstract available 分泌系) Martine; Santa Multiple Imputations for Large Amounts of Missing Marina, Loreto; Data" Schettgen, Thomas; Espada Mercedes; Irizar Amaia[.] Fernandez-Jimenez, Nora; Ballester, Ferran Lopez-Espinosa Maria-Jose

	備考	出 対 象 抽	ン 文 ク 献 ① ラ	ン 文 ク 献 ② ラ
which catalyzes pregnenolone to f perfluoroalkyl substances containing ther PFC inhibit HSD3B and structure- n type I HSD3B (HSD3B1) and rat type asured by converting pregnenolone to ntly inhibited human HSD3B1 activity are 363.56 \pm 12.14, 12.78 \pm 0.69, 6.54 Ki values and mode of inhibition of enolone, with Ki values of 5.57 \pm 4.37, d-binding site. Effects of PFC on rat B4 activity at 100 μ M. IC(50) values of Ki values and inhibition modes of the s against pregnenolone, with Ki values wed that they bound steroid-binding nhibiting HSD3B activity increased at HSD3B4.			С	В
es have examined their profiles of DC mixtures in a cross-sectional quantified plasma concentrations of pesticides (OCPs), and per- and c, behavioral, dietary, and reproductive onent analysis (PCA) to describe ultinomial logistic and multivariable cluster membership with their 39, 0.54; OR = 1.27, Cl = 1.20, 1.35), = 0.89, 0.94), and current smoking (\geq 10 associated with profiles characterized ad years since last birth, were also			С	С
			D	D

分野 タイトル 発行年 書誌情報 要旨 (原文) No. 著者 (参考) Lactation is critical to infant short-term and long-term health and protects mothers from bre diabetes mellitus. The mammary gland is a dynamic organ, regulated by the coordinated act hormones. These hormones promote gland development from puberty onwards and induce t Hannan, Fadil M nilk-secreting organ by the end of pregnancy. Progesterone withdrawal following placental Elainaf, Taha: maintained by increased pituitary secretion of prolactin and oxytocin, and stimulated by infa Vandenberg cytokine production and decreased prolactin secretion trigger large-scale mammary cell loss ヒト (内 Laura N; Nat Rev Endocrinol. 2022 Oct 3. doi: 10.1038/s41574-022-Hormonal regulation of mammary gland development 2022 00742-y. Online ahead of print. D964 review advances in the molecular endocrinology of mammary gland development and milk sy 分泌系) Kennedv and lactation functions of the mammary gland, including parathyroid hormone-related peptide secretion t Stephen H; mobilization for milk synthesis. We also consider the hormonal composition of human milk a Thakker, Rajesh health and development. Finally, we highlight endocrine and metabolic diseases that cause monogenic disorders of prolactin and prolactin receptor mutations, maternal obesity and dia labour and delivery, and exposure to endocrine-disrupting chemicals such as polyfluoroalkyl other oestrogenic compounds. PURPOSE OF REVIEW: Pregnancy can be seen as a "stress test" with complications predicti risk. Here, we review the growing epidemiological literature evaluating environmental endoc Barrett, Emily S; exposure in pregnancy in relation to two important cardiovascular disease risk factors, hype Groth, Susan W maternal obesity. RECENT FINDINGS: Overall, evidence of EDC-maternal cardiometabolic as ndocrine-Disrupting Chemical Exposures in Curr Epidemiol Rep. 2021 Sep;8(3):130-142. doi: :ト (内 Preston, Emma consistent associations were observed for phenols and maternal obesity, as well as for perfl D965 2021 Pregnancy: a Sensitive Window for Later-Life 分泌系) V; Kinkade, 10.1007/s40471-021-00272-7. Epub 2021 Aug 9. hypertensive disorders. Research on polybrominated flame retardants and maternal cardiom Cardiometabolic Health in Women Carolyn; Jamessuggestive. SUMMARY: Although numerous studies evaluated pregnancy outcomes, few eva Todd, Tamarra assessed chemical mixtures. Overall, there is a need to better understand whether pregnan contribute to adverse cardiometabolic health outcomes in women, particularly given that car cause of death in women Per- and polyfluoroalkyl substances (PFAS) have been found to be associated with gestation Birru, Rahel L: development, a maternal health disorder in pregnancy with negative effects that can extend Liang, Hai-Wei report on this association are difficult to summarize due to weak associations and wide con Faroog, Fouzia; this field is to sharpen the biologic theory on a causal pathway behind this association, and Bedi, Megha; nolecular biomarkers. The aim of this review is to summarize the literature that supports a Feghali, Maisa; 2021 Environ Health. 2021 May 22;20(1):63. doi: 10.1186/s12940-021-00740-z. ヒト (内 A pathway level analysis of PFAS exposure and risk of exposure and GDM development. Epidemiological studies demonstrate a clear association o D966 Haggerty, 分泌系) gestational diabetes mellitus glucose metabolism with GDM development. We report biologic plausibility and epidemiolog Catherine L; maternal thyroid hormones and thyrotropin (TSH) may disrupt glucose homeostasis, increas Mendez, Dara D epidemiological studies demonstrate that PFAS were positively associated with TSH and neg Catov, Janet M; thyroxine (T4). PFAS were generally positively associated with glucose and insulin levels in Ng. Carla A: of thyroid function and glucose metabolism may be a critical and missing component in the Adibi, Jennifer J risk of GDM. Food consumption, particularly of animal-based products, is considered the most important disrupting chemical (EDC) exposure. This study aims to describe the association between m Marks, Kristin J exposure to persistent EDCs using dietary pattern analysis. This study is based on subsamp Northstone, Parents and Children (ALSPAC) (N=422) and the Norwegian Mother, Father, and Child Coho Kate; data from the Medical Birth Registry of Norway (MBRN). Women in both studies completed Papadopoulou, during pregnancy, from which consumption data were categorized into 38 aggregated food g Eleni; Brantsæ collected during pregnancy and concentrations of perfluoroalkyl substances (PFAS), polychlo Environ Adv. 2021 Dec;6:10.1016/j.envadv.2021.100130. doi: ter. Anne Lise: Maternal dietary patterns during pregnancy and ヒト (内 organochlorine pesticides (OCPs) in serum/plasma were measured. Dietary patterns were ic D967 exposure to persistent endocrine disrupting chemicals Haug, Line Små 分泌系) 10.1016/j.envadv.2021.100130. regression, with blood EDC concentrations as response variables. Within ALSPAC, all patter stuen: Howards n two European birth cohorts characterized by high consumption of meat, poultry, white fish, and biscuits. In MoBa, high c Penelope P; (representing processed meats), pasta, and chocolate bars characterized PCB and OCP diet Smarr, Melissa of cheese characterized the PFAS pattern. Across both cohorts, PFAS patterns were charact M; Flanders, W cheese, PCB patterns by high consumption of rice, and OCP patterns by poultry. Dietary pat Dana: Hartman the variation in serum EDC concentrations, with explained variance being the highest for PC Terryl J dietary patterns high in animal-based products appear to be associated with persistent EDC women. Diet explains more variation in PCB concentrations than for other persistent EDC cla

	備考	出 情 対 報 象 抽	ン 文 ク 献 ① ラ	ン 文 刻 ラ
east cancer, ovarian cancer and type 2 ions of reproductive and metabolic he formation of a branched, epithelial, delivery initiates lactation, which is nt suckling. After weaning, local s, leading to gland involution. Here, we ynthesis. We discuss the hormonal nat stimulates maternal calcium nd its associated effects on infant lactation insufficiency, for example, betes mellitus, interventions during substances in consumer products and			С	С
ing later-life cardiovascular disease rine-disrupting chemical (EDC) rtensive disorders of pregnancy and ssociations was mixed. The most uoroalkyl substances (PFASs) with letabolic outcomes is limited, but aluated the postpartum period or cy exposure to these chemicals could diovascular disease is the leading			С	С
nal diabetes mellitus (GDM) beyond pregnancy. Studies that fidence intervals. One way to advance to measure it directly by way of novel pathway between PFAS f biomarkers of thyroid hormones and fic evidence that PFAS dysregulation of ing the risk of GDM. Overall, gatively with triiodothyronine (T3) and pregnancy. We propose dysregulation accurate estimation of PFAS on the			С	С
contributor to persistent endocrine naternal diet during pregnancy and les of the Avon Longitudinal Study of ort Study (MoBa) (N=276) which uses food frequency questionnaires (FFQs) roups. Maternal blood samples were orinated biphenyls (PCBs), and dentified using reduced rank ns (PFAS, PCB, and OCP) were consumption of sausages and burgers ary patterns, while high consumption retrized by high consumption of terns explained between 8 and 20% of Bs in both cohorts. In conclusion, concentrations among pregnant asses.			С	В

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No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)		出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D968	ヒト(内 分泌系)	荒木 敦子, 伊藤 佐智子, 宮下 ちひ ろ, 湊屋 街子, 岸 玲子	環境化学物質による次世代の性ホルモンへの影響	2018	3 日本衛生学雑誌, 73 巻 3 号 313-321, doi: 10.1265/jjh.73.313	In recent years, the birthrate has been continuously declining in Japan. The main causes of the decline are social factors. On the other hand, there is increasing evidence that many environmental chemicals show endocrine disrupting properties. Thus, we hypothesized that exposure to these chemicals would also be a causal for the fertility crisis. In this review, we examined current evidence that focused on environmental chemical exposure in utero and its association with reproductive hormones in children. We have included the findings from a prospective birth cohorts, the Hokkaido Study on Environment and Children's Health Sapporo cohort. According to the literature, environmental chemical levels in utero, such as polychlorinated biphenyl, dioxins, perfluorinated chemical substances, phthalates, and bisphenol A were somewhat associated with the levels of reproductive hormones, such as testosterone, estradiol, progesterone, inhibin B, and insulin-like factor-3 in cord blood, in early childhood and adolescence. The literature also suggests the disruption of androgen shower during the developmental stage in the fetal period. There are still knowledge gaps on whether these hormones at an early stage affect the pubertal development and reproductive functions in later life. In addition, alternative chemicals are produced after banning one type. The health effects of alternative chemicals should be evaluated. Effects of exposure to a mixture of the chemicals should also be examined in future studies. In conclusion, the prevention of environmental chemical hazards in relation to human reproductive function is important. It would be one of the countermeasures to the falling birthrate caused by fertility issues.		сс
D969	ヒト(内 分泌系)	岸 玲子, 荒木 敦 子	わが国で初めての本格的な出生コーホート研究から見た 環境化学物質の濃度レベルと次世代影響	2018	,保健医療科学, 67 巻 3 号 292-305, doi: 10.20683/jniph.67.3_292	 シーア・コルボーンらにより「Our stolen future (邦訳「奪われし未来」)」が出版された1996年頃から、各国で環境化学物質の内分泌かく乱作用など次世代影響に関心が高まった。日本でも我々は2001年から厚生労働科学研究により「環境と子どもの健康に関する北海道スタディ:先天異常・発達・アレルギー」として2つのコーホートを立ち上げた。コーホートの1つは北海道全域の産科の協力により器官形成期に同意を得て、母20,926人のベースライン採血を行い、出生アウトカムを観察し、その児を学童期、思春期と追跡している。他の一つは妊娠中後期に母514人の同意を得て児の詳細な精神神経発達を観察している。この研究は我が国で初めての本格的な出生コーホートで、16年に渡って追跡し、現在までに100編を超える原著論文が出ている。コーホート研究の最近の成果を見るとPCB・ダイオキシン類、有機フッ素化合物、有機塩素系農薬など半減期の長いPOPsでは母の曝露濃度が体格、甲状腺機能、性ホルモンに影響を与え、生後の神経発達、感染症アレルギー等にも影響を与えた。近年、使用量が増加しているプラスチック可塑剤やBPAなど短半減期物質と肥満や発達障害等の関係についても検討を開始している。日本では過去に高濃度の水銀曝露で水保病が、またダイオキシン類曝露でカネミライスオイル事故が引きおこされた。一方、本研究における比較的低濃度レベルの曝露でも、比較的高い人と低い人では影響の差が検出された。北海道スタディは当初から環境遺伝交互作用に着目し、SNPs解析によって喫煙やカフェインなど環境要因に感受性が高いハイリスク群を発見してきた、またエビゲノム解析では、環境化学物質の濃度と関連したメチル化への影響や、出生体重など発育に影響するCpGサイトを介在分析で明らかにできた。近年は世界的にDOHaD仮説(Developmental origin of health and Diseases,疾病の胎児期・幼少時期起源説)が重要になっているので、今後は広く小児疾患への環境要因として捉えることが必要になる、環境疫学では正確な曝露測定に基づくリスク評価を行い、科学的な成果を環境政策に活かすことが重要である、実際に、北海道スタディは環境省エコチル研究のモデルにもなり、計画設計時から協力している。また日本、韓国、台湾の3つのコーホートの主任研究者が協力してBICCA(Birth Cohort Consortium of Asia)を設立し、現在15か国で29の出生コーホートが参加して活動をしている、今後のリスク評価でも国際共同研究が数多く進展するであろう。 		C C
D970	ヒト(内 分泌系)	伊藤 佐智子(北海 道大学環境健康科 学研究教育セン ター)	環境化学物質曝露、特に残留性有機汚染物質(POPs)によ る内分泌系への影響 甲状腺並びに性ホルモン	2019	北海道公衆衛生学雑誌(0914-2630)32巻2号 Page22- 26(2019.03)	No abstract available		D D
D971	ヒト(内 分泌系)	Knox Sarah S.(米 国), Jackson Timothy, Frisbee Stephanie J., Javins Beth, Ducatman Alan M.	C8健康プロジェクトにおけるペルフルオロカーボン曝 露、性別および甲状腺機能(Perfluorocarbon exposure, gender and thyroid function in the C8 Health Project)(英語)	2011	The Journal of Toxicological Sciences(0388-1350)36巻4号 Page403-410(2011.08), doi: 10.2131/jts.36.403	C8健康プロジェクトのデータを基に、飲料水中のペルフルオロオクタン酸(PFOA)に1年以上曝露された成人52296名の断面解析におけ る甲状腺機能を評価した。その成績をチロキシン、トリヨードチロニン(T3)取込みおよび甲状腺刺激ホルモン(TSH)との関連の上で解 析し、性別および年齢(<20~<50と、>50)について層別化した。その結果、PFOAとペルフルオロスルホン酸(PFOS)はいずれも血清チ ロキシンの有意な上昇およびT3取込みの有意な減少と関連していた。更に、T3取込みとチロキシンに対しては性別/PFOS交互作用、T3 取込みに対しては性別/PFOA交互作用が認められた。以上の成績は、これらの一般的な化学物質に関連した甲状腺機能の崩壊の徴候を 示すものであり、その機序について考察した。		СВ
D972	ヒト(内 分泌系)	山野 優子(昭和大 学 医学部衛生学 教室)	【環境と健康】内分泌撹乱化学物質(環境ホルモン)とヒ トへの健康影響	2004	昭和医学会雑誌(0037-4342)64巻2号 Page138-143(2004.04), doi: 10.14930/jsma1939.64.138	No abstract available		D D

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考		ン文 ン文 ク献 ① ラ ② ラ
D973	ヒト(発 達神経毒 性)	Dalsager, Louise; Jensen, Tina Kold; Nielsen, Flemming; Grandjean, Philippe; Bilenberg, Niels; Andersen, Helle Raun	No association between maternal and child PFAS concentrations and repeated measures of ADHD symptoms at age 2½ and 5 years in children from the Odense Child Cohort	2021	Neurotoxicol Teratol. 2021 Nov-Dec;88:107031. doi: 10.1016/j.ntt.2021.107031. Epub 2021 Sep 24.	INTRODUCTION: The potential impact of exposure to perfluoroalkyl substances (PFAS) on childhood Attention-Deficit Hyperactivity-Disorder (ADHD) is unclear and deserves scrutiny. The majority of previously conducted longitudinal studies found no association between maternal serum-PFAS concentrations and ADHD symptoms in the offspring, but some studies observed possible associations with postnatal PFAS exposures, mainly in girls. OBJECTIVE: To investigate the association between maternal and child serum concentrations of five PFAS and symptoms of ADHD at ages 2½ and 5 years. METHODS: In the Odense Child Cohort (OCC) women were recruited in early pregnancy in 2010-12 and their children are being prospectively followed. Mothers donated serum samples in the first trimester and children at age 18 months to be analyzed for perfluorohexane sulfonic acid (PFHxS), perfluorooctanesulfonic acid (PFOS), perfluorooctanoic acid (PFOA), perfluorononanoic acid (PFNA) and perfluorodecanoic acid (PFDA). Parents completed the Child Behavior Check List for ages 1.5-5 years (CBCL/1½-5), including a 6- item ADHD symptom scale at age 2½ years and again at 5 years. Negative binomial and logistic regression models taking account of repeated measures were used to investigate the association between maternal and child serum-PFAS concentrations and the ADHD symptom score. Effect modification by child sex was investigated as well. RESULTS: A total of 1138 mother-child pairs were included. At age 2½ years, 17.4% of the children had an ADHD scale score ≥ 5 (equivalent to the 90th percentile), whereas the proportion was 15.8% at age 5. We found no association between either maternal or child PFAS concentrations in serum and symptoms of ADHD at age 2½ or 5 years, and no evidence of effect modification by sex. CONCLUSION: We found no evidence of an association between early-life PFAS exposure and the risk of developing symptoms of ADHD.			В
D974	ヒト(神経毒性)	Park, Sung Kyun; Ding, Ning; Han, Dehua	Perfluoroalkyl substances and cognitive function in older adults: Should we consider non-monotonic dose-responses and chronic kidney disease?	2021	Environ Res. 2021 Jan;192:110346. doi: 10.1016/j.envres.2020.110346. Epub 2020 Oct 15.	BACKGROUND: Although potential neurotoxicity of perfluoroalkyl and polyfluoroalkyl substances (PFAS) is suggested, previous epidemiologic studies have reported a 'protective' association between serum PFAS concentration and cognition function. Poor outcome assessment, residual confounding, non-monotonic dose-responses (NMDRs), and the role of reduced kidney function in PFAS excretion may be alternative explanations of these findings. OBJECTIVES: We examined the association of perfluoroalkyls with cognitive functions assessed using the Consortium to Establish a Registry for Alzheimer's Disease word learning and recall; the Animal Fluency; and the Digit Symbol Substitution tests. METHODS: We included 903 adults aged ≥60 years from the National Health and Nutrition Examination Survey (NHANES) 2011-2014. We computed a composite z-score as an average of four individual cognitive z-scores and used it as the outcome. Linear and generalized additive models were used to evaluate linear and non-linear associations. RESULTS: With the linearity assumption, perfluorooctanoate (PFOA) and perfluoronanoate (PFNA) were significantly positively associated with composite z-score after adjustment for age, sex, race/ethnicity, education, smoking, poverty-income ratio, health insurance, food security, alcohol, and physical activity. Smoothing plots suggested NMDRs, especially for perfluorooctane sulfonate (PFOS) with a U-shape dose-response. When restricting to participants without chronic kidney disease (CKD) (n = 613), the positive associations for PFOA and PFNA observed in the whole population diminished, whereas PFOS was inversely and significantly associated with composite z-score. Also, negative confounding effects of fish/seafood consumption seem to be substantial. Effect estimates of composite z-score were -0.055 (95% CI: -0.097, -0.012, P = 0.01) for a doubling increase in PFOS. DISCUSSION: These findings suggest that the previous epidemiologic findings of a 'protective' association between PFAS and cognition may be explai			В
D975	ヒト(神 経毒性)	Weng, Xueqiong; Liang, Huanzhu; Tan, Yuxuan; Chen, Jingmin; Fei, Qiaoyuan; Liu, Shan; Guo, Xinrong; Wen, Lin; Wu, Yingying; Jing, Chunxia	Mixed effects of perfluoroalkyl and polyfluoroalkyl substances exposure on cognitive function among people over 60 years old from NHANES	2022	Environ Sci Pollut Res Int. 2022 May;29(21):32093-32104. doi: 10.1007/s11356-021-17789-5. Epub 2022 Jan 11.	The relationship between perfluoroalkyl and polyfluoroalkyl substances (PFAS) and cognitive function are inconsistent, and the mixed effects of PFAS on cognitive function are still unclear. We aimed to evaluate the joint effects of PFAS on cognitive function assessed using four tests as follows: the Consortium to Establish a Registry for Alzheimer's Disease Immediate Recall Test (IRT), Delayed Recall Test (DRT), the Animal Fluency Test (AFT), and the Digit Symbol Substitution Test (DSST) in the US elderly. A total of 777 individuals aged \geq 60 from the National Health and Nutrition Examination Survey (NHANES) 2011-2014 were included in this study. Multivariable logistic regression and Bayesian kernel machine regression (BKMR) were constructed to estimate the overall and the individual effects of PFAS exposure on cognitive function. There were 21.36%, 22.65%, 21.62%, and 21.24% participants with cognitive decline in IRT, DRT, AFT, and DSST, respectively. After multivariable adjustment, perfluoroatancic acid (PFOA) was inversely associated with cognitive decline in IRT, DRT, and AFT, while no significant association was observed between any other PFAS and cognitive decline. Compared with the lowest quartile, the adjusted odds ratio of cognitive decline with a 95% confidence interval (CI) for the highest quartile of PFOA was 0.33 (95% CI: 0.15-0.69) in IRT, 0.50 (0.26-0.96) in DRT, and 0.45 (0.21-0.95) in AFT. In BKMR analysis, the overall effect of mixtures was significantly protective on cognitive decline in IRT, of which PFOA made the greatest contribution. The consistent protective effect in DRT and DSST was observed when all the chemicals were at their 50th percentile or below it. No significant interaction was observed among PFAS for cognitive function. These findings suggested that PFAS mixture at a low level of current exposure of the US population may have a protective effect on cognitive function.			В

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨 (原文)	備考	出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D976	ヒト(発 達神経毒 性)	Oh, Jiwon; Shin, Hyeong-Moo; Kannan, Kurunthachalam; Busgang, Stefanie A; Schmidt, Rebecca J; Schweitzer, Julie B; Hertz- Picciotto, Irva; Bennett, Deborah H	Childhood exposure to per- and polyfluoroalkyl substances and neurodevelopment in the CHARGE case-control study	2022	Environ Res. 2022 Dec;215(Pt 2):114322. doi: 10.1016/j.envres.2022.114322. Epub 2022 Sep 13.	BACKGROUND: Per- and polyfluoroalkyl substances (PFAS) are shown to have neurotoxic effects on animals, but epidemiological evidence for associations between childhood PFAS exposure and neurodevelopment is inconclusive. We examined if childhood PFAS concentrations are associated with a diagnosis of autism spectrum disorder (ASD), developmental delay (DD), and other early concerns (OEC) in development. METHODS: We included 551 children 2-5 years old from the CHildhood Autism Risks from Genetics and Environment (CHARGE) case-control study. Children were clinically diagnosed and classified as having ASD, DD, OEC, and typical development (TD). Fourteen PFAS were quantified in child serum samples collected when diagnostic assessments were performed. We used multinomial logistic regression models to investigate the cross-sectional associations of individual PFAS concentrations with neurodevelopmental outcomes and weighted quantile sum (WQS) regression models with repeated holdout validation to investigate the associations with PFAS mixtures. RESULTS: Childhood perfluorooctanoic acid (PFOA) was associated with increased odds of ASD (odds ratio [OR] per In ng/mL increase: 1.99, 95% confidence interval [CI]: 1.20, 3.29) and DD (OR: 2.16, 95% CI: 1.21, 3.84) versus TD. Perfluoroheptanoic acid (PFHpA) was associated with increased odds of ASD (OR: 0.43, 95% CI: 0.26, 0.69). From mixture analyses, the WQS index was associated with increased odds of ASD (ower age OR: 1.57, 5th and 95th percentile: 1.16, 2.13). Child's sex and homeownership modified associations of perfluorodecanoic acid (PFDA) with DD and ASD, respectively. CONCLUSIONS: In this case-control study, childhood PFOA, PFHpA, and a PFAS mixture was associated with increased odds of ASD. While PFUNDA was associated with decreased odds of ASD. Because we used concurrent measurements of PFAS, our results do not imply causal relationships and thus need to be interpreted with caution.		1 A
D977	ヒト(発 達神経毒 性)	Jain, Ram B	Associations between perfluoroalkyl acids in serum and lead and mercury in whole blood among US children aged 3-11 years	2021	Environ Sci Pollut Res Int. 2021 Jun;28(24):31933-31940. doi: 10.1007/s11356-021-13042-1. Epub 2021 Feb 22.	Data for 639 US children aged 3-11 years who participated in the National Health and Nutrition Examination Survey during 2013- 2014 were analyzed by fitting regression models with log10-transformed values of blood lead and methyl and total mercury as dependent variables and log10-transformed values of perfluoroalkyl acids (PFAA) as one of the independent variables. PFAAs considered were 2-(N-methyl-perfluoroactane sulfonamido) acetic acid (MPAH), linear isomer of perfluoroactanoic acid (NPFOA), perfluoronanoic acid (PFNA), perfluorodecanoic acid (PFDA), perfluorohexane sulfonic acid (PFHxS), linear isomer of perfluoroctane sulfonic acid (NPFOS), and monomethyl branch isomer of perfluoroactane sulfonic acid (MPFOS). Adjusted regression slopes (β) indicating associations between the concentrations of PFAAs with blood lead and mercury were estimated. Statistically significant associations between concentrations of each PFAA and blood lead were observed. For 10% increases in concentrations of MPAH, NPFOA, PFNA, PFDA, PFHxS, NPFOS, and MPFOS, percent increases in the concentrations of blood lead were 0.45%, 1.59%, 0.78%, 0.32%, 0.65%, 1.32%, and 0.89% respectively. For 10% increases in concentrations of MPAH, PFNA, PFDA, and NPFOS, percent increases in the concentrations of total mercury in the blood were 1.62%, 1.44%, and 3.24% respectively. For 10% increases in concentrations of PFDA and NPFOS, percent increases in the concentrations of methyl mercury in the blood were 2.07% and 4.57% respectively. While concentrations of each of the seven PFAAs were positively associated with the concentrations of blood lead, concentrations of only PFDA and NPFOS were positively associated with increases in total and methyl mercury. PFAAs having positive associations with lead and mercury imply co-exposure and/or co-existence of high concentrations of PFAAs and lead/mercury. Since PFAAs as well as lead/mercury are known to be neurotoxic, nephrotoxic, and endocrine disruptors, their co-existence/co-exposure may lead to neurodev		в

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No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)		出 精 報 抽	ン 文 ク 献 ① ラ ② ラ
D978	ヒト (発 達神経毒 性)	Luo, Fei; Chen, Qian; Yu, Guoqi; Huo, Xiaona; Wang, Hui; Nian, Min; Tian, Ying; Xu, Jian; Zhang, Jingsong; Zhang, Jun	Exposure to perfluoroalkyl substances and neurodevelopment in 2-year-old children: A prospective cohort study	2022	Environ Int. 2022 Jul 7;166:107384. doi: 10.1016/j.envint.2022.107384. Online ahead of print.	BACKGROUND: Humans are widely exposed to per- and polyfluoroalkyl substances (PFAS). As fetal stage is a critical window for neurodevelopment, it is important to know if in utero exposure to PFAS affects fetal neurodevelopment. However, previous human studies are both limited and inconsistent. OBJECTIVES: To investigate the relationship between PFAS exposure during early pregnancy and the neurodevelopmental status at 2 years of age in a prospective cohort study. METHODS: We measured 10 PFAS in maternal plasma samples collected prior to 16 weeks of gestation in the Shanghai Birth Cohort Study between 2013 and 2016. Childhood neurodevelopment was assessed at 2 years of age using the Bayley Scales of Infant and Toddler Development-Third Edition (BSID-III). Associations with domain specific scores for individual PFAS were assessed by multiple linear regression and binary logistic regression when scores were dichotomized. Quantile-based g-computation was used to estimate the joint effects of PFAS mixture. RESULTS: A total of 2257 mother-child pairs who had both PFAS and BSID measurements were included in our analyses. The means and standard deviations of comprehensive scores were 115 ± 22 , 96 ± 15 and 108 ± 15 for cognition, language, and motor, respectively. In multiple linear regressions, we observed significant negative associations of perfluorooctane sulfonate (PFOS), perfluorononanoic acid (PFNA), perfluorohexanesulfonate (PFLXS) negatively with language scores; and PFNA and PFUNDA negatively with motor scores. Quantile-based g-computation showed that PFAS mixture was significantly associated with decreased cognitive and language scores, with an estimated β of -2.1 [95% confidence interval (CI): -3.5, -0.7)] and -2.0 (95% CI: -2.9, -1.0) per one quartile increase in PFAS mixture for cognitive and language domains, respectively. PFAS mixture was associated with increased odds of low cognition (adjusted odds ratio [OR] = 1.3, 95% CI:1.0, 1.6) and language scores (OR = 1.2, 95% CI: 1.1, 1.3). CONCLUSIONS:			В
D979	ヒト (神 経毒性)	Bashir, Tahir; Obeng-Gyasi, Emmanuel	Interaction of Per- and Polyfluoroalkyl Substances and Allostatic Load among Adults in Various Occupations	2022	Diseases. 2022 Apr 29;10(2):26. doi: 10.3390/diseases10020026.	Objective: This study sought to assess the associations between occupation, serum concentrations of selected of Per- and Polyfluoroalkyl Substances (PFAS), and chronic physiological stress, as operationalized by Allostatic Load (AL), among adults aged \geq 20 years. Methods: To explore the interactions of occupation with PFAS levels and AL, data from the National Health and Nutrition Examination Survey (NHANES) 2007-2014 were used. We performed Poisson regression modeling to evaluate AL's relationships with PFAS concentrations and occupations on weighted data. Results: The results demonstrated that increased AL was positively associated with different occupation groups such as a) Public Administration and b) Arts, Entertainment, and Recreation (p-values 0.018 and 0.002, respectively), and with certain PFAS concentrations (Perfluorooctanoic acid, PFOA, p-value = 0.002). Finally, AL had a strong association with the interaction of some PFAS such as Perfluorobutane sulfonic acid (PFBS) and occupation (AL: PFBS: occupation, p-value < 0.0001), with different association measures existing across varying occupations. Conclusions: Occupation and PFOA seem to be associated with AL. This suggests the need of implementing further strategies to limit the exposure to stressors and PFAS in the work environment to promote longevity among the workforce in the U.S. Finally, policymakers must do more to clearly define standards and regulations in the work environment related to PFAS exposure.			В
D980	ヒト(神経毒性)	Starnes, Hannah M; Rock, Kylie D; Jackson, Thomas W; Belcher, Scott M	A Critical Review and Meta-Analysis of Impacts of Per- and Polyfluorinated Substances on the Brain and Behavior	2022	Front Toxicol. 2022 Apr 11;4:881584. doi: 10.3389/ftox.2022.881584. eCollection 2022.	Per- and polyfluoroalkyl substances (PFAS) are a class of structurally diverse synthetic organic chemicals that are chemically stable, resistant to degradation, and persistent in terrestrial and aquatic environments. Widespread use of PFAS in industrial processing and manufacturing over the last 70 years has led to global contamination of built and natural environments. The brain is a lipid rich and highly vascularized organ composed of long-lived neurons and glial cells that are especially vulnerable to the impacts of persistent and lipophilic toxicants. Generally, PFAS partition to protein-rich tissues of the body, primarily the liver and blood, but are also detected in the brains of humans, wildlife, and laboratory animals. Here we review factors impacting the absorption, distribution, and accumulation of PFAS in the brain, and currently available evidence for neurotoxic potential of exposures during critical periods of development and in sensitive populations, and factors that may exacerbate neurotoxicity of PFAS. While limitations and inconsistencies across studies exist, the available body of evidence suggests that the neurobehavioral impacts of long-chain PFAS exposures during development are more pronounced than impacts resulting from exposure during adulthood. There is a paucity of experimental studies evaluating neurobehavioral and molecular mechanisms of short-chain PFAS, and even greater data gaps in the analysis of neurotoxicity for PFAS outside of the perfluoroalkyl acids. Whereas most experimental studies were focused on acute and subchronic impacts resulting from high dose exposures to a single PFAS congener, more realistic exposures for humans and wildlife are mixtures exposures that are relatively chronic and low dose in nature. Our evaluation of the available human epidemiological, experimental, and wildlife data also indicates heightened accumulation of perfluoroalkyl acids in the brain after environmental exposure, in comparison to the experimental studies. These findings highlight the need			В

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D981	ヒト(神 経毒性)	Vuong, Ann M; Yolton, Kimberly; Xie, Changchun; Dietrich, Kim N; Braun, Joseph M; Webster, Glenys M; Calafat, Antonia M; Lanphear, Bruce P; Chen, Aimin	Childhood exposure to per- and polyfluoroalkyl substances (PFAS) and neurobehavioral domains in children at age 8 years	2021	Neurotoxicol Teratol. 2021 Nov-Dec;88:107022. doi: 10.1016/j.ntt.2021.107022. Epub 2021 Aug 24.	BACKGROUND: Toxicological studies have raised concerns regarding the neurotoxic effects of per- and polyfluoroalkyl substances (PFAS). However, observational evidence from human studies investigating the association between childhood PFAS and neurobehavior is limited and remains unclear. OBJECTIVES: To examine whether childhood PFAS concentrations are associated with neurobehavior in children at age 8 years and whether child sex modifies this relationship. METHODS: We used data from 208 mother-child dyads in the Health Outcomes and Measures of the Environment (HOME) Study, a prospective pregnancy and birth cohort (Cincinnati, OH, USA). We quantified PFAS in child serum at 3 and 8 years. We assessed neurobehavioral domains using the Behavior Assessment System for Children-2 at 8 years. We used multiple informant models to estimate score changes per In-increase in repeated PFAS concentrations. RESULTS: Childhood PFAS were not associated with Externalizing or Internalizing Problems at 8 years. However, we noted effect measure modification by sex, with higher scores in Externalizing Problems among males per In-unit increase in perfluoronanoate (PFNA) at 3 years ($\beta = 4.3$ points, 95% CI: 1.0, 7.7) while females had lower scores ($\beta = -2.8$ points, 95% CI: -4.7, -1.0). More Internalizing Problems were observed among males per In-unit increase in concurrent PFNA concentrations ($\beta = 3.7$ points, 95% CI: 0.7, 6.8), but not in females ($\beta = -1.7$ points, 95% CI: -4.6, 1.2). Childhood PFNA concentrations were associated with lower scores for attention problems and activity of daily living. CONCLUSION: While findings do not consistently support an association between childhood PFAS serum concentrations and neurobehavior, child sex may play a role in this relationship.		В
D982	ヒト(神経毒性)	Syeda, Tauqeerunnisa; Cannon, Jason R	Environmental exposures and the etiopathogenesis of Alzheimer's disease: The potential role of BACE1 as a critical neurotoxic target	2021	J Biochem Mol Toxicol. 2021 Apr;35(4):e22694. doi: 10.1002/jbt.22694. Epub 2021 Jan 4.	Alzheimer's disease (AD) is a major public health crisis due to devastating cognitive symptoms, a lack of curative treatments, and increasing prevalence. Most cases are sporadic (>95% of cases) after the age of 65 years, implicating an important role of environmental factors in disease pathogenesis. Environmental neurotoxicants have been implicated in neurodegenerative disorders including Parkinson's Disease and AD. Animal models of AD and in vitro studies have shed light on potential neuropathological mechanisms, yet the biochemical and molecular underpinnings of AD-relevant environmental neurotoxicity remain poorly understood. Beta-site amyloid precursor protein cleaving enzyme 1 (BACE1) is a potentially critical pathogenic target of environmentally induced neurotoxicity. BACE1 clearly has a critical role in AD pathophysiology: It is required for amyloid beta production and expression and activity of BACE1 are increased in the AD brain. Though the literature on BACE1 in response to environmental insults is limited, current studies, along with extensive AD neurobiology literature suggest that BACE1 deserves attention as an important neurotoxic target. Here, we critically review research on environmental neurotoxicants such as metals, pesticides, herbicides, fungicides, polyfluoroalkyl substances, heterocyclic aromatic amines, advanced glycation end products, and acrolein that modulate BACE1 and potential mechanisms of action. Though more research is needed to clearly understand whether BACE1 is a critical mediator of AD-relevant neurotoxicity, available reports provide convincing evidence that BACE1 is altered by environmental risk factors associated with AD pathology, implying that BACE1 inhibition and its use as a biomarker should be considered in AD management and research.		с
D983	ヒト (神 経毒性)	Moore, Sonja; Paalanen, Laura; Melymuk, Lisa; Katsonouri, Andromachi; Kolossa-Gehring, Marike; Tolonen, Hanna	The Association between ADHD and Environmental Chemicals-A Scoping Review	2022	Int J Environ Res Public Health. 2022 Mar 1;19(5):2849. doi: 10.3390/ijerph19052849.	The role of environmental chemicals in the etiology of attention deficit hyperactivity disorder (ADHD) has been of interest in recent research. This scoping review aims to summarize known or possible associations between ADHD and environmental exposures to substances selected as priority chemicals of the European Human Biomonitoring Initiative (HBM4EU). Literature searches were performed in PubMed to identify relevant publications. Only meta-analyses and review articles were included, as they provide more extensive evidence compared to individual studies. The collected evidence indicated that lead (Pb), phthalates and bisphenol A (BPA) are moderately to highly associated with ADHD. Limited evidence exists for an association between ADHD and polycyclic aromatic hydrocarbons (PAHs), flame retardants, mercury (Hg), and pesticides. The evidence of association between ADHD and cadmium (Cd) and per- and polyfluoroalkyl substances (PFASs) based on the identified reviews was low but justified further research. The methods of the individual studies included in the reviews and meta-analyses covered in the current paper varied considerably. Making precise conclusions in terms of the strength of evidence on association between certain chemicals and ADHD was not straightforward. More research is needed for stronger evidence of associations or the lack of an association between specific chemical exposures and ADHD.		В
D984	ヒト (腎 毒性)	Erdal, Huseyin; Sungur, Sana; Koroglu, Muaz; Turgut, Faruk	Determination of Serum Perfluorooctanoic Acid and Perfluorooctanesulfonic Acid Levels with Different Stages of Chronic Kidney Disease	2021	Saudi J Kidney Dis Transpl. 2021 Nov-Dec;32(6):1664-1670. doi: 10.4103/1319-2442.352427.	The aim of this study is to investigate the perfluorooctanoic acid (PFOA) and perfluorooctanesulfonic acid (PFOS) levels in patients with different stages of chronic kidney disease (CKD). Sixty-one CKD stage 1-4 patients who applied to the nephrology outpatient clinic were recruited. A control group consisting of 26 age- and sex-matched healthy controls were also included in the study. Concentrations of PFOA and PFOS were determined by comparing their peak areas with their standard curves. All samples were analyzed three times. The average values of blank samples were subtracted from the detected PFOA and PFOS values. PFOA and PFOS levels were significantly higher in CKD group than the controls (11.4 ± 7.47 , 0.45 ± 0.55 ; 0.13 ± 0.17 , 0.19 ± 0.4 ng/mL, respectively) (P = 0.001). Hemoglobin, serum albumin, and estimated glomerular filtration rate (eGFR) levels were significantly lower and potassium and uric acid levels were higher in the CKD group than the controls. PFOA and PFOS levels were significantly higher in all stages of CKD patients than healthy controls. However, there was no correlation between eGFR, and PFOS and PFOA. We have demonstrated significantly increased PFOA and PFOS concentrations in different stages of CKD patients. We could not find an association between eGFR, age, and serum PFOS and PFOA concentrations.		ВС

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン 文 ク 献 ① ラ	ン ク ②	文 献 ラ
D985	ヒト (腎 毒性)	Jain, Ram B	Perfluoroalkyl acids and their isomers, diabetes, anemia, and albuminuria: Variabilities with deteriorating kidney function	2021	Ecotoxicol Environ Saf. 2021 Jan 15;208:111625. doi: 10.1016/j.ecoenv.2020.111625. Epub 2020 Nov 11.	Data for US adults aged \geq 20 years from National Health and Nutrition Examination Survey for the years 2003-2014 were analyzed to evaluate how adjusted (N = 8481) and unadjusted (N = 9080) levels of selected perfluoroalkyl acids (PFAA) vary across the different stages of glomerular function (GF) among those who did not have diabetes, anemia, or albuminuria as compared to those who had diabetes only, anemia only, and albuminuria only. PFAAs selected for analyses were: perfluorooctanoic acid (PFOA), perfluorooctane sulfonic acid (PFOS), perfluorodecanoic acid (PFDA), perfluorohexane sulfonic acid (PFHxS), and perfluorononanoic acid (PFNA). Irrespective of GF stage, there was no noticeable evidence to suggest that adjusted levels of PFAA for those with diabetes only are any lower than those with no diabetes, no anemia, and no albuminuria. Those who had anemia only were found to have lower adjusted levels of at least PFOA, PFOS, PFDA, and PFHxS than those who had no diabetes, no anemia, and no albuminuria. These results were seen in the presence (eGFR < 60 mL/min/1.73 m(2)) as well as the absence of chronic kidney disease. For GF-1 (eGFR > 90 mL/min/1.73 m(2)), GF-2 (60 ≤ eGFR ≤ 90 mL/min/1.73 m(2)), and GF-3B/4 (15 < eGFR ≤ 45 mL/min/1.73 m(2)), those who had albuminuria only had lower adjusted levels of PFOA, PFOS, and PFHxS than those who had no diabetes, no anemia, and no albuminuria. In general, adjusted levels of those who had albuminuria only were lower than those who had anemia only at GF-3 and more often than not at GF-1 and GF-2. Rise in adjusted levels of PFAA from GF-1 to GF-3A (45 < eGFR < 60 mL/min/1.73 m(2)) was faster for those with anemia only than any other comparison group for the total population and females.			В	E	3
D986	ヒト (腎 毒性)	Li, Zhaoyang; Zhang, Ying; Wang, Fei; Wang, Ruixin; Zhang, Shiyang; Zhang, Zefang; Li, Peiwen; Yao, Jinqiu; Bi, Jiao; He, Jia; Keerman, Mulatibieke; Guo, Huan; Zhang, Xiaomin; He. Meian	Associations between serum PFOA and PFOS levels and incident chronic kidney disease risk in patients with type 2 diabetes	2022	Ecotoxicol Environ Saf. 2022 Jan 1;229:113060. doi: 10.1016/j.ecoenv.2021.113060. Epub 2021 Dec 7.	Chronic kidney disease (CKD) is a common comorbidity among patients with type 2 diabetes. Exposure to perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS) has been linked to poorer kidney function in general population, but the related studies in individuals with diabetes were very limited. We aimed to examine the longitudinal associations of PFOA and PFOS exposure and CKD incidence among diabetes patients. Baseline levels of PFOA and PFOS were measured in serum in 967 diabetes patients from the Dongfeng-Tongji cohort. Multivariable logistic regression models were used to characterize the relationship between serum PFOA and PFOS levels and incident CKD risk (defined as estimated glomerular filtration rate (eGFR) < 60 mL/min/1.73 m(2)). During 10-years follow-up, 267 incident CKD cases were identified. Only PFOS level was significantly associated with lower risk of CKD incidence (adjusted OR: 0.67; 95%CI: 0.51, 0.88). Such inverse association was only observed among participants with lower eGFR levels (< 70 mL/min/1.73 m(2)), although the interaction did not achieve statistical significance. Notably, an inverted U-shaped relationship between eGFR and serum PFOS level (P(for nonlinearity) < 0.001) was observed based on the 1825 subjects with available data at baseline. PFOS exposure was negatively associated with CKD incidence in patients with diabetes, especially in those with baseline eGFR levels < 70 mL/min/1.73 m(2). This may be explained by the implication of baseline kidney function on the serum PFAS concentrations which in turn affect the relationship between PFOS exposure and the incident CKD risk among diabetes.			В	E	3
D987	ヒト (腎 毒性)	Jain, Ram B	Impact of kidney hyperfiltration on concentrations of selected perfluoroalkyl acids among US adults for various disease groups	2021	Environ Sci Pollut Res Int. 2021 May;28(17):21499-21515. doi: 10.1007/s11356-020-11855-0. Epub 2021 Jan 7.	Data from the National Health and Nutrition Examination Survey (N = 6141) for the years 2003-2016 for US adults were analyzed to evaluate the impact of glomerular hyperfiltration on the observed concentrations of perfluorooctanoic acid (PFOA), perfluorooctane sulfonic acid (PFOS), perfluorodecanoic acid, perfluorohexane sulfonic acid (PFNA), and perfluorononanoic acid (PFNA) for several disease groups. Hyperfiltrators were defined as having an estimated glomerular filtration rate (eGFR) \geq 110 mL/min/1.73 m(2), and normal filtrators were defined as those having an eGFR between 90 and 110 mL/min/1.73 m(2). The seven disease groups for which the data were analyzed were as follows: those (i) without any diseases; (ii) with hypertension only; (iii) with albuminuria only; (iv) with anemia only; (v) with diabetes only; (vi) with hypertension and one or more of diabetes, anemia, and albuminuria; and (vii) with two or more of diabetes, anemia, and albuminuria without hypertension. For almost every PFAA, for all seven disease groups except the albuminuria only group, hyperfiltrators had lower adjusted geometric means (AGM) than normal filtrators. For example, for the disease group with hypertension only, for PFOS, the AGMs for hyperfiltrators and normal filtrators were 6.3 and 10.6 ng/mL, respectively, for the total population. For the group with albuminuria only, normal filtrators were found to have higher AGMs than hyperfiltrators for the total population and males. For example, for PFHxS, the AGMs for normal and hyperfiltrators were 0.96 and 0.86 ng/mL respectively. Males usually had higher AGMs than hyperfiltrators. Irrespectively, for the total population and males. For example, there every was also true occasionally. Usually, male-female differences were substantially narrower for normal filtrators than hyperfiltrators. Irrespective of the filtration status, the disease group with hypertension only had the highest AGMs for every PFAA. AGMs for the anemia only group were the lowest for every PFAA as compared with			В	ł	ł

分野 著者 タイトル 発行年 書誌情報 要旨 (原文) No. (参考) BACKGROUND: A growing body of evidence suggests the deleterious effects of perfluoroalk little is known on the association between PFASs joint exposure and uric acid. METHODS: S measured in 661 participants recruited from Tianjin, China using liquid chromatography/ma Yang, Ze; Men, single PFASs exposure with uric acid levels and hyperuricemia were assessed using multiva Kun; Guo, Jiaxin; models, respectively. Restricted cubic spline models were established to investigate the dos Liu, Ruifang; Liu PFASs concentrations and uric acid levels. Bayesian Kernel Machine Regression (BKMR) me Hongbo; Wei, selection was performed to assess the joint effect of PFASs on uric acid. RESULTS: Potassi Chemosphere. 2022 Nov 6;312(Pt 1):137164. doi: Jiemin; Zhang, ヒト (腎 Association between exposure to perfluoroalkyl (PFOS) and perfluoro-n-octanoic acid (PFOA) were the dominated contributors with median D988 Jingyun; Liu, 毒性) substances and uric acid in Chinese adults 10.1016/j.chemosphere.2022.137164. Online ahead of print. 9.42 ng/ml, respectively. Increased PFOA concentration (per log(2)-unit) was associated wit Liangpo; Lin, 95% CI: 0.033-0.143) and higher risk of hyperuricemia (OR = 1.134, 95% CI: 1.006-1.289). Co Xiaohui; Zhang, acid associated with log(2)-unit increment in perfluoro-n-decanoic acid (PFDA) was -0.081 Mingyue; Liu, significant linear dose-response pattern was found between log(2)-transformed PFOA conc Yong; Chen, Yu; analyses indicated a non-significant overall effect of PFASs mixture on uric acid. CONCLUS Tang, Nai-Jun between PFOA and PFDA and uric acid, and between PFOA and hyperuricemia were found joint effect of PFASs mixture on uric acid was not observed in the BKMR model, which prov and risk assessment of PEASs Exposures to per- and polyfluoroalkyl substances (PFAS) cause oxidative stress, a risk facto and cardiovascular diseases. The antiaging protein klotho is known to act as an anti-oxidativ interacts with PFAS has not been reported. This study among 3981 US adults aged 40-79 ye internal PFAS contamination to α -klotho across stages of estimated glomerular filtration rat albuminuria defined as urinary albumin creatinine ratio of >30 mg/g creatinine. In the absen Associations between the concentrations of α -klotho based kidney function was in stage GF-1 (eGFR \geq 90 mL/min/1.73 m(2)), statistically signif ヒト (腎 Jain, Ram B; Sci Total Environ. 2022 Sep 10;838(Pt 1):155994. doi: klotho and PFNA ($\beta = -0.04930$, p < 0.01), PFDA ($\beta = -0.03307$, p = 0.02), and PFUnDA (β and selected perfluoroalkyl substances in the D989 2022 毒性) presence of eGFR based kidney function and 10.1016/j.scitotenv.2022.155994. Epub 2022 May 17. 0.03011, p = 0.04) and PFOS (β = -0.03126, p = 0.03) were noted. No associations between Ducatman, Alan albuminuria: Data for US adults aged 40-79 years when kidney function was in stages GF-2 ($60 \le eGFR < 90 \text{ mL/min}/1.73 \text{ m}(2)$) or GF-3A (45 the presence or absence of albuminuria. Unexpectedly, however, in the absence of albumin 3B/4 (15 \leq eGFR < 45 mL/min/1.73 m(2)), associations were positive between α -klotho ar PFNA (β = 0.18373, p < 0.1), PFDA (β = 0.20413, p < 0.01), PFUnDA (β = 0.17660, p < 0. The inverse relationship of PFAS to the antioxidant protein α -klotho in those with healthy k reported and should be evaluated in other populations. Per- and polyfluoroalkyl substances (PFAS) are ubiquitously detected in populations worldw The objective of the study was to determine longitudinal associations of plasma PFAS conce Lin, Pi-I D; filtration rate (eGFR) and evaluate whether a lifestyle intervention modify the associations. Cardenas, randomized to the lifestyle or placebo arms in the Diabetes Prevention Program (DPP, 1996-Andres; Hauser, (DPPOS, 2002-2014). We ran generalized linear mixed models accounting a priori covariates Russ: Gold baseline PFAS concentrations and repeated measures of eGFR, separately, for six PFAS (PF Diane R: MeFOSAA, PFNA); then used quantile-based g-computation to evaluate the effects of the si Kleinman, Ken P; Per- and polyfluoroalkyl substances and kidney cohort was 64.9% female; 73.4% 40-64 years-old; 29.4% with hypertension; 50.5% randomize ヒト (腎 Environ Int. 2021 Mar;148:106375. doi: 2021 10.1016/j.envint.2020.106375. Epub 2021 Jan 19. D990 Hivert, Mariefunction: Follow-up results from the Diabetes placebo and had similar plasma PFAS concentrations as the general U.S. population in 1999 毒性) France; Calafat, Prevention Program trial kidney function (eGFR > 90 mL/min/1.73 m(2)) over the approximately 14 years of follow-up Antonia M: concentrations during DPP were inversely associated with eGFR during DPPOS follow-up. E plasma concentration of the 6 PFAS as a mixture was associated with 2.26 mL/min/1.73 m(Webster, Thomas F: DPPOS Year 5, approximately 9 years since DPP randomization and PFAS measurements. T Horton, Edward associations, but inverse associations were stronger among participants with hypertension S; Oken, Emily we found inverse associations between baseline plasma PFAS concentrations and measure follow-up. The lifestyle intervention of diet, exercise and behavioral changes did not modify hypertension may have heightened susceptibility.

	備考	出 情 対 報 象 抽	ン 文 煎 ラ	ン 文 ク 献 ② ラ
yl substances (PFASs) on kidney, but Serum PFASs concentrations were ss spectrometry. The associations of riable linear and logistic regression e-response relationships between odel with a hierarchical variable um perfluoro-1-octanesulfonate o concentrations of 16.80 ng/ml and ch elevated uric acid level ($\beta = 0.088$, inversely, the estimated change of uric mg/dL (95% CI: -0.154, -0.009). A entration and uric acid level. BKMR IONS: Significant associations n the single-pollutant models, but the ded new insights in regulation policies			В	В
per for tissue damage leading to kidney we agent, and how klotho homeostasis ears old evaluated relationships of te or eGFR-based kidney function and acce of albuminuria and when eGFR dicant inverse associations between α - $\beta = -0.03451$, p = 0.01), PFHxS (β = - th α -klotho and PFAS were observed $5 \le eGFR < 60 \text{ mL/min/1.73 m(2)}$) in uria, with kidney function in stage GF- the d PFOA (β = 0.20989, p < 0.01), 01), and PFOS (β = 0.14267, p < 0.01). idney function has not been previously			В	С
vide and may hinder kidney function. entrations with estimated glomerular We studied 875 participants initially -2002) trial and Outcomes Study et to evaluate the associations between FOS, PFOA, PFHxS, EtFOSAA, fix PFAS chemicals as a mixture. The ed to lifestyle intervention and 49.5% to l-2000. Most participants had normal p. We found that plasma PFAS (ach quartile increase in baseline 2) lower eGFR (95% CI: -4.12, -0.39) at he lifestyle intervention did not modify at baseline. Among prediabetic adults, s of eGFR throughout 14 years of the associations, but persons with			В	В

分野 タイトル 発行年 書誌情報 要旨 (原文) No. 著者 (参考) INTRODUCTION: Perfluorooctanoic acid (PFOA) has been associated with kidney cancer in conducted a pooled analysis of two large studies of PFOA and renal cell carcinoma (RCC, the cancer); one from the National Cancer Institute (NCI) (324 cases and controls), and a secon cases and 511 controls). Serum PFOA levels were estimated a median of 8 years before diag conditional logistic regression. Lifetime risk of kidney cancer per unit serum PFOA concentr calculated. RESULTS: The 25th, 50th and 75th percentiles of serum PFOA levels were 4.8, 7. Steenland, K; Environ Int. 2022 Sep;167:107425. doi: analysis. The preferred model for the pooled datawas a two-piece linear spline model (knot ヒト (発 Hofmann, J N; Risk assessment for PFOA and kidney cancer based D991 odds of RCC increased 0.1349 per 1 ng/ml increase in serum PFOA up to the knot (eg, an OF がん性) Silverman, D T; on a pooled analysis of two studies 10.1016/j.envint.2022.107425. Epub 2022 Jul 22. to the knot), and was flat thereafter. The estimated lifetime excess risk (cancer slope factor Bartell, S M 0.0018, similar to the excess risk of 0.0026 recently reported by CalEPA based on different m 2.3 years and a distribution volume of 170 ml/kg for PFOA, our results are equivalent to 0.01 limit excess lifetime kidney cancer risk to 1/1,000,000, our data suggest a limit of 0.0015 ng/ water, similar to CalEPA's proposed Public Health Goal and the new US EPA Drinking Water results correspond reasonably well with cancer slope factors developed by other investigator suggest drinking water limits similar to new recommendations by the US EPA. Currently, studies on the association between per-/polyfluoroalkyl substances (PFAS) conce residents, especially teenagers, living near fluorochemical industrial plants, are relatively rar associations. In this cross-sectional study, 775 local teenagers (11-15 years old) were include PFAS were measured. Perfluorooctanoic acid (PFOA) was found to be the dominant PFAS w Xie, Lin-Na; ng/mL (mean = 191 ng/mL), accounting for 71.5-99.1% of Σ PFAS. Statistical analyses dem Wang, Xiaoperfluoroalkyl carboxylic acids (PFCA, C8-C10) was related to the plant. In addition, the prev Chen; Su, Li-Qin Serum concentrations of per-/polyfluoroalkyl (CKD) (35.0%) in the participants was relatively high. A significantly positive association was Ji, Sai-Sai; Dong, PFOA concentration and increasing risk of CKD (OR = 1.741; 95% CI: 1.004, 3.088; p = 0.048 substances and its association with renal function ヒト (腎 Xiao-Jie; Zhu, Environ Pollut. 2022 Jun 1;302:119020. doi: 2022 10.1016/j.envpol.2022.119020. Epub 2022 Feb 17. D992 parameters among teenagers near a Chinese mass index (BMI), and household income. Similar positive correlation was also observed in 毒性) Hui-Juan: Hou. 1.031, 2.572; p = 0.037). However, no significant correlation was observed for concentrations fluorochemical industrial plant: A cross-sectional Sha-Sha; Wang, Furthermore, linear regression analyses demonstrated that none of the PFAS concentrations study Cong; Li, Zhenestimated glomerular filtration rate (eGFR) or urine albumin/urine creatinine ratio (ACR) (p Huan; Dong, negative correlation was observed between PFOA concentration and abnormal ACR (β = -0 Bing; Zhu, Ying after stratifying by CKD. Sensitivity analyses further confirmed these results. This cross-sec knowledge, to investigate the association between PFAS concentrations and renal function industrial plant. Further prospective and metabonomic studies are needed to interpret the re mechanisms underlying this association. INTRODUCTION: The objective of this study was to validate the hypothesis that increased s substances (PFASs) cause kidney damage. A causal interpretative study was designed using and Nutrition Examination Survey (NHANES) datasets. METHODS: Three statistical models, regression, generalized additive model, and regression discontinuity model (RDM), were app Perfluoroalkyl substances (PFASs) exposure and datasets to evaluate the causal relationship between the four PFAS agents and estimated gl kidney damage: Causal interpretation using the US Environ Pollut. 2021 Nov 1;288:117707. doi: ヒト (腎 Directed acyclic graphs were plotted for a more valid causal inference. RESULTS AND DISC D993 Moon, Jinyoung 2021 毒性) 2003-2018 National Health and Nutrition Examination 10.1016/j.envpol.2021.117707. Epub 2021 Jul 6. natural logarithm of each PFAS agent increases by 1 ng/mL after each cut-off value, eGFR Survey (NHANES) datasets perfluorooctanoic acid, 3.42 mL/min/1.73 m(2) for perfluorooctane sulfonic acid, 2.37 mL/m sulfonic acid, and 2.87 mL/min/1.73 m(2) for perfluorononanoic acid. The possibility of reve PFAS concentration is the consequence of reduced eGFR, not the cause, was low, and an ac confounders was not needed. CONCLUSION: This study contributes to the understanding of Further longitudinal epidemiological and toxicological studies are recommended.

	備考	出 村 報 抽	ン 文 ク 献 ① ラ	ン ク ② ラ
human studies. METHODS: We e most common type of kidney d from the C8 Science Panel (103 gnosis. Analyses were conducted via ation and per unit dose were .3, and 23.9 ng/ml for the pooled at 12.5 ng/ml serum PFOA); the log R of 2.02 (1.45-2.80) from the median) with an exposure of 1 ng/ml was nethods. Assuming a serum half-life of .28 per ng/kg/d of PFOA intake. To /L (0.0015 ppt) for PFOA in drinking r Health Advisory. CONCLUSIONS: Our rs using published summary data, and		1	A	A
entrations and the renal function of re, and not all these studies suggested ded, and serum concentrations of 18 with a concentration of 22.3-3310 onstrated that internal exposure of valence rate of chronic kidney disease s observed between the increase in 8) by adjusting for gender, age, body PFHpA with CKD (OR = 1.628, 95% CI: s of other PFAS and CKD ($p > 0.05$). s were significantly correlated with > 0.05). However, a significantly 0.141, 95% CI: -0.283, 0.001; $p = 0.048$) tional study is the first, to our in teenagers living near a Chinese esults and clarify the biological			В	A
erum concentrations of perfluoroalkyl g the US 2003-2018 National Health , including multivariable linear olied to the US 2003-2018 NHANES lomerular filtration rate (eGFR). USSION: In the RDM, when the decreased 4.63 mL/min/1.73 m(2) for iin/1.73 m(2) for perfluorohexane rse causation that increased serum dditional adjustment of potential f PFAS-induced kidney damage.		1	A	A

No.	分野 (参考)	著者	タイトル	発行年書誌情報	要旨(原文)	備考	出情 ン文 対報 ク献 象抽 ① ラ	ン 文 ク 献 ② ラ
D994	ヒト (腎 毒性)	Ferrari, Fiorenza; Manera, Miriam; Mongodi, Silvia; Esposito, Pasquale; Ronco, Claudio	The Role of Perfluorinated Compound Pollution in the Development of Acute and Chronic Kidney Disease	2021 Epub 2021 Aug 4.	Clinical Background: Poly- and perfluorinated compound (PFCS) pollution has been found to be the driver of different diseases, including glucose intolerance, hyperlipidemia, thyroid diseases, gestational diabetes mellitus and hypertension, testicular and genitourinary cancer, as well as impaired kidney function. This review focuses on the renal effects of PFCS, intending to clarify their occurrence and pathogenetic mechanisms. Epidemiology: Between October 31st, 2017, and March 31st, 2020, most frequently analyzed PFCS were perfluorooctane sulfonate, perfluorooctanoic acid, sodium perfluoro-1-hexanesulfonate, perfluoro-n-nonanoic acid, and perfluoro-n-decanoic acid. Unfortunately, the novel replacement compounds (e.g., perfluoroether carboxylic 1. acid) are unregulated, and they are not under study. PFCS are linked with an impaired kidney function: the kidney is a target of PFCS because it is involved in their excretion. Inter- and intra-species variations exist and affect PFCS pharmacokinetics, leading to different risk profiles of adverse effects, even at similar exposures, and influencing the risk of renal damage in case of concomitant exposure to PFCS and some heavy metals. Challenges, Prevention and Treatment: In the last 20 years, much effort has been made to stop the PFCS production in Europe and USA. However, human exposure remains persistently high due to PFCS long half-life, the large-scale production in some countries and the unregulated novel compounds. This context makes further studies mandatory to understand the pathogenetic mechanisms of old and new PFCS and the effective strategies to remove PFCS from the human blood in the most affected areas of the world.		C	С
D995	ヒト (腎 毒性)	Cui, Shu; Zhao, Xinghua; Chu, Xiaohan; Zhang, Shengwei; Gu, Qingyang; Xu, Changbao	Effect of polyfluoroalkyl chemicals on the occurrence of urge urinary incontinence: a population-based study	2021 Ther Adv Urol. 2021 Jul 27;13:17562872211029799. doi: 10.1177/17562872211029799. eCollection 2021 Jan-Dec.	BACKGROUND: The artificial fluorinated group of compounds polyfluoroalkyl chemicals (PFCs) has been applied extensively in daily life for decades, and is present in food, drinking water, and indoor dust. The nephrotoxicity of PFCs has been widely studied for its characteristics of being mainly excreted through passing urine and affecting urodynamics. This work aimed to investigate the relationship between PFCs and the occurrence of urge urinary incontinence (UUI) in the United States (US) population. METHODS: There were 3157 eligible female participants retrieved from the National Health and Nutrition Examination Survey (NHANES) between 2007 and 2014. A logistic regression model was used to examine the relationship between UUI and eight kinds of PFCs. The dose-response relationship was investigated through restricted cubic spline analysis in this retrospective study. RESULTS: Of the 3157 eligible female participants, 913 self-reported a history of UUI. Total PFCs, perfluorohexane sulfonic acid (PFHS), 2-(N-methyl-perfluorooctane sulfonamido) acetate (MPAH), and perfluorononanoic acid (PFNA) correlated positively with the occurrence of UUI after adjusting for age, race, education, vigorous recreational activities, hypertension, diabetes, body mass index (BMI), creatinine, and estimated glomerular filtration rate (eGFR). Based on the results of sub-group analysis, the increasing tertiles contained odds ratios [OR; 95% confidence intervals (CI)] of 1.25 (95% CI, 1.03-1.51, p = 0.026) and 1.56 (95% CI, 1.29-1.89, p < 0.001) for total PFCs compared with the lowest tertile. The OR for PFHS, MPAH, and PFNA were 1.75, 1.71, and 1.41 respectively, in the highest tertile. CONCLUSION: This study investigated the relationship between PFCs and UUI in female and found total PFCs, PFHS, MPAH, and PFNA were positively correlated with the risk of UUI. The results will contribute to developing individualized treatment for female patients suffering UUI.		В	C
D996	ヒト (腎 毒性)	Mao, Weipu; Hu, Qiang; Chen, Saisai; Chen, Yu; Luo, Ming; Zhang, Ziwei; Geng, Jiang; Wu, Jianping; Xu, Bin; Chen, Ming	Polyfluoroalkyl chemicals and the risk of kidney stones in US adults: A population-based study	2021 Ecotoxicol Environ Saf. 2021 Jan 15;208:111497. doi: 10.1016/j.ecoenv.2020.111497. Epub 2020 Oct 19.	The potential nephrotoxicity of polyfluoroalkyl chemicals (PFCs) have received extensive attention. However, the relationship between PFCs and the risk of kidney stones remain unclear. This study aimed to examine the level of PFCs in the US population and its relationship with the risk of kidney stones. We investigated the serum levels of six PFCs in 8453 adult participants (\geq 20 years) from the National Health and Nutrition Examination Survey (NHANES) between 2007 and 2016, including perfluorodecanoic acid (PFDE), perfluorohexane sulfonic acid (PFHS), 2-(N-methyl-perfluorooctane sulfonamido) acetate (MPAH), perfluorononanoic acid (PFNA), perfluoroundecanoic acid (PFUA), and perfluorododecanoic acid (PFDO). Logistic regression model was used to evaluate the correlation between PFCs and kidney stones. Of the 8453 participants, 787 self-reported a history of kidney stones. After adjusting for gender, age, race, education, marital status, body mass index (BMI), hypertension, diabetes and estimated glomerular filtration rate (eGFR), we found that total PFCs and PFHS were positively correlated with the risk of kidney stones. Compared with the lowest tertile, the odds ratios with 95% confidence intervals (CI) with increasing tertiles were 1.30 (95% CI,1.08-1.59, p = 0.007) and 1.25 (95 CI%,1.00-1.52, p = 0.024) for total PFCs and 1.24 (95 CI%,1.03-1.51, p = 0.032), and 1.35 (95 CI,1.10-1.68, p = 0.005) for PFHS. Our study shows that total PFCs and PFHS were associated with an increased risk of kidney stones		В	В

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ンコ 対報 ク 象抽 ① :	文 ン文 新 ク 献 フ フ
D997	ヒト (腎 毒性)	Su, Fan; Zeeshan, Mohammed; Xiong, Li-Hua; Lv, Jia-Yun; Wu, Yan; Tang, Xiao- Jiang; Zhou, Yang; Ou, Yan- Qiu; Huang, Wen-Zhong; Feng, Wen-Ru; Zeng, Xiao-Wen; Dong, Guang-Hui	Co-exposure to perfluoroalkyl acids and heavy metals mixtures associated with impaired kidney function in adults: A community-based population study in China	2022	Sci Total Environ. 2022 Sep 15;839:156299. doi: 10.1016/j.scitotenv.2022.156299. Epub 2022 May 26.	BACKGROUND: Previous studies have separately linked either perfluoroalkyl acid (PFAA) or heavy metal exposure with kidney dysfunction. However, the relationships of co-exposure to PFAAs and heavy metals with kidney function are still unclear. OBJECTIVES: To explore the associations between exposure to PFAAs and heavy metals mixtures and kidney function in adults. METHODS: We conducted a cross-sectional community-based population study in Guangzhou, China, enrolling 1312 adults from November 2018 to August 2019. We quantified 13 PFAAs in serum and 14 heavy metals in plasma. We chose estimated glomerular filtration rate (eGFR) and chronic kidney disease (CKD) as outcomes of interest. Distributed lag non-linear models (DLNMs) were used to check nonlinearity of individual pollutant with kidney function. Joint associations of pollutant mixtures on kidney function were assessed by Bayesian Kernel Machine Regression (BKMR) models. We further explored modification effects of gender. RESULTS: Most individual PFAA and heavy metal were associated with declined kidney function in single-pollutant models. We also observed significant dose-response relationships of pollutant mixtures with reduced eGFR levels and increased odds of CKD in BKMR models. Perfluoroheptanesulfonic acid (PFHpS), arsenic (As) and strontium (Sr) were the predominant contributors among pollutant mixtures. A change in log PFHpS, As and Sr concentrations from the 25th to the 75th percentile were associated with a decrease in eGFR of -5.42 (95% confidence interval (CI): -6.86, -3.98), -2.14 (95% CI: -3.70, -0.58) and -1.87 (95% CI: -3.03, -0.72) mL/min/1.73 m(2), respectively, when other pollutants were at their median values. In addition, the observed associations were more obvious in females. CONCLUSIONS: We provided new evidence that co-exposure to PFAAs and heavy metals mixtures was associated with reduced kidney function in adults and PFHpS, As and Sr appeared to be the major contributors. Further		В	A
D998	ヒト (腎 毒性)	Hsu, Chien-Ning; Tain, You-Lin	Adverse Impact of Environmental Chemicals on Developmental Origins of Kidney Disease and Hypertension	2021	Front Endocrinol (Lausanne). 2021 Oct 14;12:745716. doi: 10.3389/fendo.2021.745716. eCollection 2021.	studies are warranted to confirm our findings and elucidate the underlying mechanisms.Chronic kidney disease (CKD) and hypertension are becoming a global health challenge, despite developments in pharmacotherapy. Both diseases can begin in early life by so-called "developmental origins of health and disease" (DOHaD).Environmental chemical exposure during pregnancy can affect kidney development, resulting in renal programming. Here, we focus on environmental chemicals that pregnant mothers are likely to be exposed, including dioxins, bisphenol A (BPA), phthalates, per- and polyfluoroalkyl substances (PFAS), polycyclic aromatic hydrocarbons (PAH), heavy metals, and air pollution. We summarize current human evidence and animal models that supports the link between prenatal exposure to environmental chemicals and developmental origins of kidney disease and hypertension, with an emphasis on common mechanisms. These include oxidative stress, renin-angiotensin system, reduced nephron numbers, and aryl hydrocarbon receptor signaling pathway. Urgent action is required to identify toxic chemicals in the environment, avoid harmful chemicals exposure during pregnancy and lactation, and continue to discover other potentially harmful chemicals. Innovation is also needed to identify kidney disease and hypertension in the earliest stage, as well as translating effective reprogramming interventions from animal studies into clinical practice. Toward DOHaD approach, prohibiting toxic chemical exposure and better understanding of underlying mechanisms, we have the potential to reduce global burden of kidney disease and hypertension.		В	C
D999	ヒト(血液毒性)	Lin, Chien-Yu; Lee, Hui-Ling; Wang, Chikang; Sung, Fung- Chang; Su, Ta- Chen	Association between the total plasma isomers of per- and polyfluoroalkyl substances and erythrograms in young and middle-aged Taiwanese populations	2021	Ecotoxicol Environ Saf. 2021 Dec 20;227:112902. doi: 10.1016/j.ecoenv.2021.112902. Epub 2021 Oct 14.	PURPOSE: Per- and polyfluoroalkyl substances (PFAS) are human-made chemicals used in daily use products. Recent studies have shown that different perfluorooctanoic acid (PFOA) and/or perfluorooctane sulfonate (PFOS) isomers may have different biological effects. In vitro studies have also reported that PFAS exposure can alter the structure of hemoglobin (Hb). In epidemiology, however, few studies have investigated the relationship between PFAS exposure and erythrocytes. Additionally, the correlation between PFOA/PFOS isomers and full erythrograms has never been explored. APPROACH AND RESULTS: In cohorts comprising young and middle-aged Taiwanese populations, we enrolled 1483 participants (aged between 12 and 63 years) to analyze the correlations between the plasma levels of PFOA/PFOS isomers and whole-blood erythrograms. The study comprised 868 men and 615 women with a mean age of 31.2 years. When all PFOA/PFOS isomers were entered into the multiple linear regression model, the linear PFOA (L-PFOA) levels were positively correlated with the Hb, hematocrit (HCT), mean corpuscular volume (MCV), and mean corpuscular hemoglobin (MCH) levels while the branched PFOS (B-PFOS) levels were positively associated with the Hb, HCT, and mean corpuscular hemoglobin concentration (MCHC). The mean value of Hb was the highest (14.66 mg/dL (95% CI =14.52-14.80); P for trend <0.001) when both the L-PFOA and B-PFOS levels were above the 50th percentile. CONCLUSIONS: The results imply that PFOA/PFOS isomers may increase the weight and volume of Hb/RBC and that L-PFOA/B-PFOS may have an additive effect on the Hb levels. However, it is also possible PFAS detected at a higher concentration may due to its binding to higher levels of Hb. Further studies are needed to investigate the effects of PFOA/PFOS isomers on RBCs in humans.		В	В

分野 タイトル 発行年 要旨 (原文) No 著者 書誌情報 (参考) PURPOSE: Per- and polyfluoroalkyl substances (PFAS) are a class of man-made chemicals and epidemiological reports have found that PFAS exposure can modify the function of plate affect platelet activity, and thrombograms are a simple method of indirect assessment of pla been no large-scale research investigating the association between PFAS levels and comple APPROACH AND RESULTS: In the current cross-sectional study, we enrolled 1779 Taiwane Lin, Chien-Yu years) to study the associations between serum PFAS concentrations and thrombograms. T Wang, Chikang; with a mean age of 34.5 years. When all four PFAS were fitted by the multiple linear models Association between serum per- and polyfluoroalkyl ヒト (血 Ecotoxicol Environ Saf. 2022 May 1;236:113457. doi: D1000 substances and thrombograms in young and middle-2022 decreased significantly with increasing quartiles of perfluorooctanoate acid (PFOA) and per Sung, Fung 液毒性) 10.1016/j.ecoenv.2022.113457. Epub 2022 Mar 30. Chang; Su, Taplatelet distribution width (PDW), mean platelet volume (MPV), and platelet-large cell ratio aged Taiwanese populations Chen with increasing quartiles of PFOS. The mean platelet count was the lowest (264.02 k/µL [95 both PFOA and PFOS concentrations were above the 50th percentile. CONCLUSIONS: We re correlated with thrombograms. If the association is etiologic, PFOA/PFOS may decrease the also increase the variation and the average size of platelets in the subjects of the study. Inte synergistic effects on the decrease in platelet counts. Further research is needed to study th humans For the first time (N = 6291), a study was undertaken to estimate associations between the folate (RBCF) and concentration of six perfluoroalkyl acids (PFAAs), namely, perfluorooctan sulfonic acid (PFOS), perfluorohexane sulfonic acid (PFHxS), perfluorodecanoic acid (PFDA) perfluoroundecanoic acid (PFUnDA) for US adults aged ≥20 years by fitting regression mode and Nutrition Examination Survey for 2007-2014. In almost consistent fashion, increasing co associated with decreasing concentrations of RBCF. For the total population, for a 10% incre PFOS, PFDA, PFHxS, PFNA, and PFUnDA, percent decreases in RBCF concentrations were Impact of the increasing concentrations of selected ヒト (血 Environ Sci Pollut Res Int. 2021 Oct;28(37):52357-52369 0.16%, 0.89%, and 0.43%, respectively. RBCF concentrations of PFAAs were found to be 110 D1001 Jain, Ram B perfluoroalkyl acids on the observed concentrations of 2021 液毒性) doi: 10.1007/s11356-021-14454-9. Epub 2021 May 19. the four quartiles of PFOS; 112, 1068, 1009, and 948 nmol/L across the four quartiles of PFC red blood cell folate among US adults aged ≥20 vears across the four quartiles of PFNA; and 1099, 1094, 989, and 952 nmol/L across the four qua carboxylic acids with carbon chain length > 8 decreased concentrations of RBCF to a greate length \leq 8. Perfluorinated chemicals with a sulfonic group with carbon chain length > 6 dec greater degree than those carbon chain length \leq 6. The degree to which concentrations of F and race/ethnicity. Non-Hispanic blacks as compared to non-Hispanic whites and Hispanics concentrations. Mechanisms responsible for negative associations between RBCF and PFAA will need to be researched further. BACKGROUND: Perfluoroalkyl chemicals (PFCs) are widely detected in the environment and linked to asthma and a number of respiratory responses in children and mice. However, no p association between exposure to PFCs and airway inflammation in adults. OBJECTIVES: To serum PFCs and fractional exhaled nitric oxide (FeNO), a biomarker of airway inflammation sectional study of 3630 adults aged 20-79 years who participated in the National Health and (NHANES, 2007-2012) was conducted. Serum concentrations of five major PFCs were meas method, including perfluorohexane sulfonic acid (PFHxS), perfluorononanoic acid (PFNA), pe 2021 Environ Res. 2021 Jul;198:110450. doi: Xu, Huadong; Association between exposure to polyfluoroalkyl perfluorooctane sulfonic acid (PFOS), and perfluorodecanoic acid (PFDE). The detection rate ヒト (呼 D1002 Mao, Yu; Hu, chemicals and increased fractional exhaled nitric multivariable linear regression and Bayesian kernel machine regression (BKMR) analyses we 吸器) 10.1016/j.envres.2020.110450. Epub 2020 Nov 11. associations between serum PFCs and FeNO. RESULTS: After adjusted for potential confou Yanan: Xu. Bucai oxide in adults analyses found that compared with their lowest tertiles, highest tertiles of PFOS, PFDE and with 5.02% (95% CI: 1.40%, 8.77%), 3.77% (95% CI: 0.30%, 7.36%) and 6.34% (95% CI: 2.81%, respectively. The second tertile of PFNA was significantly correlated with a 4.79% (95% CI: compared with the lowest tertile. In the BKMR analysis, the mixture effect of PFCs on FeNO levels were at or above the 60th percentiles compared to those at their medians. PFOS and single-exposure effects on FeNO when all the other PFCs are set at a particular threshold. C preliminary evidence that serum PFCs were positively associated with increased FeNO in a

	備考	出 情 対 報 象 抽	ン 文 ク 献 ① ラ	ン 文 ク 献 ② ラ
used in many products. Recent in vitro elets. Platelet size has been shown to atelet function. However, there has the thrombograms in humans. se subjects (aged between 12 and 63 here were 1175 men and 604 women at the same time, platelet counts fluorooctane sulfonate (PFOS), while (PLCR) also increased significantly % CI 256.00-272.04]; P < 0.001) when eport that serum PFAS levels were number of platelets, while PFOS may erestingly, PFOA and PFOS may have the effect of PFAS on platelets in			В	В
concentratio ns of red blood cell oic acid (PFOA), perfluorooctane), perfluorononanoic acid (PFNA), and els for the data from National Health ncentrations of PFAAs were ease in the concentrations of PFOA, found to be 0.33%, 0.66%, 0.83%, 4, 1042, 100, and 936 nmol/L across DA; 1125, 1054, 1005, and 967 nmol/L rtiles of PFUnDA. Perfluorinated r degree than those carbon chain reased concentrations of RBCF to a RBCF decrease varied by age, gender, s had the lowest decreases in RBCF A concentrations are not known and			В	С
d human body, and they have been previous studies have investigated the evaluate the associations between in adults. METHODS: A cross- d Nutrition Examination Survey ured using SPE-HPLC-TIS-MS/MS erfluorooctanoic acid (PFOA), es of them were all >85%. Weighted ere applied to examine the nding factors, linear regression PFOA were significantly associated 10.01%) increases in FeNO, 41%, 8.29%) increase in FeNO increased significantly when the PFC PFOA displayed significant positive CONCLUSIONS: This study provided lults.			A	В

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン 文 ク 献 ① ラ	ン 文 ク 献 ② ラ
D1003	ヒト (骨 毒性)	Højsager, F D; Andersen, M; Juul, A; Nielsen, F; Möller, S; Christensen, H T; Grøntved, A; Grandjean, P; Jensen, T K	Prenatal and early postnatal exposure to perfluoroalkyl substances and bone mineral content and density in the Odense child cohort	2022	Environ Int. 2022 Sep;167:107417. doi: 10.1016/j.envint.2022.107417. Epub 2022 Jul 16.	INTRODUCTION: Exposure to perfluoroalkyl substances (PFAS) has been associated with lower bone mineral density (BMD) in animal and human studies, but prospective data from children are limited. OBJECTIVES: To determine associations between prenatal and early postnatal PFAS exposure and BMD at age 7 years. METHODS: In the Odense Child Cohort, Denmark, pregnant women were recruited in 2010-2012, and their children were invited for subsequent health examinations. At 12 weeks of gestation the pregnant women delivered a serum sample, and at age 18 months serum was obtained from the child to measure perfluoroctane sulfonic acid (PFOS), perfluoroctanoic acid (PFOA), perfluorohexane sulfonic acid (PFHxS), perfluoronanoic acid (PFNA) and perfluorodecanoic acid (PFDA) by LC-MS/MS. At age 7 years DXA scans were performed to measure bone mineral content (BMC) and BMD Z-score. PFAS in pregnancy (n = 924) and/or at age 18 months (n = 511) were regressed against DXA measurements, adjusted for maternal education, child height Z-score, sex (for BMC) and for postnatal exposure, additionally duration of total breastfeeding. We additionally performed structural equation models determining combined effects of pre-and postnatal PFAS exposures. RESULTS: Higher prenatal and early postnatal serum concentrations of all measured PFAS were associated with lower BMC and BMD Z-scores at age 7 years, all estimates were negative although not all significant. For each doubling of prenatal or 18-month exposure to PFDA, BMD Z-scores were lowered by -0.07 (95 % CI -0.10; -0.03) and -0.14 (-0.25; -0.03), respectively after adjustment. Pre- and postnatal PFAS exposure. DISCUSSION: Bone density is established in childhood, and a reduction in BMD during early childhood may have long-term implication for peak bone mass and lifelong bone health. Future studies of the impact of PFAS exposure on fracture incidence will help elucidate the clinical relevance.			В	В
D1004	ヒト (骨 毒性)	Xiong, Xianmei; Chen, Baihang; Wang, Zhongqing; Ma, Liqiong; Li, Shijie; Gao, Yijia	Association between perfluoroalkyl substances concentration and bone mineral density in the US adolescents aged 12-19 years in NHANES 2005-2010	2022	Front Endocrinol (Lausanne). 2022 Oct 5;13:980608. doi: 10.3389/fendo.2022.980608. eCollection 2022.	BACKGROUND: Reports on the association of perfluoroalkyl substances (PFASs) exposure with adolescent bone health are scarce, and studies have primarily targeted maternal serum. OBJECTIVE: We evaluated the relationship between autologous serum perfluorooctanoic acid (PFOA), perfluorooctane sulfonic acid (PFOS), perfluorohexane sulfonic acid (PFHXS) and perfluoronanoic acid (PFNA) levels and bone mineral density (BMD) in adolescents. METHODS: We analyzed data from 1228 adolescents aged 12-19 years in the National Health and Nutrition Examination Survey (NHANES) 2005-2010 and used multiple regression analysis to identify the relationship between serum PFOA, PFOS, PFHXS, and PFNA concentrations and total femur, femoral neck, and lumbar spine BMD, in addition to multiple stratified subgroup analyses. RESULTS: The mean age of participants was 15 years, males had higher serum PFOA, PFOS, and PFNA concentrations were negatively correlated with total femur, femoral neck, and lumbar spine BMD (all p < 0.05), and In-PFHxS was positively correlated with total femur and femoral neck BMD (all p< 0.05). In males, In-PFOA was negatively associated with total femur and lumbar spine BMD (all p< 0.05), In-PFOS was associated with the reduced total femur, femoral neck, and lumbar spine BMD (all p< 0.05), In-PFOS was associated with the increased total femur and femoral neck BMD (all p< 0.05), and In-PFNA was negatively correlated with total femur and lumbar spine BMD (all p< 0.05), In-PFOS was associated with the increased total femur and femoral neck BMD (all p< 0.05), and In-PFNA was negatively correlated with total femur and femoral neck BMD (all p< 0.05), and In-PFNA was negatively correlated with total femur and femoral neck BMD (all p< 0.05), and In-PFNA was negatively correlated with total femur and femoral neck BMD (all p< 0.05), and In-PFNA was negatively correlated with total femur and femoral neck BMD (all p< 0.05), and In-PFNA was negatively correlated with total femur and femoral neck BMD (all p< 0.05). CONCLUSIONS: I			В	В
D1005	ヒト (骨 毒性)	Buckley, Jessie P	Bone Accrual During Adolescence: Do Endocrine- Disrupting Chemicals Play a Role?	2022	J Clin Endocrinol Metab. 2022 Sep 28;107(10):e4242-e4243 doi: 10.1210/clinem/dgac391.	No abstract available			D	D

No.	分野 (参考)	著者	タイトル 発	论行年	書誌情報	要旨(原文)	備考	出情 ン文 対報 ク献 象抽 ① ラ	、 ン文 え ク献 の フ
D1006	ヒト (骨 毒性)	Blomberg, Annelise; Mortensen, Jann; Weihe, Pál; Grandjean, Philippe	Bone mass density following developmental exposures to perfluoroalkyl substances (PFAS): a longitudinal cohort study	2022	Environ Health. 2022 Nov 19;21(1):113. doi: 10.1186/s12940- 022-00929-w.	Background: Environmental exposures to industrial chemicals, including perfluoroalkyl substances (PFAS), may play a role in bone development and future risk of osteoporosis. However, as prospective evidence is limited, the role of developmental PFAS exposures in bone density changes in childhood is unclear. The objective of this study was to estimate associations between serum-PFAS concentrations measured in infancy and early childhood and areal bone mineral density (aBMD) measured at age 9 years in a birth cohort of children from the Faroe Islands. Methods: We prospectively measured concentrations of five PFAS in cord serum and serum collected at 18 months, 5 years and 9 years, and conducted whole-body DXA scans at the 9-year clinical visit. Our study included 366 mother-child pairs with DXA scans and at least one PFAS measurement. We estimated covariate-adjusted associations of individual PFAS concentrations with age-, sex- and height-adjusted aBMD z-scores using multivariable regression models and applied formal mediation analysis to estimate the possible impact of by several measures of body composition. We also evaluated whether associations were modified by child sex. Results: We found PFAS exposures in childhood to be negatively associated with aBMD z-scores, with the strongest association seen for perfluoronanoic acid (PFNA) at age 5 years. A doubling in age-5 PFNA was associated with a 0.15 decrease in aBMD z-score (95% CI: - 0.26, - 0.039). The PFNA-aBMD association was significantly stronger in males than females, although effect modification by sex was not significant for other PFAS exposures. Results from the mediation analysis usgested that any potential associations between aBMD and 18-month PFAS exposures. Results from the mediated by total body fat and BMI, although most estimated total effects for PFAS exposures at age 18 months were non-significant. PFAS exposures at age 9 were not associated with age-9 aBMD z-scores. Conclusions: The PFAS-aBMD association sidentified in this and previous stu		В	В
D1007	ヒト (骨 毒性)	Xu, Yiyi; Hansson, Emelie; Andersson, Eva M; Jakobsson, Kristina; Li, Huiqi	High exposure to perfluoroalkyl substances in drinking water is associated with increased risk of osteoporotic fractures - A cohort study from ronneby, Sweden	2022	Environ Res. 2022 Nov 11:114796. doi: 10.1016/j.envres.2022.114796. Online ahead of print.	BACKGROUND: Perfluoroalkyl substances (PFAS) have been reported to be related to decreased bone mineral density, but the relationship with osteoporosis and fractures is less studied. This study aimed to investigate the risks of osteoporotic fractures in a Swedish population with long-term exposure to PFAS through drinking water. METHODS: The Ronneby Register Cohort, including 61,504 individuals who had ever lived in Ronneby during 1985-2013, was used. Exposure to PFAS was assessed according to the yearly residential address with or without highly contaminated water supply and was categorized as 'never-high' and 'ever-high' exposure. The 'ever-high' exposure was further divided into 'early-high' and 'late-high' depending on if the exposure was before or after 2005. Inpatient and outpatient hospital diagnoses of fractures were retrieved from the National Patient Register. Major osteoporotic fractures (MOF, i.e., hip, vertebrae, proximal humerus and distal forearm fractures), and hip fractures were considered as the primary outcomes. Cox proportional hazard models with time-varying exposure were used to estimate the hazard ratios (HRs). Stratified analyses were performed in each sex and age group (<50 yrs and ≥ 50 yrs). RESULTS: Elevated risks of MOF (HR 1.11, 95% CI 1.03-1.19) and hip fractures (1.12, 1.00-1.24) were observed when comparing 'ever-high' to 'never-high' exposure. The HRs were even higher for 'late-high' exposure (MOF: 1.29, 1.16-1.44; hip fractures: 1.22, 1.01-1.47). Further adjustment for highest achieved education slightly attenuated the estimates. Individuals above 50 years old showed even higher HR estimates. Similar patterns were found for all fractures. CONCLUSION: Our results provide further evidence supporting the adverse effects of PFAS on osteoporosis. A better understanding of dose-response relationships as a basis for risk assessment is warranted.		В	В
D1008	ヒト (歯)	Yu, Miao; Tu, Peijun; Dolios, Georgia; Dassanayake, Priyanthi S; Volk, Heather; Newschaffer, Craig; Fallin, M Daniele; Croen, Lisa; Lyall, Kristen; Schmidt, Rebecca; Hertz- Piccioto, Irva; Austin, Christine; Arora, Manish; Petrick, Lauren M	Tooth biomarkers to characterize the temporal dynamics of the fetal and early-life exposome	2021	Environ Int. 2021 Dec;157:106849. doi: 10.1016/j.envint.2021.106849. Epub 2021 Sep 2.	BACKGROUND: Teeth have unique histology that make this biomatrix a time-capsule for retrospective exposure analysis of fetal and early life. However, most analytic methods require pulverizing the whole tooth, which eliminates exposure timing information. Further, the range of chemicals and endogenous exposures that can be measured in teeth has yet to be fully characterized. METHODS: We performed untargeted metabolomics on micro-dissected layers from naturally shed deciduous teeth. Using four liquid-chromatography high-resolution mass spectrometry analytical modes, we profiled small molecules (<1000 Da) from prenatal and postnatal tooth fractions. In addition, we employed linear regression on the tooth fraction pairs from 31 children to identify metabolites that discriminate between prenatal and postnatal exposures. RESULTS: Of over 10,000 features measured in teeth dentin, 390 unique compounds were annotated from 62 chemical classes. The class with the largest number of compounds was carboxylic acids and their derivatives (36%). Of the annotated exogenous metabolites (phthalates, parabens, perfluoroalkyl compounds, and cotinine) and endogenous metabolites (fatty acids, steroids, carnitines, amino acids, and others), 91 are linked to 256 health conditions through published literature. Differential analysis revealed 267 metabolites significantly different between the prenatal and the postnatal tooth fractions (adj. p-value < 0.05, Bonferroni correction), and 21 metabolites exclusive to the prenatal fraction. CONCLUSIONS: The prenatal and early postnatal exposures that is not possible by maternal biomarkers. Indeed, we identified several metabolites exclusively in the prenatal fraction, suggesting unique fetal exposures that are markedly different to postnatal exposures. Expansion of databases that include tooth matrix metabolites will strengthen biological interpretation and shed light on exposures during gestation and early life that may be causally linked with later health conditions.		с	С
パーフルオロ化合物に係る国際機関等の評価及び科学的知見の情報収集並びに整理 別添-2 文献データベース文献リスト

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨 (原文)	備考	出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D1009	ヒト (肺)	Butnor, Kelly J; Covington, Jeffrey; Taatjes, Douglas J; DeWitt, John; Von Turkovich, Michele A	Fluorine detection in the lung tissue of a worker with interstitial pulmonary fibrosis and long-term occupational exposure to polytetrafluoroethylene and perfluorooctanoic acid	2020	Ultrastruct Pathol. 2020 Nov 20;44(4-6):496-500. doi: 10.1080/01913123.2020.1842828. Epub 2020 Nov 17.	Exposure to polytetrafluoroethylene (PTFE), a compound used in nonstick cookware coating and a variety of other applications, is known to cause acute lung injury and granulomatous pneumonitis. It is uncertain whether PTFE and compounds used in its manufacture, such as perfluorooctanoic acid (PFOA), cause chronic lung disease. Here we report a case of interstitial pulmonary fibrosis in a 71-year-old man who died following a brief illness clinically suspected to be acute respiratory distress syndrome. He had a 25-year history of occupational exposure to PTFE and PFOA. At postmortem examination, the lungs demonstrated diffuse alveolar damage (DAD) superimposed on interstitial pulmonary fibrosis. The interstitial fibrosis lacked fibroblast foci and exhibited basilar and subpleural accentuation with focal microscopic honeycombing. Within the fibrotic lung parenchyma were scattered giant cells containing birefringent translucent particles. Scanning electron microscopy and energy-dispersive x-ray spectroscopy (SEM-EDS) were performed. A majority of the birefringent particles demonstrated a prominent peak for fluorine by EDS analysis. This is the first report to document the presence of fluorine, an elemental constituent of PTFE and PFOA, in fibrotic lung tissue. Careful evaluation of other individuals with long-term exposure to PTFE and/or PFOA appears warranted to better elucidate the spectrum of pulmonary disease associated with these compounds.		сс
D1010	ヒト (肺)	Nübler, Stefanie; Esteban López, Marta; Castaño, Argelia; Mol, Hans G J; Haji- Abbas-Zarrabi, Karin; Schäfer, Moritz; Müller, Johannes; Hajslova, Jana; Dvorakova, Darina; Antignac, Jean-Philippe; Koch, Holger M; Haug, Line Små stuen; Vorkamp, Katrin; Göen, Thomas	Interlaboratory Comparison Investigations (ICIs) and External Quality Assurance Schemes (EQUASs) for human biomonitoring of perfluoroalkyl substances (PFASs) in serum as part of the quality assurance programme under HBM4EU	2022	Sci Total Environ. 2022 Nov 15;847:157481. doi: 10.1016/j.scitotenv.2022.157481. Epub 2022 Jul 20.	Perfluoroalkyl substances (PFASs) are of very high concern due to their persistence and accumulative behaviour as well as their manifold adverse health effects. Human biomonitoring (HBM) based on the determination of PFASs in serum samples is an adequate and established strategy for exposure and risk assessment of the population. The suspected health risks associated with exposure levels in the general population call for reliable HBM data verified by Quality Assurance and Quality Control (QA/QC) measures. PFASs were among the chemicals selected as priority substances in HBM4EU, a pan-European project to harmonize and advance HBM within 30 European countries. For this purpose, the analytical comparability and accuracy of PFASs-analysing laboratories was assessed in a QA/QC programme comprising Interlaboratory Comparison Investigations (ICIs) and External Quality Assurance Schemes (EQUASs). This paper presents the evaluation process and discusses the results of four ICI/EQUAS rounds for the determination of eight perfluoroalkyl carboxylic acids and four perfluoroalkyl sulfonic acids (PFBS, PFHxS, PFHpS, PFOS) in serum. All 21 participating laboratories achieved satisfactory results for at least six of these biomarkers, although low limits of quantification (of about 0.1 μ g/L) were required to quantify serum PFAS levels at general population exposure levels. The mean relative standard deviation of the participants' results (study RSD(R)) significantly improved from 22 % to 13 % over all PFAS biomarkers in the course of the four rounds. This QA/QC programme succeeded in establishing a network of laboratories with high analytical comparability and accuracy for the analysis of PFASs across 12 European countries.		сс
D1011	ヒト(酸 化ストレ ス)	Lemos, Leila; Gantiva, Laura; Kaylor, Catherine; Sanchez, Alessandra; Quinete, Natalia	American oysters as bioindicators of emerging organic contaminants in Florida, United States	2022	Sci Total Environ. 2022 Aug 20;835:155316. doi: 10.1016/j.scitotenv.2022.155316. Epub 2022 Apr 18.	Per- and polyfluoroalkyl substances (PFAS) and phthalate esters (PAEs) are emerging contaminants of higher concern due to their wide industrial and commercial use, toxicity, and potential adverse health effects. In this study, we assessed PFAS and PAEs exposure in American oysters collected in three study sites in Florida, USA. Potential physiological effects of these contaminants were assessed by collecting oyster biometric data, calculating condition indices, and assessing oxidative stress levels in these individuals. Finally, a human health risk assessment was conducted based on the concentrations found in the consumable Tampa Bay (TB) oysters. All PFAS and PAEs compounds assessed in this study were detected in at least one oyster in all study sites. Among all locations, Σ PFAS concentration range was 0.611-134.78 ng·g(-1) and Σ PAEs <0.328-1021 ng·g(-1). Despite the smaller size of Biscayne Bay (BB) oysters, they displayed the highest concentrations of most of the PFAS and PAEs compounds, which is likely associated with population size, and other sources in the area. Condition index (CI) III was smaller in BB oysters, likely indicating a stressed population. Even though BB oysters were the most affected individuals, Marco Island (MI) oysters displayed the highest levels of lipid peroxidation, which can also be associated with environmental factors and decreased food availability. Conversely, TB oysters exhibited the highest levels of hydrogen peroxide, likely indicating a better defense mechanism in TB oysters compared to MI oysters. The human health risk assessment for TB oysters indicated low risk from PFAS and PAEs exposure, but there is no reference dose for other compounds and the human diet is wider than only oysters. Therefore, the risk of contaminant exposure is likely higher. This study demonstrates the value of integrating data on contaminant exposure and physiological responses of bioindicator specimens to better understand how emerging contaminants are affecting marine wildlife.		C C

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D1012	ヒト (死 亡)	Wen, Xue; Wang, Mei; Xu, Xuewen; Li, Tao	Exposure to Per- and Polyfluoroalkyl Substances and Mortality in U.S. Adults: A Population-Based Cohort Study	2022	Environ Health Perspect. 2022 Jun;130(6):67007. doi: 10.1289/EHP10393. Epub 2022 Jun 22.	BACKGROUND: Per- and polyfluoroalkyl substances (PFAS) are widespread environmental contaminants associated with diseases such as cancer and dyslipidemia. However, few studies have investigated the association between PFAS mixture exposure and mortality in general populations. OBJECTIVES: This study aimed to explore the association between PFAS mixture, perfluorooctanoic acid (PFOA), and perfluorooctane sulfonic acid (PFOS) and mortality in U.S. adults by a nationally representative cohort. METHODS: Adults \geq 18 years of age who were enrolled in the National Health and Nutrition Examination Survey (NHANES) (1999-2014) were included in our study. Baseline serum concentrations of seven PFAS were measured and individuals were followed up to 31 December 2015. Hazard ratios (HRs) and confidence intervals (CIs) were estimated using Cox proportional hazards models. Association between PFAS mixture exposure and mortality was subsequently analyzed by clustering PFAS mixtures into subgroups. Association between PFOA/PFOS exposure and mortality was subsequently analyzed in both continuous and categorical models. RESULTS: During the follow-up period, 1,251 participants died. In the mixture analysis, the k-means algorithm clustered participants into low-, medium-, and high-exposure groups. Compared with the low-exposure group, participants in the high-exposure group showed significantly higher risks for all-cause mortality (HR = 1.38; 95% CI: 1.07, 1.80), heart disease mortality (HR = 1.58; 95% CI: 1.05, 2.51), and cancer mortality (HR = 1.57; 95% CI: 1.02, 2.07), heart disease mortality (third vs. first tertile HR = 1.65; 95% CI: 1.09, 2.57), and cancer mortality (third vs. first tertile HR = 1.75; 95% CI: 1.10, 2.83), whereas PFOA exposure had no significant association with mortality. Assuming the observed association is causal, the number of deaths associated with PFOS exposure (\geq 17.1 vs. < 7.9 ng/mL) was \sim 382,000 (95% CI: 176,000, 588,000) annually between PFOS and mortality was stonger among women and people w		ВВ
D1013	ヒト (ス トレス)	Bashir, Tahir; Obeng-Gyasi, Emmanuel	The Association between Multiple Per- and Polyfluoroalkyl Substances' Serum Levels and Allostatic Load	2022	Int J Environ Res Public Health. 2022 Apr 29;19(9):5455. doi: 10.3390/ijerph19095455.	Background/Objective: This study aimed to explore the association between allostatic load (AL), an index of chronic stress, with nine per- and polyfluoroalkyl substances (PFASs), a group of organic compounds used in commercial and industrial applications. The PFASs explored were perfluorohexane sulfonic acid (PFHS), perfluorononanoic acid (PFDE), perfluorobetanoic acid (PFHP), perfluorodecanoic acid (PFDS), perfluoroneptanoic acid (PFHP), perfluoroctane sulfonic acid (PFDS), perfluoroneptanoic acid (PFDA), and perfluoroctane sulfonic acid (PFOS). This study was performed to better understand the association between PFASs and AL, which may be a mediator of several diseases. Methods: This study was performed to adults aged 20 and older, using the National Health and Nutrition Examination Survey (NHANES) 2007-2014 data. AL was calculated as a cumulative index of ten biomarkers from the cardiovascular, inflammatory, and metabolic system, which was dichotomized into high risk (assigned a value of 1) or low risk (assigned a value 0) depending on if the index value was ≥3 (chronic physiological stress) or &Lt3 (less stressed). In this study, PFASs and covariates such as age, gender, ethnicity, alcohol consumption, smoking, and physical activity were explored using descriptive statistics and logistic regression modeling. Results: The results indicated that in adults, AL was more elevated in men as compared to women, in those aged ≥60 years, and varied by ethnicity. For instance, non-Hispanic Blacks had higher AL levels (mean of 3.92) compared to other ethnicities. A significant number of the participants tested for PFBS, PFHP, PFDO were below the LOD and thus these PFASs were excluded from the analysis. Our analysis demonstrated multicollinearities between variables such as PFNA, PFOS, and PFOA with variance inflation factor (VIF) values of 6.197, 6.212, and 5.139, respectively. Thus, PFASs were analyzed individually and adjusted for age, gender, ethnicity, physical activity, smoking, and alcohol consumption. The resu		B C
D1014	ヒト (そ の他)	Koskela, Antti; Ducatman, Alan; Schousboe, John T; Nahhas, Ramzi W; Khalil, Naila	Perfluoroalkyl Substances and Abdominal Aortic Calcification	2022	J Occup Environ Med. 2022 Apr 1;64(4):287-294. doi: 10.1097/JOM.0000000000002479. Epub 2022 Jan 6.	OBJECTIVE: To evaluate if serum perfluoroalkylated substances (PFAS) were associated with abdominal aortic calcification (AAC). METHODS: We used weighted logistic regression to investigate the gender-specific association between PFAS serum levels and AAC more than or equal to 6 from dual-energy X-ray absorptiometry (DXA) scans of the thoraco-lumbar spine from National Health and Nutrition Examination Survey 2013-2014 survey participants aged more than or equal to 40 years. RESULTS: After adjusting for confounding, none of log-transformed perfluorooctanoic acid (PFOA), perfluorooctane sulfonate (PFOS), perfluorohexane sulfonic acid (PFHxS), or perfluorononanoic acid (PFNA) were significantly associated with AAC for either men or women (adjusted odds ratios [ORs] ranged from 0.80 to 1.33, P > 0.05 each). For PFOA and PFOS, the association was positive only in women (although the difference was not statistically significant in either case). CONCLUSION: These findings do not provide general support for a relationship of PFAS exposure to AAC, although the results show a need for gender-specific consideration in a larger dataset.		C C

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D1015	ヒト(その他)	Clarity, Cassidy; Trowbridge, Jessica; Gerona, Roy; Ona, Katherine; McMaster, Michael; Bessonneau, Vincent; Rudel, Ruthann; Buren, Heather; Morello-Frosch, Rachel	Associations between polyfluoroalkyl substance and organophosphate flame retardant exposures and telomere length in a cohort of women firefighters and office workers in San Francisco	2021	Environ Health. 2021 Aug 28;20(1):97. doi: 10.1186/s12940- 021-00778-z.	BACKGROUND: Environmental chemical exposures can affect telomere length, which in turn has been associated with adverse health outcomes including cancer. Firefighters are occupationally exposed to many hazardous chemicals and have higher rates of certain cancers. As a potential biomarker of effect, we assessed associations between chemical exposures and telomere length in women firefighters and office workers from San Francisco, CA. METHODS: We measured serum concentrations of polyfluoroalkyl substances (PFAS), urinary metabolites of flame retardants, including organophosphate flame retardants (OPFRs), and telomere length in peripheral blood leukocytes in women firefighters (N = 84) and office workers (N = 79) who participated in the 2014-15 Women Workers Biomonitoring Collaborative. Multiple linear regression models were used to assess associations between chemical exposures and telomere length. RESULTS: Regression results revealed significant positive associations between perfluorooctanoic acid (PFOA) and telomere length and perfluorooctanesulfonic acid (PFOS) and telomere length among the whole cohort. Models stratified by occupation showed stronger and more significant associations between telomere length and log- transformed PFOA (β (95%CI) = 0.57(0.12, 1.02)), PFOS (0.44 (0.05, 0.83)), and perfluorooteanoic acid (PFDA) and telomere length among firefighters. Significant associations between OPFR metabolites and telomere length were seen for bis (1,3- dichloro-2-propyl) phosphate (BDCPP) and telomere length among office workers (0.21(0.03, 0.40)) and bis (2-chloroethyl) phosphate (BCEP) and telomere length among firefighters (- 0.14(- 0.28, - 0.01)). For OPFRs, the difference in the direction of effect by occupational group may be due to the disparate detection frequencies and concentrations of exposure between the two groups and/or potential unmeasured confounding. CONCLUSION: Our findings suggest positive associations between PFAS and telomere length in women workers, with larger effects seen among fi		c c
D1016	ヒト(そ の他)	Clarity, Cassidy; Trowbridge, Jessica; Gerona, Roy; Ona, Katherine; McMaster, Michael; Bessonneau, Vincent; Rudel, Ruthann; Buren, Heather; Morello-Frosch, Rachel	Associations between polyfluoroalkyl substance and organophosphate flame retardant exposures and telomere length in a cohort of women firefighters and office workers in San Francisco	2020	medRxiv. 2020 Nov 10:2020.11.05.20226183. doi: 10.1101/2020.11.05.20226183. Preprint.	BACKGROUND: Environmental chemical exposures can affect telomere length, which in turn has been associated with adverse health outcomes including cancer. Firefighters are occupationally exposed to many hazardous chemicals and have higher rates of certain cancers. As a potential marker of effect, we assessed associations between chemical exposures and telomere length in women firefighters and office workers from San Francisco, CA. METHODS: We measured serum levels of polyfluoroalkyl substances (PFAS), urinary metabolites of flame retardants, including organophosphate flame retardants (OPFRs), and telomere length in peripheral blood leukocytes in women firefighters and office workers who participated in the 2014-15 Women Workers Biomonitoring Collaborative. Multiple linear regression models were used to assess associations between chemical exposures and telomere length. RESULTS: Regression results revealed significant positive associations between perfluoroctanoic acid (PFOA) and telomere length and perfluoroctanesulfonic acid (PFOS) and telomere length among the whole cohort. Models stratified by occupation showed stronger and more significant associations between telomere length and log-transformed PFOA (β (95%CI) = 0.57(0.12, 1.02)), PFOS (0.44 (0.05, 0.83)), and perfluorodecanoic acid (PFDA) (0.43 (0.02, 0.84)). Modeling PFAS as categories of exposure showed significant associations between perfluoronanoic acid (PFNA) and telomere length among firefighters. Significant associations between OPFR metabolites and telomere length were seen for bis(1,3-dichloro-2-propyl) phosphate (BDCPP) and telomere length among office workers (0.21(0.03, 0.40)) and bis(2-chloroethyl) phosphate (BCEP) and telomere length among firefighters (-0.14(-0.28, -0.01)). For OPFRs, the difference in the direction of effect by occupational group may be due to the disparate detection frequencies and levels of exposure between tFAS and telomere length in women workers, with larger effects seen among firefighters as compared to office wor		C C

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨 (原文)	備考	出情 ン文 ン文 対報 象抽 ① ラ ② ラ
D1017	ヒト(慢性疾患)	You, Lei; Zheng, Fujian; Su, Chang; Wang, Limei; Li, Xiang; Chen, Qianqian; Kou, Jing; Wang, Xiaolin; Wang, Yanfeng; Wang, Yuting; Mei, Surong; Zhang, Bing; Liu, Xinyu; Xu, Guowang	Metabolome-wide association study of serum exogenous chemical residues in a cohort with 5 major chronic diseases	2022	Environ Int. 2022 Jan;158:106919. doi: 10.1016/j.envint.2021.106919. Epub 2021 Oct 8.	BACKGROUND: Chronic diseases have become main killers affecting the health of human, and environmental pollution is a major health risk factor that cannot be ignored. It has been reported that exogenous chemical residues including pesticides, herbicides, fungicides, veterinary drugs and persistent organic pollutants are associated with chronic diseases. However, the evidence for their relationship is equivocal and the underlying mechanisms are unclear. OBJECTIVES: We aim to investigate the linkages between serum exogenous chemical residues and 5 main chronic diseases including obesity, hyperuricemia, hypertension, diabetes and dyslipidemia, and further reveal the metabolic perturbations of chronic diseases related to exogenous chemical residue exposure, then gain potential mechanism insight at the metabolic level. METHODS: LC-MS-based targeted and nontargeted methods were respectively performed to quantify exogenous chemical residues and acquire metabolic profiling of 496 serum samples from chronic disease patients. Non-parametric test, correlation and regression analyses were carried out to investigate the association between exogenous chemical residues and chronic diseases. Metabolome-wide association study combined with the meeting-in-the-middle strategy and mediation analysis was performed to reveal and explain exposure-related metabolic disturbances and their risk to chronic diseases. RESULTS: In the association analysis of 106 serum exogenous chemical residues and 5 chronic diseases, positive associations of serum perfluoroalkyl substances (PFASs) with hyperuricemia were discovered while other associated with increased risk for hyperuricemia. Creatine, glyceryl monooleate, phosphatidylcholine 36:6, phosphatidylethanolamine 40:6, cholesterol and sphingolipid 36:1:20 were significant markers which mediated the associations of the residues with hyperuricemia. CONCLUSIONS: Our study demonstrated a significantly positive association between PFASs, but also increased the risk of hyperuricemia.		СВ
D1018	ヒト (炎 症性腸疾 患)	Lochhead, Paul; Khalili, Hamed; Ananthakrishnan , Ashwin N; Burke, Kristin E; Richter, James M; Sun, Qi; Grandjean, Philippe; Chan, Andrew T	Plasma concentrations of perfluoroalkyl substances and risk of inflammatory bowel diseases in women: A nested case control analysis in the Nurses' Health Study cohorts	2022	Environ Res. 2022 May 1;207:112222. doi: 10.1016/j.envres.2021.112222. Epub 2021 Oct 16.	BACKGROUND: Perfluoroalkyl substances (PFASs) are synthetic compounds used in a wide variety of industrial and consumer applications. An association between PFAS exposure and risk of ulcerative colitis (UC) has been reported in a highly exposed population. However, data are limited on risk of inflammatory bowel diseases (IBD) among individuals with background population levels of PFAS exposure. OBJECTIVES: We set out to examine the association between plasma PFAS concentrations and risk of IBD among women in two population-based, prospective cohort studies in which pre-diagnostic blood specimens were available. METHODS: We conducted a nested case-control study in the Nurses' Health Study and Nurses' Health Study II cohorts. We identified 73 participants with incident Crohn's disease (CD) and 80 participants with incident UC who had provided blood samples before diagnosis. Cases were matched 1:2 to IBD-free controls. Plasma concentrations of five major PFASs were measured by liquid chromatography and tandem mass spectrometry. We used conditional logistic models to estimated odds ratios for risk of IBD according to log(10)-transformed PFAS concentrations, adjusting for potential confounders. RESULTS: In multivariable models, we observed inverse associations between plasma concentrations of three PFASs and risk of CD (all P \leq 0.012 for a standard deviation increase in log(10)PFAS). The inverse association with CD was strongest for perfluorodecanoate, where, compared to the lowest tertile, the odds ratio (OR) for the highest tertile was 0.39 (95% confidence interval, 0.17-0.92). No associations were observed between PFAS concentrations and UC risk. DISCUSSION: Our results do not support the hypothesis that elevated PFAS exposure is associated with higher risk of UC. Contrary to expectation, our data suggest that circulating concentrations of some PFASs may be inversely associated with CD development.		СС
D1019	ヒト (腸 内微生物 叢)	Thompson, Kelsey N; Oulhote, Youssef; Weihe, Pal; Wilkinson, Jeremy E; Ma, Siyuan; Zhong, Huanzi; Li, Junhua; Kristiansen, Karsten; Huttenhower, Curtis; Grandjean, Philippe	Effects of Lifetime Exposures to Environmental Contaminants on the Adult Gut Microbiome	2022	Environ Sci Technol. 2022 Nov 17. doi: 10.1021/acs.est.2c03185. Online ahead of print.	Emerging experimental evidence indicates that toxicant-induced alterations in gut microbiota composition and activity may affect host homeostasis. However, data from human studies are scarce; to our knowledge, no previous studies have quantified the association of lifetime exposure to environmental chemicals, across multiple time points, with the composition of the adult gut microbiome. Here we studied 124 individuals born in the Faroe Islands in 1986-1987 who were followed approximately every seven years from birth through age 28 years. Organochlorine compounds, including polychlorinated biphenyls (PCBs) and pesticides, perfluoroalkyl substances (PFAS), and mercury (Hg), were measured in cord blood and longitudinally in participants' blood. At age 28, the gut microbiome was assessed using shotgun metagenomic sequencing. Historical contaminant exposures had little direct effect on the adult gut microbiome, while a small number of fastidious anaerobes were weakly linked to recent PFAS/PFOS exposures at age 28. In this cohort, our findings suggest no lasting effects of early life exposures on adult gut microbial composition, but proximal exposures may contribute to gut microbiome alterations. The methods developed and used for this investigation may help in future identification of small but lasting impacts of environmental toxicant exposure on the gut microbiome.		C C

分野 タイトル 発行年 書誌情報 要旨 (原文) No. 著者 (参考) Perfluoroalkyl substances (PFASs) are widespread synthetic substances with various adver mechanism of toxicity for PFASs is via epigenetic changes, such as DNA methylation. Previo associations between PFAS exposure and DNA methylation among newborns and adults. Ho PFASs influence DNA methylation among children of school age. In this exploratory study wi PFASs through drinking water highly contaminated from firefighting foams, we aimed to inve Xu, Yiyi; Lindh, was associated with alteration in DNA methylation and epigenetic age acceleration. Sixty-th Christian H; Perfluoroalkyl substances influence DNA methylation Environ Epigenet. 2022 Feb 4;8(1):dvac004. doi: - ト Ronneby Biomarker Cohort (Sweden) were included. The children were either controls with Fletcher, Tony: in school-age children highly exposed through drinking (DNA> D1020 perfluorooctane sulfonic acid: median 2.8 and range 1-5 ng/ml) or those exposed to very high akobsson, water contaminated from firefighting foam: a cohort 10.1093/eep/dvac004. eCollection 2022. チル化) perfluorooctane sulfonic acid: median 295 and range 190-464 ng/ml). These two groups we Kristina; Engströ study in Ronneby, Sweden mass index. Genome-wide methylation of whole-blood DNA was analyzed using the Infinium m, Karin Epigenetic age acceleration was derived from the DNA methylation data. Twelve differential differentially methylated regions were found when comparing the high-exposure group to the differences in epigenetic age acceleration between these two groups (P = 0.66). We found with DNA methylation at specific genomic positions and regions in children at school age, where mechanism for linking PFAS exposure to health effects. Sum, Ka Kei; Tint, Mya Thway BACKGROUND: While socioeconomic position (SEP) is consistently related to pregnancy an Aguilera, Rosana biological mechanisms are manifold, thus necessitating more comprehensive characterization Dickens, Borame during pregnancy. OBJECTIVES: We implemented an exposomic approach to systematically Sue Lee; Choo, landscape of prenatal exposures in a setting where social segregation was less distinct in a Sue; Ang, Li METHODS: We described the correlation structure of 134 prenatal exogenous and endogeno Ting; Phua, normones, immunomodulatory metabolites, environmental pollutants) collected in a diverse, Desiree: Law high-income longitudinal mother-offspring cohort (N = 1341; 2009-2011). We examined the Evelyn C; Ng, - ト paternal, household, and areal level SEP indicators and 134 exposures using multiple regres Sharon; Tan, (SEPと as well as potential effect measure modification by ethnicity and nativity. Finally, we generat 2022 Environ Int. 2022 May;163:107205. doi: 10.1016/j.envint.2022.107205. Epub 2022 Mar 26. Karen Mei-Ling; The socioeconomic landscape of the exposome during D1021 エクスポ Multiple Correspondence Analysis to further explore possible curved relationships. RESULTS Benmarhnia, pregnancy ノームの associated with anthropometric/adiposity measures, folate, omega-3 fatty acids, insulin-like Tarik; Karnani, 関連) neopterin, an inflammatory marker. We observed paternal education was more strongly and Neerja; Eriksson exposures than maternal education. This was most apparent amongst couples discordant or Johan G; Chong, additional non-linear associations between areal composite SEP and particulate matter. Env Yap-Seng; Yap and polyfluoroalkyl substances) and micronutrients (e.g., folate and copper) showed opposir Fabian; Tan, Kol nativity, respectively. DISCUSSION: SEP-exposome relationships are complex, non-linear, ar Hian; Lee, Yung reinforce the potential role of paternal contributions and context-specific modifiers of associ Seng; Chan, maternal diet-related exposures. Despite weak presumed areal clustering of individual expo Shiao-Yng; reinforces subtle non-linearities in areal-level exposures. Chong, Mary F F Huang, Jonathan Oseguera-López, Perfluorooctane sulfonate (PFOS) and perfluorohexane sulfonate (PFHxS) are toxic and bioa Iván; Pérez-Stockholm Convention's list as persistent organic pollutants. Due to their toxicity, worldwide Cerezales, Serafí in spermatozoa physiology during pre-fertilization processes, the present study seeks to ana n; Ortiz-Sánchez alterations caused by the presence of these compounds in boar sperm during the in vitro ca Paola Berenice: Perfluorooctane Sulfonate (PFOS) and capacitation was performed in supplemented TALP-Hepes media and mean lethal concentr n vitro Mondragon-Perfluorohexane Sulfonate (PFHxS) Alters Protein Animals (Basel). 2020 Oct 21;10(10):1934. doi: and 1930.60 μ M for PFHxS were obtained. Results by chlortetracycline staining showed tha D1022 (生殖発 Phosphorylation, Increase ROS Levels and DNA 2020 Pavne, Oscar: Sá 10.3390/ani10101934 to membrane proteins were scarcely affected by PFOS. The spontaneous acrosome reaction 生毒性) nchez-Sánchez, Fragmentation during In Vitro Capacitation of Boar significantly reduced by PFOS and slightly increased by PFHxS. Both toxic compounds signi Raúl; Jiménez-Spermatozoa process from 30 min of exposure. An increase in ROS production was observed by flow cytor Morales, Irma: fragmentation by the comet assay. The immunocytochemistry showed a decrease of tyrosin Fierro, Reyna; equatorial and acrosomal zone of the spermatozoa head. In conclusion, PFOS and PFHxS ha González-Má nortality and altering vital parameters for proper sperm capacitation. rauez. Humberte

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se health effects. A potential bus studies have evaluated bowever, no study has evaluated how ith school-age children exposed to estigate whether exposure to PFASs ree children aged 7-11 years from the only background exposure ($n = 32$; gh levels of PFASs ($n = 31$; re matched on sex, age, and body in MethylationEPIC BeadChip kit. Iy methylated positions and seven e control group. There were no that PFAS exposure was associated hich may indicate a possible			С	В
d birth outcome disparities, relevant on of SEP-exposome associations characterize the socioeconomic hypotheses-generating manner. ous sources (e.g., micronutrients, population-representative, urban, associations between maternal, sions adjusted for precision variables, ted summary SEP indices using S: Individual and household SEP were e growth factor-II, fasting glucose, and consistently related to maternal n education. Analyses revealed vironmental contaminants (e.g., per- ng associations by ethnicity and nd context specific. Our findings iations, such as between ethnicity and sures in our context, our approach			С	В
accumulative, included in the e distribution, and lack of information alyze the toxic effects and possible pacitation. The spermatozoa ation values of 460.55 μ M for PFOS, at intracellular Ca(2+) patterns bound a determined by FITC-PNA was ficantly alter the normal capacitation metry and considerable DNA e phosphorylation in proteins of the ave toxic effects on the sperm, causing			С	С

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出	ン 文 ク 献 ① ラ	ン 文 え の 献 フ
D1023	in vitro (生殖発 生毒性)	Davidsen, Nichlas; Rosenmai, Anna Kjerstine; Lauschke, Karin; Svingen, Terje; Vinggaard, Anne Marie	Developmental effects of PFOS, PFOA and GenX in a 3D human induced pluripotent stem cell differentiation model	2021	Chemosphere. 2021 Sep;279:130624. doi: 10.1016/j.chemosphere.2021.130624. Epub 2021 Apr 22.	Polyfluoroalkyl substances (PFASs), including perfluorooctanesulfonic acid (PFOS) and perfluorooctanoic acid (PFOA), are persistent pollutants routinely found in human blood. PFASs have been associated with health issues such as decreased birth weight and impaired vaccination response in children. Substitutes to these PFASs, such as ammonium 2,3,3,3-tetrafluoro-2- (heptafluoropropoxy)propanoate (GenX) have been introduced, although hazard information is limited. Human induced pluripotent stem cell (hiPSC) based models are valuable for studying these compounds, as they mimic human embryonic development. We used our recently developed PluriBeat assay to investigate PFOS, PFOA and GenX for effects on early embryonic development in vitro. In our assay hiPSCs go through the early stages of embryonic development in 3D cultures of embryoid bodies (EBs) that mimic the human blastocyst until they finally form beating cardiomyocytes. Both PFOS and PFOA had a strong effect on cardiomyocyte differentiation at non-cytotoxic concentrations, with PFOS being more potent than PFOA. Moreover, both compounds decreased EB size at the highest test concentrations. GenX induced a weak concentration-dependent effect on differentiation of one hiPSC line, but not of another. Transcriptional analysis of mRNA from the cardiomyocyte marker MYH7. This suggest that PFOS and PFOA perturb cardiomyocyte differentiation by disrupting molecular pathways similar to those taking place in the developing embryo. Based on these findings, we conclude that our PluriBeat assay has the potential to become a valuable, sensitive model system for elucidating embryotoxic effects of PFASs in future.			с	С
D1024	in vitro (生殖発 生毒性)	Bangma, Jacqueline; Szilagyi, John; Blake, Bevin E; Plazas, Cinthya; Kepper, Stewart; Fenton, Suzanne E; C Fry, Rebecca	An assessment of serum-dependent impacts on intracellular accumulation and genomic response of per- and polyfluoroalkyl substances in a placental trophoblast model	2020	Environ Toxicol. 2020 Dec;35(12):1395-1405. doi: 10.1002/tox.23004. Epub 2020 Aug 13.	Per- and polyfluoroalkyl substances (PFAS), a class of environmental contaminants, have been detected in human placenta and cord blood. The mechanisms driving PFAS-induced effects on the placenta and adverse pregnancy outcomes are not well understood. This study investigated the impact of perfluorooctanesulfonic acid (PFOS), perfluorooctanoic acid (PFOA), and a replacement PFAS known as hexafluoropropylene oxide dimer acid (HFPO-DA, tradename GenX) on placental trophoblasts in vitro. Several key factors were addressed. First, PFAS levels in cell culture reagents at baseline were quantified. Second, the role of supplemental media serum in intracellular accumulation of PFAS in a human trophoblast (JEG3) cell line was established. Finally, the impact of PFAS on the expression of 96 genes involved in proper placental function in JEG3 cells was evaluated. The results revealed that serum-free media (SFM) contained no detectable PFAS. In contrast, fetal bovine serum-supplemented media (SSM) contained PFNA, PFUdA, PFTrDA, and 6:2 FTS, but these PFAS were not detected internally in cells. Intracellular accumulation following 24 hr treatments was significantly higher when cultured in SFM compared to SSM for PFOS and PFOA, but not HFPO-DA. Treatment with PFAS was associated with gene expression changes (n = 32) in pathways vital to placental function, including viability, syncytialization, inflammation, transport, and invasion/mesenchymal transition. Among the most robust PFAS-associated changes were those observed in the known apoptosis-related genes, BAD and BAX. These results suggest a complex relationship between PFAS, in vitro culture conditions, and altered expression of key genes necessary for proper placentation.			с	С
D1025	in vitro (生殖発 生毒性)	Feng, Jianan; Soto-Moreno, Edgar J; Prakash, Aashna; Balboula, Ahmed Z; Qiao, Huanyu	Adverse PFAS effects on mouse oocyte in vitro maturation are associated with carbon-chain length and inclusion of a sulfonate group	2022	Cell Prolif. 2022 Oct 27:e13353. doi: 10.1111/cpr.13353. Online ahead of print.	OBJECTIVES: Per- and polyfluoroalkyl substances (PFAS) are man-made chemicals that are widely used in various products. PFAS are characterized by their fluorinated carbon chains that make them hard to degrade and bioaccumulate in human and animals. Toxicological studies have shown PFAS toxic effects: cytotoxicity, immunotoxicity, neurotoxicity, and reproductive toxicity. However, it is still unclear how the structures of PFAS, such as carbon-chain length and functional groups, determine their reproductive toxicity. METHODS AND RESULTS: By using a mouse-oocyte-in-vitro-maturation (IVM) system, we found the toxicity of two major categories of PFAS, perfluoroalkyl carboxylic acid (PFCA) and perfluoroalkyl sulfonic acid (PFSA), is elevated with increasing carbon-chain length and the inclusion of the sulfonate group. Specifically, at 600 μ M, perfluorohexanesulfonic acid (PFHxS) and perfluorooctanesulfonic acid (PFOS) reduced the rates of both germinal-vesicle breakdown (GVBD) and polar-body extrusion (PBE) as well as enlarged polar bodies. However, the shorter PFSA, perfluorobutanesulfonic acid (PFBS), and all PFCA did not show similar adverse cytotoxicity. Further, we found that 600 μ M PFHxS and PFOS exposure induced excess reactive oxygen species (ROS) and decreased mitochondrial membrane potential (MMP). Cytoskeleton analysis revealed that PFHxS and PFOS exposure induced chromosome misalignment, abnormal F-actin organization, elongated spindle formation, and symmetric division in the treated oocytes. These meiotic defects compromised oocyte developmental competence after parthenogenetic activation. CONCLUSIONS: Our study provides new information on the structure-toxicity relationship of PFAS.			с	С

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文ン文 対報 象抽 ① ラ ② ラ
D1026	in vitro (生殖発 生毒性)	Zhang, Pingping; Qi, Changyong; Ma, Zhinan; Wang, Yixiong; Zhang, Lei; Hou, Xiaojing	Perfluorooctanoic acid exposure in vivo perturbs mitochondrial metabolic during oocyte maturation	2022	Environ Toxicol. 2022 Dec;37(12):2965-2976. doi: 10.1002/tox.23652. Epub 2022 Aug 27.	Perfluorooctanoic acid (PFOA), a member of a group of polyfluorinated and perfluorinated alkyl substances (PFAS), is associated with adverse pregnancy outcomes in mammals. However, the effects of in vivo exposure to PFOA on the female reproductive system and the underlying mechanisms remain unclear. In our study, we constructed a mouse model to investigate whether low-dose PFOA (1 mg/kg/day) or high-dose PFOA (5 mg/kg/day) affect meiosis maturation of oocytes and the potential mechanisms that may be associated with oocyte maturation disorder. Our results indicate that low-dose and high-dose PFOA can lead to impaired oocyte maturation, which is manifested by decreased rate of embryonic foam rupture and first polar body extrusion. Moreover, PFOA exposure harmed the mitochondrial metabolic, resulting in low levels of ATP contents, high reactive oxygen species, aberrant mitochondrial membrane potential. In addition, the proportion of DNA damage marker <i>γ</i> -H2AX was also significantly increased in PFOA exposure oocytes. These changes lead to abnormal arrangements of the spindle and chromosomes during oocyte maturation. In conclusion, our results for the first time illustrated that exposure to PFOA in vivo in female mice impaired the meiosis maturation of oocytes, which provided a basis for studying the mechanism of PFOA reproductive toxicity in female mammals.		c c
D1027	in vitro (生殖発 生毒性)	Zhou, Yuanyuan; Li, Hongping; Lin, Chuanping; Mao, Yuchan; Rao, Jinpeng; Lou, Yiyun; Yang, Xinyun; Xu, XiangRong; Jin, Fan	Perfluorooctanoic acid (PFOA) inhibits the gap junction intercellular communication and induces apoptosis in human ovarian granulosa cells	2020	Reprod Toxicol. 2020 Dec;98:125-133. doi: 10.1016/j.reprotox.2020.09.005. Epub 2020 Sep 21.	Perfluorooctanoic acid (PFOA) has attracted widespread research attention as it is very stable, bioaccumulates, and causes reproductive toxicity. Data from several animal experiments and epidemiological studies indicate that female fertility may decline because of ovarian granulosa cell (GC) apoptosis as oocyte quality is positively associated with effective gap junctional intercellular communication (GJIC) between GCs. To the best of our knowledge, however, no previous trials have been conducted or reported on the effects of PFOA exposure on apoptosis induction in human GCs. Moreover, the roles of GJIC in GC survival and in the induction of apoptosis in GCs by PFOA remain unclear. To test this, we cultured human GCs in vitro and treated them with 0 μ M, 0.3 μ M, or 30 μ M PFOA for 24 h. We also treated a human ovarian GC line (KGN) with various combinations of PFOA, retinoic acid (RA, 10 μ M), and carbenoxolone disodium (CBX, 50 mM). Our findings showed that PFOA lowered human GC viability and increased apoptosis. The effects of CBX resemble those of PFOA. The combination of PFOA and CBX enhances the inhibition of GJIC by PFOA and promotes apoptosis. The effects of RA are the opposite to those of PFOA. The combination of RA and PFOA mitigates PFOA-induced GJIC inhibition and reduces apoptosis. The observed expression levels of apoptosis-related proteins were consistent with the aforementioned findings. Hence, our study demonstrated that PFOA may induce human ovarian GC apoptosis by inhibiting GJIC.		c c
D1028	in vitro (生殖発 生毒性)	Zhou, Yu-Ting; Li, Rui; Li, Si- Hong; Ma, Xiang; Liu, Lu; Niu, Dong; Duan, Xing	Perfluorooctanoic acid (PFOA) exposure affects early embryonic development and offspring oocyte quality via inducing mitochondrial dysfunction	2022	Environ Int. 2022 Sep;167:107413. doi: 10.1016/j.envint.2022.107413. Epub 2022 Jul 16.	Perfluorooctanoic acid (PFOA) is a synthetic perfluorinated compound that is extensively used as an integral surfactant in commercial production. Owing to its hydrophilicity and persistence, PFOA can accumulate in living organisms and induce severe disease in animals and humans. It has been reported that PFOA exposure can affect ovarian function and induce reproductive toxicity; however, the effects and potential mechanism of PFOA exposure during gestation on early embryonic development and offspring remain unclear. This study found that PFOA exposure in vitro disrupted spindle assembly and chromosome alignment during the first cleavage of early mouse embryos, which impacted early embryonic cleavage and blastocyst formation. Moreover, PFOA exposure caused mitochondrial dysfunction and oxidative stress by inducing aberrant Ca(2+) levels, liquid drops(LDs), and mitochondrial membrane potential in the 2-cell stage. Furthermore, we found that PFOA exposure to PFOA significantly increased ovarian apoptosis in 2-cell stage by inhibiting SOD2 function. Gestational exposure to PFOA significantly increased ovarian apoptosis and disrupted follicle development in F1 offspring. In addition, oocyte maturation competence was decreased in F1 offspring. Finally, single-cell transcriptome analysis revealed that PFOA-induced oocyte deterioration was caused by mitochondrial dysfunction and apoptosis in the F1 offspring. In summary, our results indicated that gestational exposure to PFOA had potential toxic effects on ovarian function and led to a higher incidence of meiotic defects in F1 female offspring.		c c
D1029	in vitro (生殖発 生毒性)	Guo, Conghui; Zhao, Zhihong; Zhao, Kun; Huang, Jianhao; Ding, Linshu; Huang, Xiaogang; Meng, Li; Li, Li; Wei, Hengxi; Zhang, Shouquan	Perfluorooctanoic acid inhibits the maturation rate of mouse oocytes cultured in vitro by triggering mitochondrial and DNA damage	2021	Birth Defects Res. 2021 Aug 15;113(14):1074-1083. doi: 10.1002/bdr2.1899. Epub 2021 Apr 19.	BACKGROUND: Perfluorooctanoic acid (PFOA) is widely used in the manufacture of household and industrial products. It has certain toxicity and leaves many residues in the environment. Numerous studies have shown that PFOA exhibits endocrine disrupting properties and immunotoxicity and induces developmental defects. However, there is very little information regarding its toxicity on oocytes. METHODS: We cultured denuded oocytes in maturation medium supplemented with 0, 300, or 500 PFOA during IVM and evaluated the maturation of oocytes from the aspects of ROS(DCFH-DA), mitochondria(MitoOrange and JC-1), DNA damage(P-H2AX), and cytoskeleton(β -tubulin). RESULTS: Compared with the control group, the PFOA treatment group exhibited significantly reduced proportion of oocytes matutation. Furthermore, the DCFH-DA test showed that PFOA significantly increased reactive oxygen species (ROS) levels. PFOA disrupted mitochondrial distribution and decreased mitochondrial function as assessed using MitoOrange and JC-1. In addition, PFOA-treated oocytes exhibited a significantly higher percentage of P-H2AX, defective β -tubulin, abnormal chromosome alignment, lower expression of the anti-apoptotic gene Bcl-2, and higher expression of the apoptotic genes caspase3 and Bax. CONCLUSION: In summary, PFOA could negatively and directly affect oocyte maturation in vitro and cause oxidative stress, mitochondrial function disruption, DNA damage, cytoskeleton damage, and apoptosis.		сс

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No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 対報 象抽 ① ラ	ン 文 ク 献 ② ラ
D1030	in vitro (生殖発 生毒性)	Lin, Tingting; Zhang, Yurong; Ding, Xinbao; Huang, Tao; Zhang, Wenjuan; Zou, Weiying; Kuang, Haibin; Yang, Bei; Wu, Lei; Zhang, Dalei	Perfluorooctanoic acid induces cytotoxicity in spermatogonial GC-1 cells	2020	Chemosphere. 2020 Dec;260:127545. doi: 10.1016/j.chemosphere.2020.127545. Epub 2020 Jul 7.	Perfluorooctane acid (PFOA), a typical perfluorinated chemical, has been suggested to interfere with male reproductive function. In this study, mouse spermatogonial GC-1 cells were in vitro treated with PFOA (250, 500 or 750 μ M) for 24 h to investigate the cytotoxicity of PFOA and its underlying mechanisms. Our results indicated that exposure to intermediate and high doses of PFOA suppressed the viability of GC-1 cells in a concentration-dependent manner. Furthermore, PFOA treatment markedly enhanced the generation of reactive oxygen species and malondialdehyde, with diminished activity of superoxide dismutase. Particularly, PFOA exposure evoked a decline in mitochondrial membrane potential and ATP production. Furthermore, the apoptotic index and caspase-3 activity were significantly elevated after treatment with PFOA. In addition, PFOA incubation caused an increase in LC3B-II/LC3B-I ratio. Meanwhile, PFOA resulted in an excessive accumulation of autophagosomes in the cytoplasm. Taken together, exposure to PFOA can elicit cytotoxicity to spermatogonial GC-1 cells in vitro, which may be link to the mitochondrial oxidative damage and induction of apoptosis and autophagy.		С	с
D1031	in vitro (生殖発 生毒性)	Basini, Giuseppina; Bussolati, Simona; Torcianti, Veronica; Grasselli, Francesca	Perfluorooctanoic Acid (PFOA) Induces Redox Status Disruption in Swine Granulosa Cells	2022	Vet Sci. 2022 May 26;9(6):254. doi: 10.3390/vetsci9060254.	Perfluorooctanoic acid (PFOA) is employed in the production and processing of several plastic materials, mainly during the production of waterproof fabrics or nonstick cookware. PFOA is identified as a substance of very high concern, as it is classified as a persistent, bioaccumulative, and toxic (PBT) substance because of its persistence in the environment and its potential accumulation in organisms. Thus, safe levels of exposure cannot be established, and PFOA emissions should be minimized. PFOA has recently been linked to several health concerns in humans. In particular, a disruptive effect on redox status homeostasis has been documented, with a potential impairment of normal reproductive function that requires adequate oxidative balance. Therefore, the aim of the present study was to evaluate the effects of PFOA (2, 20, and 200 ng/mL) on ovarian granulosa cells, a model of reproductive cells. The obtained results reveal that PFOA stimulated cell viability (p < 0.05). Regarding the effects on free radical production, O(2)(-), NO, and H(2)O(2) were significantly inhibited (p < 0.05), while the nonenzymatic antioxidant power was not significantly modified. Collectively, the present results deserve attention since free radical molecules play a crucial role in ovarian follicle development leading to a successful ovulation.		С	С
D1032	in vitro (生殖発 生毒性)	Du, Yatao; Cai, Zhenzhen; Zhou, Guangdi; Liang, Wei; Man, Qiuhong; Wang, Weiye	Perfluorooctanoic acid exposure increases both proliferation and apoptosis of human placental trophoblast cells mediated by ER stress-induced ROS or UPR pathways	2022	Ecotoxicol Environ Saf. 2022 May 1;236:113508. doi: 10.1016/j.ecoenv.2022.113508. Epub 2022 Apr 23.	Perfluorooctanoate acid (PFOA) is a highly persistent and widespread chemical in the environment. PFOA serum levels in pregnant women are positively associated with an increased risk of placenta-related disorders. However, the mechanism of PFOA cytotoxicity involved in placental cells and cellular responses such as ER stress remains poorly understood. In this study, we studied the cellular toxicity of PFOA with a focus on proliferation and apoptosis in a human placental trophoblast cell line. Cell viability, number, apoptosis, stress response, activation of the involved signaling pathways were assessed. Our results showed PFOA affected cell viability, proliferation and also resulted in apoptosis. Besides, both pro-proliferation and pro-apoptosis effects were attenuated by endoplasmic reticulum (ER) stress inhibitors. Further experiments demonstrated that two different signaling pathways were activated by PFOA-induced ER stress and involved in PFOA toxicity: the reactive oxygen species (ROS)-dependent ERK signaling triggered trophoblast proliferation, while the ATF4-dependent C/EBP homologous protein (CHOP) signaling was the trigger of apoptosis. We conclude that PFOA-induced ER stress is the trigger of proliferation and apoptosis of trophoblast via ROS or UPR signaling pathway, which leads to the altered balance critical to the normal development and function of the placenta.		С	С
D1033	in vitro (生殖発 生毒性)	Hallberg, Ida; Persson, Sara; Olovsson, Matts; Moberg, Mikaela; Ranefall, Petter; Laskowski, Denise; Damdimopoulou, Pauliina; Sirard, Marc-Andre; Rü egg, Joëlle; Sjunnesson, Ylva C B	Bovine oocyte exposure to perfluorohexane sulfonate (PFHxS) induces phenotypic, transcriptomic, and DNA methylation changes in resulting embryos in vitro	2022	Reprod Toxicol. 2022 Apr;109:19-30. doi: 10.1016/j.reprotox.2022.02.004. Epub 2022 Feb 24.	Knowledge on the effects of perfluorohexane sulfonate (PFHxS) on ovarian function is limited. In the current study, we investigated the sensitivity of oocytes to PFHxS during in vitro maturation (IVM), including consequences on embryo development at the morphological, transcriptomic, and epigenomic levels. Bovine cumulus-oocyte complexes (COCs) were exposed to PFHxS during 22 h IVM. Following fertilisation, developmental competence was recorded until day 8 of culture. Two experiments were conducted: 1) exposure of COCs to 0.01 μ g mL(-1) - 100 μ g mL(-1) PFHxS followed by confocal imaging to detect neutral lipids and nuclei, and 2) exposure of COCs to 0.1 μ g mL(-1) PFHxS followed by analysis of transcriptomic and DNA methylation changes in blastocysts. Decreased oocyte developmental competence was observed upon exposure to \geq 40 μ g mL(-1) PFHxS and altered lipid distribution was observed in the blastocysts upon exposure to 1-10 μ g mL(-1) PFHxS (not observed at lower or higher concentrations). Transcriptomic data showed that genes affected by 0.1 μ g mL(-1) PFHxS were enriched for pathways related to increased synthesis and production of reactive oxygen species. Enrichment for peroxisome proliferator-activated receptor- γ and oestrogen pathways was also observed. Genes linked to DNA methylation changes were enriched for similar pathways. In conclusion, exposure of the bovine oocyte to PFHxS during the narrow window of IVM affected subsequent embryonic development, as reflected by morphological and molecular changes. This suggests that PFHxS interferes with the final nuclear and cytoplasmic maturation of the oocyte leading to decreased developmental competence to blastocyst stage.		C	С

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D1034	in vitro (生殖発 生毒性)	Gingrich, Jeremy; Pu, Yong; Upham, Brad L; Hulse, Madeline; Pearl, Sarah; Martin, Denny; Avery, Anita; Veiga-Lopez, Almudena	Bisphenol S enhances gap junction intercellular communication in ovarian theca cells	2021	Chemosphere. 2021 Jan;263:128304. doi: 10.1016/j.chemosphere.2020.128304. Epub 2020 Sep 14.	Gap junction intercellular communication (GJIC) is necessary for ovarian function, and it is temporospatially regulated during follicular development and ovulation. At outermost layer of the antral follicle, theca cells provide structural, steroidogenic, and vascular support. Inter- and extra-thecal GJIC is required for intrafollicular trafficking of signaling molecules. Because GJIC can be altered by hormones and endocrine disrupting chemicals (EDCs), we tested if any of five common EDCs (bisphenol A (BPA), bisphenol S (BPS), bisphenol F (BPF), perfluorooctanesulfonic acid (PFOS), and triphenyltin chloride (TPT)) can interfere with theca cell GJIC. Since most chemicals are reported to repress GJIC, we hypothesized that all chemicals tested, within environmentally relevant human exposure concentrations, will inhibit theca cell GJICs. To evaluate this hypothesis, we used a scrape loading/dye transfer assay. BPS, but no other chemical tested, enhanced GJIC in a dose- and time-dependent manner in ovine primary theca cells. A signal-protein inhibitor approach was used to explore the GJIC-modulatory pathways involved. Phospholipase C and mitogen-activated protein kinase (MAPK) inhibitors significantly attenuated BPS-induced enhanced GJIC. Human theca cells were used to evaluate translational relevance of these findings. Human primary theca cells had a ~40% increase in GJIC could result in hyperplasia of the theca cell layer or prevent ovulation by holding the oocyte in meiotic arrest. Further studies are necessary to understand in vitro to in vivo translatability of these findings on follicle development and fertility outcomes.		c c
D1035	in vitro (生殖発 生毒性)	Martínez- Quezada, R; González-Castañ eda, G; Bahena, I; Domínguez, A; Domínguez-Ló pez, P; Casas, E; Betancourt, M; Casillas, F; Rodrí guez, J J; Álvarez, L; Mateos, R A; Altamirano, M A; Bonilla, E	Effect of perfluorohexane sulfonate on pig oocyte maturation, gap-junctional intercellular communication, mitochondrial membrane potential and DNA damage in cumulus cells in vitro	2021	Toxicol In Vitro. 2021 Feb;70:105011. doi: 10.1016/j.tiv.2020.105011. Epub 2020 Oct 7.	Perfluorohexane sulfonate (PFHxS) is one of the most abundant perfluorinated compounds in the environment. Exposure to this compound has been correlated to a decrease in human fertility, although the molecular and cellular mechanisms underlying this correlation have not been described. The adverse reproductive effects of PFHxS could be based on alterations in oocyte maturation, the process rendering oocytes competent for fertilization. The aim of this study was to evaluate the effect of PFHxS on porcine oocyte viability and maturation in vitro, as well as on gap-junctional intercellular communication (GJIC) in cumulus-oocyte complexes (COCs), oocyte mitochondrial membrane potential (m $\Delta \Psi$) and DNA damage in cumulus cells, as possible mechanisms of action. PFHxS caused cytotoxicity (medium lethal concentration, LC(50) = 329.1 μ M) and inhibition of oocyte maturation (medium inhibitory concentration, MIC(50) = 91.68 μ M). GJIC was not affected in exposed COCs. However, the mitochondrial membrane potential was significantly decreased in PFHxS-exposed oocytes at the germinal vesicle breakdown (GVBD) stage. In addition, exposure to PFHxS induced DNA damage in cumulus cells. Thus, inhibition of oocyte maturation by PFHxS could be attributed to a decreased oocyte m $\Delta \Psi$ at the GVBD and to DNA damage of the cumulus cells that support the oocyte.		c c
D1036	in vitro (生殖発 生毒性)	Abdulhasan, Mohammed; Ruden, Ximena; You, Yuan; Harris, Sean M; Ruden, Douglas M; Awonuga, Awoniyi O; Alvero, Ayesha; Puscheck, Elizabeth E; Rappolee, Daniel A	Using Live Imaging and FUCCI Embryonic Stem Cells to Rank DevTox Risks: Adverse Growth Effects of PFOA Compared With DEP Are 26 Times Faster, 1,000 Times More Sensitive, and 13 Times Greater in Magnitude	2021	Front Toxicol. 2021 Nov 30;3:709747. doi: 10.3389/ftox.2021.709747. eCollection 2021.	Fluorescent ubiquitination-based cell cycle indicator (FUCCI) embryonic stem cells (ESCs), which fluoresce green during the S- G2-M phases, generate an S-shaped curve for the accumulation of cells during normal stemness (NS) culture with leukemia- inhibitory factor (LIF). Since it was hypothesized that a culture of ESCs was heterogeneous in the cell cycle, it was expected that increased S-G2-M-phases of the cell cycle would make an S-shaped curve parallel to the accumulation curve. Unexpectedly, it was observed that the fraction of FUCCI ESCs in green decreases over time to a nadir at ~24 h after previous feeding and then rapidly enters S-G2-M-phases after medium change. G1 delay by infrequent medium change is a mild stress, as it does not affect growth significantly when frequency is increased to 12 h. Perfluoro-octanoic acid (PFOA) and diethyl phthalate (DEP) were used as examples of members of the per- and polyfluoroalkyl substances (PFAS) and phthalate families of chemicals, respectively. Two adverse outcomes were used to compare dose- and time-dependent effects of PFOA and DEP. The first was cell accumulation assay by time-lapse confluence measurements, largely at Tfinal/T74 h. The second was by quantifying dominant toxicant stress shown by the suppression of mild stress that creates a green fed/unfed peak. In terms of speed, PFOA is 26 times faster than DEP for producing a time-dependent LOAEL dose at 100 uM (that is, 2 h for PFOA and 52 h for DEP). PFOA has 1000-fold more sensitive LOAEL doses than DEP for suppressing ESC accumulation (confluence) at day 3 and day 2. There were two means to compare the magnitude of the growth suppression of PFOA and DEP. For the suppression of the accumulation of cells measured by confluence at Tfinal/T74h, there was a 13-fold suppression at the highest dose of PFOA > the highest dose of DEP. For the suppression of entry into the cell cycle after the G1 phase by stress on day 1 and 2, there is 10-fold more suppression by PFOA than DEP. The data presented here suggest tha		C C

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出	ン 文 シ 文 ク 献 ク 南 ① ラ ② き
D1037	in vitro (生殖発 生毒性)	Forsthuber, Martin; Widhalm, Raimund; Granitzer, Sebastian; Kaiser, Andreas Marius; Moshammer, Hanns; Hengstschläger, Markus; Dolznig, Helmut; Gundacker, Claudia	Perfluorooctane sulfonic acid (PFOS) inhibits vessel formation in a human 3D co-culture angiogenesis model (NCFs/HUVECs)	2022	Environ Pollut. 2022 Jan 15;293:118543. doi: 10.1016/j.envpol.2021.118543. Epub 2021 Nov 17.	Perfluorooctane sulfonic acid (PFOS) is a ubiquitous environmental pollutant. In humans, PFOS exposure has been associated with a number of adverse health outcomes, including reduced birth weight. Whether PFOS is capable of affecting angiogenesis and thus possibly fetal development is unknown. Therefore, we investigated 1) the metabolic activity of PFOS-exposed endothelial cells (human umbilical vein endothelial cells, HUVECs), fibroblasts (normal colon fibroblasts, NCFs), and epithelial cells (human colorectal carcinoma cells, HCT116), 2) PFOS-specific inhibition of vascular endothelial growth factor receptor (VEGFR)2 stimulation in KDR/NFAT-RE HEK293 cells, and 3) the antiangiogenic potential of PFOS in a 3D in vitro angiogenesis model of HUVECs and NCFs. In terms of metabolic activity, endothelial cells (HUVECs) were much more sensitive to PFOS than fibroblasts (NCFs) or epithelial cells (HCT116). VEGFR2 signaling in KDR/NFAT-RE HEK293 cells decreased with increasing PFOS concentrations. In co-culture (angiogenesis assay), PFOS treatment resulted in a dose-dependent reduction in tip and branch formation, tip length (μ m), and total structural area (μ m(2)) with stable metabolic activity of HUVECs up to high concentrations. We conclude that PFOS possesses antiangiogenic properties. Inhibition of VEGFR2 signaling indicates a possible mechanism of action that can be linked to an existing Adverse Outcome Pathway (AOP43) containing the AO reduced birth weight. Further studies are needed to confirm PFOS-specific adverse effects on angiogenesis, placental perfusion, and fetal growth.			сс
D1038	in vitro (生殖発 生毒性)	Chen, Jingyue; Miao, Yilong; Gao, Qian; Cui, Zhaokang; Xiong, Bo	Exposure to perfluorooctane sulfonate in vitro perturbs the quality of porcine oocytes via induction of apoptosis	2021	Environ Pollut. 2021 Sep 1;284:117508. doi: 10.1016/j.envpol.2021.117508. Epub 2021 Jun 2.	Perfluorooctane sulfonate (PFOS) is a widely used artificial surfactant with potential toxicity to humans and animals. However, little is known about the impact of PFOS on the female germ cell development. Here, we report that PFOS exposure weakens oocyte quality by disturbing oocyte meiotic competency and fertilization ability. Specifically, PFOS exposure impaired cytoskeleton assembly including spindle organization and actin polymerization to cause the oocyte maturation arrest. In addition, PFOS exposure also impaired the mitochondrial dynamics and function, resulting in the increased levels of reactive oxygen species (ROS) and DNA damage as well as generation of apoptosis. Lastly, PFOS exposure compromised the distribution of cortical granules (CGs) and their component ovastacin, leading to the failure of sperm binding and fertilization. Altogether, our study illustrates that oxidative stress-induced apoptosis is a major cause for the deteriorated quality of porcine oocytes exposed to PFOS.			сс
D1039	in vitro (生殖発 生毒性)	Lavogina, Darja; Visser, Nadja; Samuel, Külli; Davey, Eva; Bjö rvang, Richelle D; Hassan, Jasmin; Koponen, Jani; Rantakokko, Panu; Kiviranta, Hannu; Rinken, Ago; Olovsson, Matts; Salumets, Andres; Damdimopoulou, Pauliina	Endocrine disrupting chemicals interfere with decidualization of human primary endometrial stromal cells in vitro	2022	Front Endocrinol (Lausanne). 2022 Aug 19;13:903505. doi: 10.3389/fendo.2022.903505. eCollection 2022.	Multiple studies have shown associations between exposure to endocrine disrupting chemicals (EDCs) and reduced fertility in women. However, little is known about the target organs of chemical disruption of female fertility. Here, we focus on the hormone-sensitive uterine lining, the endometrium, as a potential target. Decidualization is the morphological and functional change that endometrial stromal cells undergo to support endometrial receptivity, which is crucial for successful implantation, placentation, and pregnancy. We investigated the effect of nine selected EDCs on primary human endometrial stromal cell decidualization in vitro. The cells were exposed to a decidualization-inducing mixture in the presence or absence of 1 μ M of nine different EDCs for nine days. Extent of decidualization was assessed by measuring the activity of cAMP dependent protein kinase, Rho-associated coiled-coil containing protein kinase, and protein kinase B in lysates using photoluminescent probes, and secretion of prolactin into the media by using ELISA. Decidualization-inducing mixture upregulated activity of protein kinases and prolactin secretion in cells derived from all women. Of the tested chemicals, dichlorodiphenyldichloroethylene (p,p'-DDE), hexachlorobenzene (HCB) and perfluorooctanesulfonic acid (PFOS) significantly reduced decidualization as judged by the kinase markers and prolactin secretion. In addition, bisphenol A (BPA) reduced prolactin secretion but did not significantly affect activity of the kinases. None of the EDCs was cytotoxic, based on the assessment of total protein content or activity of the viability marker casein kinase 2 in lysates. These results indicate that EDCs commonly present in the blood circulation of reproductive-aged women can reduce decidualization of human endometrial stromal cells in vitro. Future studies should focus on detailed hazard assessment to define possible risks of EDC exposure to endometrial dysfunction and implantation failure in women.			с с
D1040	in vitro (生殖発 生毒性)	Wei, Kang-Na; Wang, Xin-Jie; Zeng, Zhao- Cheng; Gu, Ruo- Ting; Deng, Shu- Zi; Jiang, Jiang; Xu, Chang-Long; Li, Wei; Wang, Hai-Long	Perfluorooctane sulfonate affects mouse oocyte maturation in vitro by promoting oxidative stress and apoptosis induced bymitochondrial dysfunction	2021	Ecotoxicol Environ Saf. 2021 Dec 1;225:112807. doi: 10.1016/j.ecoenv.2021.112807. Epub 2021 Sep 22.	Perfluorooctane sulphonate (PFOS), as a surfactant, is widely applied in the agricultural production activities and has become a potential menace to human health. The mechanism of its effect on the maturation of mammalian oocytes is unclear. This study explored the toxic effect of PFOS on mouse oocyte maturation in vitro. The results revealed that PFOS under a concentration of 600 μ M could significantly reduce the polar body extrusion rate (PBE) of mouse oocytes and cause symmetrical cell division. Further experiments showed that PFOS resulted in the abnormal cytoskeleton of the oocytes, causing the abnormal spindles and misplaced chromosomes, as well as the impaired dynamics of actin. Moreover, PFOS exposure inhibited the process of oocyte meiosis, which reflected in the slower spindle migration and continuous activation of spindle assembly checkpoint (SAC), then ultimately increased the probability of aneuploidy. Most importantly, PFOS exposure reduced the quality of oocytes, specifically by disrupting the function of mitochondria, inducing cell oxidative stress, and triggering early apoptosis. Furthermore, the level of methylation of histones is additionally influenced. In summary, our findings showed that PFOS exposure interfered with the maturation of mouse oocytes through affecting cytoskeletal dynamics, meiotic progression, oocyte quality, and histone modifications.			сс

No.	分野 (参考)	著者	タイトル	発行年	書誌情報		備考	情 報 抽	ン 文 ク 献 ① ラ	ン 文 ク 献 ② ラ
D1041	in vitro (生殖発 生毒性)	Hallberg, Ida; Persson, Sara; Olovsson, Matts; Sirard, Marc- André; Damdimopoulou, Pauliina; Rüegg, Joëlle; Sjunnesson, Ylva C B	Perfluorooctane sulfonate (PFOS) exposure of bovine oocytes affects early embryonic development at human-relevant levels in an in vitro model	2021	Toxicology. 2021 Dec;464:153028. doi: 10.1016/j.tox.2021.153028. Epub 2021 Nov 8.	Perfluorooctane sulfonate (PFOS) has been added to Stockholm Convention for global phase out, but will continue to contribute to the chemical burden in humans for a long time to come due to extreme persistence in the environment. In the body, PFOS is transferred into to the ovarian follicular fluid that surrounds the maturing oocyte. In the present study, bovine cumulus oocyte complexes were exposed to PFOS during 22 h in vitro maturation. Concentrations of 2 ng g(-1) (PFOS-02) representing average human exposure and 53 ng g(-1) (PFOS-53) relevant to highly exposed groups were used. After exposure, developmental competence was recorded until day 8 after fertilisation. Blastocysts were fixed and either stained to evaluate blastomere number and lipid distribution using confocal microscopy or frozen and pooled for microarray-based gene expression and DNA methylation analyses. PFOS-53 delayed the first cleavage to two-cell stage and beyond at 44 h after fertilisation ($p < .01$). No reduction of proportion blastocysts were seen at day 8 in either of the groups, but PFOS-53 exposure resulted in delayed development into more advanced stages of blastocysts seen as both reduced developmental stage ($p = .001$) and reduced number of blastomeres ($p = .04$). Blastocysts showed an altered lipid distribution that was more pronounced after exposure to PFOS-53 (increased total lipid volume, $p=.0003$, lipid volume/cell $p < .0001$) than PFOS-02, where only decreased average lipid droplet size ($p=.02$) was observed. Gene expression analyses revealed pathways differently regulated in the PFOS-treated groups compared to the controls, which were related to cell death and survival through e.g., P38 mitogen-activated protein kinases and signal transducer and activator of transcription 3, which in turn activates tumour protein 53 (TPS). Transcriptomic changes were also associated with metabolic stress response, differentiation and proliferation, which could help to explain the phenotypic changes seen in the blastocysts. The gene			В	С
D1042	in vitro (生殖発 生毒性)	Li, Jing; Quan, Xiao-Jie; Chen, Gang; Hong, Jia- Wei; Wang, Qi; Xu, Lin-Lin; Wang, Bing-Hua; Yu, Ze-Hua; Yu, Hong-Min	PFOS-induced placental cell growth inhibition is partially mediated by IncRNA H19 through interacting with miR-19a and miR-19b	2020	Chemosphere. 2020 Dec;261:127640. doi: 10.1016/j.chemosphere.2020.127640. Epub 2020 Jul 13.	Perfluorooctane sulfonic acid (PFOS), a persistent environmental pollutant, has been associated with decreased birth weight. The dysregulation of long non-coding RNA (IncRNA) H19 has been implicated in pregnancy complications such as intra-uterine growth retardation (IUGR), preeclampsia (PE), however, the expression and function of H19 in PFOS-exerted detrimental effects in the placenta remains to be unveiled. Here, we explored the role of H19 in PFOS-induced placental toxicity. Results showed that PFOS caused decreased cell growth in human HTR-8/SVneo cells. Expression of H19 was increased, while miR-19a and miR-19b expression were decreased in mice placenta tissues and in HTR-8/SVneo cells exposed to PFOS. A significant hypomethylation was observed at the H19 promoter in the placentas of mice that were gestational exposed to high dose of PFOS. H19 was confirmed to bind with miR-19a and miR-19b, targeting SMAD4. Furthermore, H19 appeared to partially improve the cell growth of HTR-8/SVneo cells exposed to PFOS via upregulation of miR-19a and miR-19b. In summary, our findings revealed that H19/miR-19a and miR-19b/SMAD4 axis exerted important functions in PFOS-induced placenta cell toxicity.			С	С
D1043	in vitro (生殖発 生毒性)	Qu, Jianhua; Han, Yu; Zhao, Ziyan; Wu, Yuan; Lu, Ying; Chen, Gang; Jiang, Junkang; Qiu, Lianglin; Gu, Aihua; Wang, Xinru	Perfluorooctane sulfonate interferes with non- genomic estrogen receptor signaling pathway, inhibits ERK1/2 activation and induces apoptosis in mouse spermatocyte-derived cells	2021	Toxicology. 2021 Aug;460:152871. doi: 10.1016/j.tox.2021.152871. Epub 2021 Jul 22.	Perfluorooctane sulfonate (PFOS) is a widespread persistent organic pollutant. Both epidemiological survey and our previous in vivo study have revealed the associations between PFOS exposure and spermatogenesis disorder, while the underlying mechanisms are far from clear. In the present study, GC-2 cells, a mouse spermatocyte-derived cell line, was used to investigate the toxic effects of PFOS and its hypothetical mechanism of action. GC-2 cells were treated with PFOS (0, 50, 100 and 150 μ M) for 24 h or 48 h. Results demonstrated that PFOS dose-dependently inhibited cell viability, induced G0/G1 cell cycle arrest and triggered apoptosis, which might be partly explained by the decrease in cyclin D1, PCNA and Bcl-2 protein expression; increase in Bax protein expression; and activation of caspase-9, -3. In addition, PFOS did not directly transactivate or repress estrogen receptors (ERs) in gene reporter assays, whereas the protein levels of both ER α and ER β were significantly altered and the downstream ERK1/2 phosphorylation was inhibited by PFOS. Furthermore, pretreatment with specific ER α agonist PPT (1 μ M) significantly attenuated the above PFOS-induced effects while specific ER β agonist DPN (1 μ M) accelerated them. These results suggest that PFOS may induce growth inhibition and apoptosis via non-genomic estrogen receptor/ERK1/2 signaling pathway in GC-2 cells, which provides a novel insight regarding the potential role of ERs in mediating PFOS-triggered spermatocyte toxicity.			С	С

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D1044	in vitro (生殖発 生毒性)	Mario, Teteltitla; Yvonne, Ducolomb; Veronica, Souza; Alejandro, Domí nguez; Juan, Rodríguez- Mercado; Diana, Flores; Edmundo, Bonilla; Eduardo, Casas; Mario, Altamirano; Altamirano; Altamirano; Alma, López; Ivan, Bahena; Concepcion, Gutierrez; Fahiel, Casillas; Miguel, Betancourt	Effects of perfluorooctanoic acid in oxidative stress generation, DNA damage in cumulus cells, and its impact on in vitro maturation of porcine oocytes	2022	Environ Toxicol. 2022 Jun;37(6):1394-1403. doi: 10.1002/tox.23492. Epub 2022 Feb 21.	Perfluorooctanoic acid is a synthetic compound mostly used in a wide range of consumer products with several adverse effects on somatic cells and gametes. It has been linked to hepatotoxic and carcinogenic effects, alterations in the immune system, endocrine, and reproductive alterations. In vivo studies show an increase in reactive oxygen species and DNA damage. However, the mechanisms by which this compound affects fertility, remain contradictory. Therefore, the aim of the present study was to evaluate the effect of perfluorooctanoic acid on oocyte viability and maturation, as well as the viability, generation of oxidative stress, and genotoxic damage in the cumulus cells exposed during in vitro maturation. This compound had a negative effect on oocyte viability (lethal concentration, LC(50) = 269 μ M) and maturation (inhibition maturation concentration IM(50) = 75 μ M), while in cumulus cells the LC(50) was 158 μ M. The generation of reactive oxygen species evaluated in cumulus cells, protein carbonylation, and DNA damage, was significantly increased at 40 μ M perfluorooctanoic acid. This study provides evidence that perfluorooctanoic acid causes reactive oxygen species generation, protein oxidation, and DNA damage in cumulus cells, compromising the maturation and viability of porcine oocyte, which may affect fertility.		C C				
D1045	MOA(生 殖毒性)	Yue, Yiren; Li, Sida; Qian, Zhuojia; Pereira, Renalison Farias; Lee, Jonghwa; Doherty, Jeffery J; Zhang, Zhenyu; Peng, Ye; Clark, John M; Timme- Laragy, Alicia R; Park, Yeonhwa	Perfluorooctanesulfonic acid (PFOS) and perfluorobutanesulfonic acid (PFBS) impaired reproduction and altered offspring physiological functions in Caenorhabditis elegans	2020	Food Chem Toxicol. 2020 Nov;145:111695. doi: 10.1016/j.fct.2020.111695. Epub 2020 Aug 22.	Perfluorobutanesulfonic acid (PFBS), a shorter chain Per- and polyfluoroalkyl substances (PFASs) cognate of perfluoroctanesulfonic acid (PFOS), has been used as replacement for the toxic surfactant PFOS. However, emerging evidences suggest safety concerns for PFBS and its effect on reproductive health is still understudied. Therefore, the current work aimed to investigate the effect of PFBS, in comparison to PFOS, on reproductive health using Caenorhabditis elegans as an in vivo animal model. PFOS ($\geq 10 \ \mu$ M) and PFBS ($\geq 1000 \ \mu$ M) significantly impaired the reproduction capacity of C. elegans, represented as reduced brood size (total egg number) and progeny number (hatched offspring number), without affecting the hatchability. Additionally, the preconception exposure of PFOS and PFBS significantly altered the embryonic nutrient loading and composition, which further led to abnormalities in growth rate, body size and locomotive activity in F1 offspring. Though the effective exposure concentration of PFBS was approximately 100 times higher than PFOS, the internal concentration of PFBS was lower than that of PFOS to produce the similar effects of PFOS. In conclusion, PFOS and PFBS significantly impaired the reproductive capacities in C. elegans and the preconception exposure of these two compounds can lead to offspring physiological dysfunctions.		сс				
D1046	MOA(生 殖発生毒 性)	Blake, Bevin E; Rickard, Brittany P; Fenton, Suzanne E	A High-Throughput Toxicity Screen of 42 Per- and Polyfluoroalkyl Substances (PFAS) and Functional Assessment of Migration and Gene Expression in Human Placental Trophoblast Cells	2022	Front Toxicol. 2022 Apr 25;4:881347. doi: 10.3389/ftox.2022.881347. eCollection 2022.	Per- and polyfluoroalkyl substances (PFAS) have become ubiquitous environmental contaminants that have been associated with adverse pregnancy outcomes in women and experimental research models. Adverse developmental and reproductive outcomes have been investigated for relatively few PFAS, and such studies are not scalable to address the thousands of unique chemical structures. As the placenta has been reported as a PFAS target tissue, the human placental trophoblast JEG-3 cell line was employed in a high-throughput toxicity screen (HTTS) to evaluate the effects of 42 unique PFAS on viability, proliferation, and mitochondrial membrane potential (MMP). HTTS concentration-response curve fitting determined EC50 values for 79% of tested compounds for at least one of the three endpoints. Trophoblast migratory potential was evaluated for a subset of six prioritized PFAS using a scratch wound assay. Migration, measured as the percent of wound closure after 72 h, was most severely inhibited by exposure to 100 µM perfluorooctanoic acid (PFOA; 72% closure), perfluorooctanesulfonic acid (PFOS; 57% closure), or ammonium perfluoro-2-methyl-3-oxahexanoate (GenX; 79% closure). PFOA and GenX were subsequently evaluated for disrupted expression of GPEX1 (300 µM GenX and 3 µM GenX), GPER1 (300 µM GenX), and SOD1 and altered cellular response to xenobiotic stress was indicated by upregulation of the placental efflux transporter, ABCG2 (300 µM GenX, 3 µM GenX, and 100 µM PFOA). These findings suggest the placenta is potentially a direct target of PFAS exposure and indicate that trophoblast cell gene expression and function are disrupted at PFAS levels well below the calculated cytotoxicity threshold (EC50). Future work is needed to determine the mechanism(s) of action of PFAS towards placental trophoblasts.		C C				

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D1047	MOA(生 殖発生毒 性)	Huang, Jing; Sun, Liwei; Mennigen, Jan Alexander; Liu, Yu; Liu, Shuai; Zhang, Miao; Wang, Qiyu; Tu, Wenqing	Developmental toxicity of the novel PFOS alternative OBS in developing zebrafish: An emphasis on cilia disruption	2021	l Hazard Mater. 2021 May 5;409:124491. doi: 1 10.1016/j.jhazmat.2020.124491. Epub 2020 Nov 5.	In recent years, sodium p-perfluorous nonenoxybenzene sulfonate (OBS) has emerged as a substitute for PFOS with large demand and application in the Chinese market. However, little is known about potential developmental effects of OBS. In this study, zebrafish embryos were acutely exposed to different concentrations of OBS and the positive control PFOS for a comparative developmental toxicity assessment. OBS caused hatching delays, body axis curvature, neurobehavioral inhibition and abnormal cardiovascular development. These organismal effects were accompanied by change of development related genes expression profile, in which some cases were similar to PFOS. Overall, the toxic effects induced by OBS were generally milder than that of PFOS. Further investigation suggested that both OBS and PFOS disrupted ciliogenesis, evidenced by the ciliary immunostaining, changes in gene expression of kinesin family, dynein arm family and tubulin family members, as well as downregulation of the abundance of motor proteins including KIF3C, DYNC1H1 and DYNC1LI1. The influence of PFOS was stronger than that of OBS on ciliary genes and proteins. Molecular docking analysis revealed that both OBS and PFOS may act on ciliary motor proteins to interfere with ciliogenesis, leading to ciliary dysfunction and providing a novel probable action mode linked to developmental toxicity. This raises concerns regarding the health risks of the novel PFOS alternative OBS.		сс
D1048	実験動物 (生殖発 生毒性)	Yin, Jiechen; Jian, Zihai; Zhu, Guangcan; Yu, Xiaojin; Pu, Yuepu; Yin, Lihong; Wang, Dayong; Bu, Yuanqing; Liu, Ran	Male reproductive toxicity involved in spermatogenesis induced by perfluorooctane sulfonate and perfluorooctanoic acid in Caenorhabditis elegans	2021	l I 10.1007/s11356-020-10530-8. Epub 2020 Aug 25.	As a persistent organic pollutant, perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA) have gained increasing research attention over recent years because of their potential risk to humans and the environment. In this paper, we investigated the reproductive toxicity of these pollutants using a C. elegans model to evaluate spermatogenesis throughout the entire developmental cycle of him-5 mutant by exposing to 0.001, 0.01, and 0.1 mmol/L PFOS or PFOA for 48 h. Experimental results suggested that PFOS and PFOA exposure led to reductions in brood size, germ cell number, spermatid size, and motility, and increases in rate of malformation spermatids. Analysis of variance (ANOVA) showed that exposure to PFOS resulted in higher levels of damage than PFOA in germ cells only in 0.001 mmol/L exposure group. RT-qPCR was used to further investigate the expression of genes associated with different stages of spermatogenesis, such as mitosis and meiosis, fibrous body-membranous organelles (FB-MOS), and sperm activation. The expression levels of wee-1.3, spe-4, spe-6, and spe-17 genes were increased, while those of puf-8, spe-10, fer-1, swm-1, try-5, and spe-15 genes were decreased. Our results suggesting that PFOS or PFOA may cause spermatogenesis damage by disrupting the mitotic proliferation, meiotic entry, formation of the MOs, fusion of the MOs and plasma membrane (PM), and pseudopods. Loss-of-function studies using puf-8 and spe-10 mutants revealed spe-10 gene was specifically involved in PFOS or PFOA induced reproductive toxicity via regulating one or more critical palmitoylation events, while puf-8 gene was not direct target of PFOS and PFOA, and PFOS and PFOA may act on the upstream gene of puf-8, thus affecting reproductive ability. Taken together, these results demonstrate the potential adverse impact of PFOS and PFOA exposure on spermatogenesis and provide valuable data for PFC risk assessment. Grapical abstract.		c c
D1049	実験動物 (生殖発 生毒性)	Ortiz-Sánchez, Paola Berenice; Roa-Espitia, Ana L; Fierro, Reyna; López-Torres, Aideé S; Jimé nez-Morales, Irma; Oseguera- López, Iván; Hern ández-González, Enrique O; Gonzá lez-Márquez, Humberto	Perfluorooctane sulfonate and perfluorooctanoic acid induce plasma membrane dysfunction in boar spermatozoa during in vitro capacitation	2022	2 Reprod Toxicol. 2022 Jun;110:85-96. doi: 10.1016/j.reprotox.2022.03.013. Epub 2022 Mar 29.	Spermatozoa require the capacitation, a series of biochemical events, to perform fertilization. Many toxic compounds can interfere in this process, including perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA), which belong to the perfluoroalkyl substances (PFAS). Since both substances are found in many everyday materials and are highly persistent, they accumulate in organisms where they have been associated with fertility problems. This study analyzes the effects of PFOS and PFOA on the functionality of boar spermatozoa, and changes in the plasma membrane (PM) during capacitation. The median lethal concentrations (LC50) of PFOS and PFOA were 460 and 1894 μM, respectively, while the mean inhibitory concentrations of capacitation (ICC50) were 274 μM and 1458 μM, respectively. The ICC50 of PFOA was insufficient to reduce the capacitation, but 950 μM (½ LC50) of PFOA and the ICC50 of PFOS significantly reduced the number of capacitated spermatozoa. PFOS and PFOA also impeded the progesterone (P4)-induced acrosomal reaction (iAR). These effects occur despite the accumulation of [Ca(2+)](i) under capacitating conditions. The accumulation of [Ca(2+)](i) produces saturation, which prevents its entry through ionophore A23187 and P4 in the presence of PFOS. Membrane potential (Emv) was deregulated. Both PFAS affected lipid membrane conductance mediated by valinomycin. The spermatozoa presented 49% and 47% of membrane dysfunction with PFOS and PFOA, respectively. By causing membrane damage, both substances prevented the release of cholesterol and altered the organization of membrane microdomains (MMDs). Data indicate that both PFAS caused alterations in PM functionality.		сс

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No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D1050	実験動物 (生殖発 生毒性)	Marques, Emily S; Agudelo, Juliana; Kaye, Emily M; Modaresi, Seyed Mohamad Sadegh; Pfohl, Marisa; Bečanov á, Jitka; Wei, Wei; Polunas, Marianne; Goedken, Michael; Slitt, Angela L	The role of maternal high fat diet on mouse pup metabolic endpoints following perinatal PFAS and PFAS mixture exposure	2021	Toxicology. 2021 Oct;462:152921. doi: 10.1016/j.tox.2021.152921. Epub 2021 Aug 28.	Per- and polyfluoroalkyl substances (PFAS) are a family of chemicals that are ubiquitous in the environment. Some of these chemicals, such as perfluoroctanesulfonic acid (PFOS), perfluorohexanesulfonate (PFHxS) and perfluoroctanoic acid (PFOA), are found in human sera and have been shown to cause liver steatosis and reduce postnatal survival and growth in rodents. The purpose of this work is to evaluate the impact of diet and PFAS exposure to mouse dam (mus musculus) on the risk to pup liver and metabolism endpoints later in life, as well as evaluate PFAS partitioning to pups. Timed-pregnant dams were fed a standard chow diet or 60 % kcal high fat diet (HFD). Dams were administered either vehicle, 1 mg/kg PFOA, 1 mg/kg PFOS, 1 mg/kg PFHxS, or a PFAS mixture (1 mg/kg of each PFOA, PFOS, and PFHxS) daily via oral gavage from gestation day 1 until postnatal day (PND) 20. At PND 21, livers of dams and 2 pups of each sex were evaluated for lipid changes while remaining pups were weaned to the same diet as the dam for an additional 10 weeks. Dam and pup serum at PND 21 and PND 90 were also evaluated for PFAS concentration, alanine aminotransferase (ALT), leptin and adiponectin, and glycosylated hemoglobin A1c. Perinatal exposure to a HFD, as expected, increased pup body weight, maternal liver weight, pup liver triglycerides, pup serum ALT, and pup serum leptin. PFOA and the PFAS mixture increased liver weights, and. treatment with all three compounds increased liver triglycerides. The maternal HFD increased dam and pup serum PFAS levels, however, was protective against PFOA-induced increase in serum ALT and observed increases in liver triglycerides. The PFAS mixture had very distinct effects when compared to single compound treatment, suggesting some cumulative effects, particularly when evaluating PFAS transfer from dam to pup. This data highlights the importance of diet and mixtures when evaluating liver effect of PFAS and PFAS partitioning.		сс
D1051	実験動物 (生殖発 生毒性)	Aghaei, Zahra; Steeves, Katherine L; Jobst, Karl J; Cahill, Lindsay S	The impact of perfluoroalkyl substances on pregnancy, birth outcomes, and offspring development: a review of data from mouse models †	2022	Biol Reprod. 2022 Mar 19;106(3):397-407. doi: 10.1093/biolre/ioab223.	Per- and polyfluoroalkyl substances (PFASs) such as perfluorooctanoic acid (PFOA) and perfluorooctanesulfonic acid (PFOS) are persistent in the environment and bioaccumulate in wildlife and humans, potentially causing adverse health effects at all stages of life. Studies from human pregnancy have shown that exposure to these contaminants are associated with placental dysfunction and fetal growth restriction; however, studies in humans are confounded by genetic and environmental factors. Here, we synthesize the available results from mouse models of pregnancy to show the causal effects of prenatal exposure to PFOA and PFOS on placental and fetal development and on neurocognitive function and metabolic disorders in offspring. We also propose gaps in the present knowledge and provide suggestions for future research studies.		сс
D1052	実験動物 (生殖発 生毒性)	Huang, Chunjie; Wu, Di; Zhang, Kejia; Khan, Faheem Ahmed; Pandupuspitasar i, Nuruliarizki Shinta; Wang, Yongsheng; Huo, Lijun; Sun, Fei	Perfluorooctanoic acid alters the developmental trajectory of female germ cells and embryos in rodents and its potential mechanism	2022	Ecotoxicol Environ Saf. 2022 May 1;236:113467. doi: 10.1016/j.ecoenv.2022.113467. Epub 2022 Apr 4.	issues, the underlying mechanisms of which are still in its infancy. Here, we report that PFOA deteriorates female reproduction at multiple development stages. Oocyte meiosis and preimplantation development are severely impaired by PFOA with oxidative stress being a contributor. Supplementing with antioxidant melatonin partially rescues oocyte meiotic maturation and non-apoptotic demise. The attenuation in ovarian follicle development however can be improved by metformin but not melatonin. Importantly, metformin blunts PFOA-induced fetal growth retardation (FGR) and such protective effect could be recapitulated by transplantation of fecal material and pharmacological activation of AMPK. Mechanistically, PFOA causes gut microbiota dysbiosis, which might thereby rewire host metabolism of L-phenylalanine, histamine and L-palmitoylcarnitine that triggers hyperphenylalaninaemia, inflammation and ferroptosis to initiate FGR. Deregulated serine metabolism by the gut microbe constitutes an alternative mechanism underlying PFOA-induced FGR in that modulation of serine in dam's diet phenocopied the FGR. Our study expands the understanding of risk factors that impair human reproductive health, and proposes restoration of gut microbiota diversity and intervention of metabolism as therapeutics mitigating health risks predisposed by environmental perturbation.		сс
D1053	実験動物 (生殖発 生毒性)	Bao, Jialu; Zhang, Yan; Zhang, Linchao; Wang, Xiaodan	Effects of maternal exposure to PFOA on testes of male offspring mice	2021	Chemosphere. 2021 Jun;272:129585. doi: 10.1016/j.chemosphere.2021.129585. Epub 2021 Jan 6.	This study was conducted to explore the effects of maternal exposure to perfluorooctanoic acid (PFOA) on testicular development of male offspring mice. 20 pregnant Kunming mice were randomly divided into control group and PFOA exposure group with 10 mice of each. In PFOA exposure group, pregnant mice were given 5 mg/kg BW PFOA daily by gavage during gestation. Male offspring mice were killed to separate serum and collect testis at postpartum day 21, then tested the experimental indicators. The results showed that compared with control group, the content of PFOA in the serum of PFOA-exposed mice increased significantly and testosterone content is significantly reduced. Histological observations revealed architectural damages in testis in PFOA exposed groups and the apoptosis was increased. Transcriptome sequencing results showed that the U4/U6 snRNA coding genes snu13 and prp19 complex coding genes HSP73 were up-regulated and the U5 snRNA coding genes Brr2, Prp8 and EJC/TREX coding THOC genes were down-regulated after PFOA exposure Real-time PCR confirmed this result. These results indicate that the exposure of pregnant mice to perfluorooctanoic acid will have a damaging effect on the development of testes in male offspring mice, which may be due to blocked activation of the shear body, changes in structural functions, and inability to perform shear functions.		сс

分野 タイトル 発行年 書誌情報 要旨 (原文) No 著者 (参考) Perfluorooctanoic acid (PFOA) could induce developmental toxicities, affecting various orga peroxisome-proliferation activated receptor alpha (PPAR α) had been identified as a major effects are frequently reported. To further elucidate the mechanism of toxicity in PFOA-indu RNA-seq analysis was performed in hatchling chicken hearts developmentally exposed to ve RT-PCR and western blotting were then performed to confirm the identified potential targets Guo, Yajie; Yuan Junhua; Ni, Hao designed to overexpress and silence identified target miRNA in developing chicken embryo, 実験動物 Environ Pollut. 2022 Nov 1;312:120022. doi: investigated. 21 miRNAs and 1142 mRNAs were identified to be affected by developmental e li, Jing; Zhong, Perfluorooctanoic acid-induced developmental D1054 (生殖発 Shuping; Zheng, cardiotoxicity in chicken embryo: Roles of miR-490-5p 10.1016/j.envpol.2022.120022. Epub 2022 Aug 23. hearts. Among the identified differentially expressed miRNAs, miR-490-5p was confirmed to 生毒性) Yuxin: Jiang. exposure, along with its downstream targets, Synaptosome associated protein 91 (SNAP91) Qixiao (LYPD6), as indicated by RT-PCR and western blotting results. Lentivirus overexpressing m induced by PFOA exposure, while lentivirus silencing miR-490-5p alleviated PFOA-induced of observed in the expression of downstream target genes, SNAP91 and LYPD6. In summary, r SNAP91 and LYPD6 are associated with PFOA-induced developmental cardiotoxicity in chic further elucidate the mechanism of PFOA-induced developmental cardiotoxicity. Perfluorooctanoic acid (PFOA) is an emerging organic pollutant (EOP) hazardous to human Shao, Wentao; Xu. Jin: Xu. exposure on offspring as well as the underlying mechanisms remain unclear. In this study, IC Cheng; Weng, PFOA exposure (0.05 mg/kg/day) were established to investigate the roles on metabolic disc Zhenkun: Liu composition, hepatic lipid levels, transcriptome and metabolome were analyzed. Expression 宝騇勈劮 Early-life perfluorooctanoic acid exposure induces Qian; Zhang, Xir Environ Pollut. 2021 Mar 1;272:115974. doi: inflammasome formation and gut barrier integrity were measured. Furthermore, oral adminis 2021 10.1016/j.envpol.2020.115974. Epub 2020 Nov 4. D1055 (生殖発 obesity in male offspring and the intervention role of Liang, Jingjia; Li mg/kg/day) was performed to observe the rescue effect on lipid disorders caused by PFOA 生毒性) chlorogenic acid Wenxiang; that gestational exposure to PFOA resulted in obesity, hepatic inflammation, disorders of lip Zhang, Yi; Jiang, barrier integrity in male offspring. Notably, these adverse effects were attenuated by CGA su Zhaoyan; Gu, that PFOA exposure during early life stage induced potential risks for later onset of obesity Aihua ameliorated by CGA treatment. This study aimed to explore the mechanism of perfluorooctanoic acid (PFOA) toxicity on the pregnancy. Pregnant mice were given 0, 1, 5, 10, 20, and 40 mg/kg PFOA daily by gavage fro sacrificed on GD 9. Subsequently, several toxicity parameters were evaluated, including the uterine indexes, histopathological changes of the liver and uterus, and levels of malondialde (SOD), and glutathione peroxidase (GSH-Px) in the liver. We also determined the expression Zhang, Yan Caspase-3 in decidual cells by immunohistochemistry and the TUNEL assay to detect apopt 実験動物 Zhang, Linchao; Environ Sci Pollut Res Int. 2021 Dec;28(46):66355-66365. that PFOA increased the liver weights and reduced the uterus index in a dose-dependent ma Perfluorooctanoic acid exposure in early pregnancy D1056 (牛殖発 Bao, Jialu; Liu. 2021 doi: 10.1007/s11356-021-15453-6. Epub 2021 Jul 31. the levels of SOD and GSH-Px were significantly decreased, and MDA increased substantia induces oxidative stress in mice uterus and liver 生毒性) Liantao; Wang, mg/kg of PFOA caused more substantial harm to the uterus, thus a higher probability for col Xiaodan expression of FAS, FASL, Bax, and Caspase-3 in decidual cells of the uterus in the PFOA tre n a dose-dependent manner. The expression of Bcl-2 was downregulated, decreasing the B control group had significantly fewer apoptotic cells in the uterus and shallower staining tha findings of this study suggest that oxidative damage may be one of the mechanisms by which subsequent increase in uterine cell apoptosis may cause embryo loss or damage Perfluorooctanoic acid (PFOA) is a synthetic fluorosurfactant used in the manufacturing of f onger produced in the United States, it is environmentally persistent and found in imported textiles. Previous studies have identified developmental toxicity of PFOA, but little is known ovary. Thus, this study examined the effects of PFOA on hormone levels, ovarian steroidoge Yang, May; Lee, folliculogenesis in mice in vitro and in vivo. For the in vitro studies, antral follicles from adult Yuna; Gao, vehicle control or 1, 10, or 100 $\,\mu$ g/ml PFOA for 96 h. For the in vivo studies, adult CD-1 fer 実験動物 Liying; Chiu, Toxicol Sci. 2022 Mar 28;186(2):260-268. doi: vehicle control or 1, 5, 10, or 20 mg/kg/day PFOA for 10 days. Gene expression of steroidog Perfluorooctanoic Acid Disrupts Ovarian D1057 (生殖発 Karen; Meling, 2022 Steroidogenesis and Folliculogenesis in Adult Mice 10.1093/toxsci/kfac005. hormones, and follicle counts were analyzed. In vitro, PFOA (100 μ g/ml) significantly decre 生毒性) Daryl D; Flaws, estrone levels, and gene expression of StaR, Cyp11a1, and Hsd3b1 compared with controls. Jodi A; Warner, decreased progesterone and pregnenolone levels (5 mg/kg), increased testosterone levels Genoa R expression of Cvp19a1 (1 mg/kg) compared with controls. Exposure to PFOA also significar decreasing primordial follicles and increasing preantral and antral follicles (5 and 10 mg/kg these data show that PFOA disrupts adult ovarian function in a nonmonotonic matter and ma failure

	備考	出 情 対 報 象 抽	ン 文 前 ① ラ	ン 文 ク 献 ② ラ
ns, including the heart. Although target of PFOA, PPAR α -independent iced developmental cardiotoxicity, whicle or 2 mg/kg (egg weight) PFOA. s. Furthermore, lentivirus was and the resulting phenotypes were exposure to PFOA in chicken embryo be significantly affected by PFOA and LY6/PLAUR domain containing 6 iR-490-5p mimicked the phenotype changes. Similar patterns were also niR-490-5p and its downstream genes, ken embryo, which might help to			С	С
health. Effects of maternal PFOA CR mouse models of gestational low orders of offspring. Body weight, body of genes related to lipid metabolism, stration of chlorogenic acid (CGA) (100 exposure. Our findings demonstrated id metabolism, and disruption of gut upplementation. These data suggested and metabolic disorder which could be			C	C
uterus and liver of mice during early m gestational day (GD) 1-7 and uterus and liver weights, liver and hyde (MDA), superoxide dismutase as of FAS, FASL, Bax, Bcl-2, and cosis uterine cells. The results showed anner. With increasing doses of PFOA, lly in liver tissue. 20 mg/kg and 40 ngestion and resorption. The eatment groups significantly increased ccl-2/Bax ratio. At gestation day 9, the in the 40 mg/kg PFOA group. The ch PFOA induces liver toxicity, and a			С	С
luorotelomers. Although PFOA is no food packaging, cookware, and about the effects of PFOA on the adult nic gene expression, and female mice were cultured with male mice were orally dosed with genic enzymes, levels of sex steroid eased follicle growth, estradiol and In vivo, exposure to PFOA significantly (1 mg/kg), and increased gene ty altered follicle counts by) compared with controls. Collectively, ay pose a risk for premature ovarian			С	С

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン 文 ク 献 ① ラ	ン 文 ク 献 ② ラ
D1058	実験動物 (生殖発 生毒性)	Clark, Kendra L; Davis, John S	Perfluorooctanoic acid (PFOA) promotes follicular growth and alters expression of genes that regulate the cell cycle and the Hippo pathway in cultured neonatal mouse ovaries	2022	Toxicol Appl Pharmacol. 2022 Nov 1;454:116253. doi: 10.1016/j.taap.2022.116253. Epub 2022 Sep 21.	Perfluorooctanoic acid (PFOA) is a synthetic chemical resistant to biodegradation and is environmentally persistent. PFOA is found in many consumer products and is a major source of water contamination. While PFOA has been identified as a contaminant of concern for reproductive health, little is known about the effects of PFOA on ovarian follicular development and growth. Recent evidence indicates that the Hippo pathway is an important regulator of ovarian physiology. Here, we investigated the effects of PFOA on ovarian folliculogenesis during the neonatal period of development and potential impacts on the Hippo signaling pathway. Post-natal day 4 (PND4) neonatal ovaries from CD-1 mice were cultured with control medium (DMSO <0.01% final concentration) or PFOA (50 μ M or 100 μ M). After 96 h, ovaries were collected for histological analysis of folliculogenesis, gene and protein expression, and immunostaining. Results revealed that PFOA (50 μ M) increased the number of secondary follicles, which was accompanied by increases in mRNA transcripts and protein of marker of proliferation marker Ki67 with no impacts on apoptosis markers Bax, Bcl2, or cleaved caspase-3. PFOA treatment (50 μ M and 100 μ M) stimulated an upregulation of transcripts of cell cycle regulators Ccna2, Ccnb2, Ccne1, Ccnd1, Ccnd2, and Ccnd3. PFOA also increased abundance of transcripts of Hippo pathway components Mst1/2, Lats1, Mob1b, Yap1, and Taz, as well as downstream Hippo pathway targets Areg, Amotl2, and Cyr61, although it decreased transcripts for anti-apoptotic Birc5. Inhibition of the Hippo pathway targets that occupationally relevant levels of PFOA (50 μ M) can stimulate follicular growth and proliferation. Together, these findings suggest that occupationally relevant levels of PFOA (50 μ M) can stimulate follicular activation in neonatal ovaries potentially through activation of the Hippo pathway.			С	с
D1059	実験動物 (生殖発 生毒性)	Merrill, Alyssa K; Conrad, Katherine; Marvin, Elena; Sobolewski, Marissa	Effects of gestational low dose perfluorooctanoic acid on maternal and "anxiety-like" behavior in dams	2022	Front Toxicol. 2022 Aug 29;4:971970. doi: 10.3389/ftox.2022.971970. eCollection 2022.	Pregnancy is a unique critical window with nearly ubiquitous exposure to low concentrations of endocrine disrupting chemicals, such as per- and poly-fluoroalkyl substances (PFAS). Human and animal research suggests that PFAS compounds disrupt hypothalamic-pituitary-adrenal axis function, with some evidence of altered "anxiety-like" behavior, but little is known about the potential effects on maternal mental health following exposures during pregnancy. Evaluating the consequences of gestational PFAS exposures on maternal health is essential, because approximately 1 in 10 women experience postpartum depression, often with increased anxiety. To address this gap, dams were exposed to a low dose, 0.1 mg/kg, of perfluorooctanoic acid (PFOA) from gestational day 0 to birth. Maternal behavior was then observed from postnatal days 5-9, and "anxiety-like" behavior was measured using open field spontaneous locomotor behavior and elevated plus maze following weaning. No difference was observed in the litter size or sex of offspring. Gestational PFOA exposure altered maternal behavior. Despite similar nursing durations, PFOA dams spent more time nursing in a flat posture and on their side, and less time in kyphosis. Despite significantly quicker first contact, PFOA dams did not return pups to the nest quicker, indicating reduced retrieval latency. At weaning, dams displayed increased "anxiety-like" behaviors in the elevated plus maze with a significantly higher mean duration in the closed arms and reduced choice frequency with significantly lower number of entries in the closed and open arms. PFOA dams showed reductions in ambulatory movement across the session-associated behaviors, such as forced swim, anhedonia, and social preference, will further delineate behavioral mechanisms. Further research on the effects of environmental contaminant exposures during pregnancy effects maternal depression-associated, and/or "anxiety-like" behavior is necessary for the public health protection of women.			C	c
D1060	実験動物 (生殖発 生毒性)	Wang, Zhongyuan; Zhang, Tongtong; Wu, Jiajin; Wei, Xiyi; Xu, Aiming; Wang, Shangqian; Wang, Zengjun	Male reproductive toxicity of perfluorooctanoate (PFOA): Rodent studies	2021	Chemosphere. 2021 May;270:128608. doi: 10.1016/j.chemosphere.2020.128608. Epub 2020 Oct 14.	Perfluorooctanoic acid (PFOA) is an artificial organic substance widely used for decades, which seriously threatens human health. This study aimed to identify human-relevant correlates between PFOA exposure and the male rodent reproductive system. We performed a systematic literature review of the relevant literature of PubMed, Cochrane Library databases, Web of Science and Embase from the establishment to April 2020. Studies included the effects of PFOA on the reproductive system of male rodents. The meta-analysis was performed on the basis of the following points: level of testosterone and estradiol in serum, development of reproductive organs, pathological changes of reproduction organs and parameters of semen. A series of 16 studies was enrolled in this study. The standard mean difference (SMD) for PFOA-related reproductive toxicity was summarised as -0.39 (95% confidence interval [CI]: 0.71, -0.07). The lower serum testosterone levels, decreased absolute testicular and epididymal weights, higher serum estradiol levels, elevated relative testicular and seminal vesicle weights and increased incidence of Leydig cell adenoma and percentage of abnormal sperm were observed in the exposed group compared with the control group. However, no statistical difference was found in the day of preputial separation of pups and percentage of motile sperm. In conclusion, PFOA exposure heightens the reproductive system damage in male rodents. However, many studies included in the review did not identify mechanisms by which PFOA induces changes to the male reproductive system, which is an area for additional study.			В	с

分野 タイトル 発行年 書誌情報 要旨 (原文) No. 著者 (参考) This study investigated the protective effect of rutin on reproductive and blood-testis barrier perfluorooctanoic acid (PFOA) exposure. In this study, male ICR mice were randomly divided (ddH(2)O, 5 mL/kg), PFOA group (PFOA, 20 mg/kg/d, 5 mL/kg), PFOA + rutin group (PFC mg/kg/d, 5 mL/kg). Mice were exposed to PFOA for 28 days by gavage once daily in the pre Ma. Xinzhuang: Histopathological observations demonstrated that rutin treatment during PFOA exposure ca Ren, Xijuan; 実験動物 Rutin ameliorates perfluorooctanoic acid-induced and epididymis such as atrophy of spermatogenic epithelium and stenosis of epididymal lum Zhang, Xuemin; Drug Chem Toxicol. 2022 Nov 13:1-12. doi: D1061 (生殖発 2022 testicular injury in mice by reducing oxidative stress layers of spermatogenic cells. Biochemical detection demonstrated that rutin can reduce 8-H Griffin, Nathan; 10.1080/01480545.2022.2145483. Online ahead of print 生毒性) and improving lipid metabolism concentration in the serum and testis tissues. Rutin can also ameliorate glutathione peroxida Liu, Hui; Wang, dismutase (SOD) content, and reduce malondialdehyde (MDA) and total cholesterol (TC) col immunofluorescence and transmission electron microscopy demonstrated that rutin can am PFOA exposure. Rutin ameliorated the stress expression of tight junction proteins occludin a findings suggested that rutin has a degree of protection in reproductive and BTB damage, w perspective on the application of rutin to prevent reproductive damage. BACKGROUND: Perfluorohexane sulfonate (PFHxS) is a six-carbon perfluoroalkyl sulfonic a contaminant. This study aims to investigate the effects of PFHxS exposure on female reprod in mice. METHODS: Eight-week-old ICR mice were divided randomly into four groups admin doses of 0.5, 5, and 50 mg/kg/day for 42 days by intragastric administration. Body weight, c counts, and serum sex hormone levels were evaluated. The expression of kisspeptin and gor Yin, Xiaorui; Di in the hypothalamus was also detected. RESULTS: Compared to vehicle exposure, 5 mg/kg, Tingting; Cao, 実験動物 J Ovarian Res. 2021 Oct 27;14(1):141. doi: 10.1186/s13048-Chronic exposure to perfluorohexane sulfonate leads estrous cycle, especially the duration of diestrus, after 42 days of treatment. The numbers (inyuan; Liu, D1062 (生殖発 to a reproduction deficit by suppressing hypothalamic and corpus lutea were significantly reduced in the PFHxS-treated mice. Moreover, compared Zhengnan; Xie, 021-00903-z. 生毒性) kisspeptin expression in mice treated mice showed decreases in the serum levels of follicle-stimulating hormone (FSH), lu Jingyan; Zhang, (E2), and reduced GnRH mRNA levels, along with the lack of an LH surge. Furthermore, the Suyun of kisspeptin immunoreactivity and kiss-1 mRNA in the arcuate nucleus (ARC) and anterove than the control mice. After intraventricular administration of kisspeptin-10, the numbers of corpus lutea recovered, along with the levels of GnRH mRNA, FSH, and LH in the mice treat CONCLUSION: These results indicate that chronic exposure of mice to 5 mg/kg/day PFHxS inhibiting kisspeptin expression in the ARC and AVPV regions, leading to deficits in follicular Ramskov Obesity is a complex disease with many causes, including a possible role for environmental Tetzlaff, Cecilie (PFHxS) is one of many per- and polyfluoroalkyl substances (PFASs) frequently detected in Nethe: Ramhøi obesogenic compound. We examined the potential long-term effects of PFHxS on metabolic Louise; developmental exposure to 0.05, 5 or 25 mg/kg bw/day, with or without co-exposure to a ba Lardenois, Auré Adult female rats perinatally exposed to 実験動物 disrupting chemicals (EDmix). Both male and female offspring showed signs of lower birth w perfluorohexane sulfonate (PFHxS) and a mixture of Toxicol Lett. 2021 Mar 15;339:78-87. doi: ie: Axelstad D1063 (生殖発 2021 Female offspring exposed to both PFHxS and EDmix had increased body weight in adulthood 10.1016/j.toxlet.2020.12.018. Epub 2020 Dec 30. Marta; Evrard, endocrine disruptors display increased body/fat 生毒性) larger in the PFHxS-exposed female offspring when compared to those exposed to EDmix al Bertrand; weights without a transcriptional footprint in fat cells molecular markers in the fat tissue by performing whole transcriptome profiling revealed no Chalmel, Frédé and there were no significant effects on plasma leptin levels in exposed females. Our result ric; Taxvig, endocrine disrupting chemicals can influence body weight later in life, but the effect is not n Camilla; Svingen expression in the fat tissue. Terje

	備考	出 情 対 報 象 抽	ン 文 ク 献 ① ラ	ン 文 ク 献 ② ラ
r (BTB) damage induced by I into three groups, Ctrl group DA, 20 mg/kg/d, 5 mL/kg; rutin, 20 esence or absence of rutin. In reduce structural damage to testis inen, while increase in the number and hydroxy-2'-desoxyguanosine (8-OHdG) ase (GSH-Px) and superoxide intent in testis tissues. Biotin tracking eliorate BTB structural damage during and claudin-11. In conclusion, our hich could put forward a new			С	С
cid found as an environmental duction and the underlying mechanism istered corn oil (vehicle) and PFHxS at ovarian weight, estrous cycle, follicle nadotropin releasing hormone (GnRH) /day PFHxS treatment prolonged the of secondary follicles, antral follicles d with the control mice, the PFHxS- iteinizing hormone (LH), and estrogen PFHxS-treated mice had lower levels ntral periventricular nucleus (AVPV) secondary follicles, antral follicles and ed with 5 mg/kg/day PFHxS. c affects reproductive functions by r development and ovulation.			В	С
chemicals. Perfluorohexane sulfonate humans and it is suspected to be an parameters in rats after ckground mixture of twelve endocrine weight following intrauterine exposure. d. The retroperitoneal fat pad was one. An attempt to detect putative significant changes between groups a show that early life exposure to ecessarily reflected in changed gene			С	С

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 対報 象抽 ① ラ	ン 文 ク 献 ② ラ
D1064	実験動物 (生殖発 生毒性)	Cope, Harlie A; Blake, Bevin E; Love, Charlotte; McCord, James; Elmore, Susan A; Harvey, Janice B; Chappell, Vesna A; Fenton, Suzanne E	Latent, sex-specific metabolic health effects in CD-1 mouse offspring exposed to PFOA or HFPO-DA (GenX) during gestation	2021	Emerg Contam. 2021;7:219-235. doi: 10.1016/j.emcon.2021.10.004. Epub 2021 Oct 31.	BACKGROUND: Perfluorooctanoic acid (PFOA) is an environmental contaminant associated with adverse metabolic outcomes in developmentally exposed human populations and mouse models. Hexafluoropropylene oxide-dimer acid (HFPO-DA, commonly called GenX) has replaced PFOA in many industrial applications in the U.S. and Europe and has been measured in global water systems from <1 to 9350 ng/L HFPO-DA. Health effects data for GenX are lacking. OBJECTIVE: Determine the effects of gestational exposure to GenX on offspring weight gain trajectory, adult metabolic health, liver pathology and key adipose gene pathways in male and female CD-1 mice. METHODS: Daily oral doses of GenX (0.2, 1.0, 2.0 mg/kg), PFOA (0.1, 1.0 mg/kg), or vehicle control were administered to pregnant mice (gestation days 1.5-17.5). Offspring were fed a high- or low-fat diet (HFD or LFD) at weaning until necropsy at 6 or 18 weeks, and metabolic endpoints were measured over time. PFOA and GenX serum and urine concentrations, weight gain, serum lipid parameters, body mass composition, glucose tolerance, white adipose tissue gene expression, and liver histopathology were evaluated. RESULTS: Prenatal exposure to GenX led to its accumulation in the serum and urine of 5-day old pups (P = 0.007, P < 0.001), which was undetectable by weaning. By 18 weeks of age, male mice fed LFD in the 2.0 mg/kg GenX group displayed increased weight gain (P < 0.05), fat mass (P = 0.012), and insulin sensitivity (P = 0.014) in comparison to control males fed LFD. Female mice fed HFD had a significant increase in hepatocyte single cell necrosis in 1.0 mg/kg GenX group (P = 0.022) and 1.0 mg/kg PFOA group (P = 0.003) compared to control HFD females. Both sexes were affected by gestational GenX exposure; however, the observed phenotype varied between sex with males displaying more characteristics of metabolic disease and females exhibiting liver damage in response to the gestational exposure. CONCLUSIONS: Prenatal exposure to Tank genX and 1 mg/kg PFOA induces adverse metabolic		В	с
D1065	実験動物 (生毒性)	Owumi, Solomon E; Akomolafe, Ayomide P; Imosemi, Innocent O; Odunola, Oyeronke A; Oyelere, Adegboyega K	N-acetyl cysteine co-treatment abates perfluorooctanoic acid-induced reproductive toxicity in male rats	2021	Andrologia. 2021 Jun;53(5):e14037. doi: 10.1111/and.14037. Epub 2021 Mar 16.	 placental and potentially lactational transfer are important exposure routes for GenX. Perfluorooctanoic acid is a synthetic perfluoroalkyl-persistent in the environment and toxic to humans. N-acetylcysteine is a pro- drug of both amino acid l-cysteine and glutathione-a non-enzymatic antioxidant. N-acetylcysteine serves as an antidote for paracetamol poisoning and alleviates cellular oxidative and inflammatory stressors. We investigated N-acetylcysteine role against reproductive toxicity in male Wistar rats (weight: 140-220 g; 10 weeks old) posed by perfluorooctanoic acid exposure. Randomised rat cohorts were dosed both with perfluorooctanoic acid (5 mg/kg; p.o) or co-dosed with N-acetylcysteine (25 and 50 mg/kg p.o) for 28 days. Sperm physiognomies, biomarkers of testicular function and reproductive hormones, oxidative stress and inflammation were evaluated. Co-treatment with N-acetylcysteine significantly (p < .05) reversed perfluorooctanoic acid-mediated decreases in reproductive enzyme activities, and adverse effect on testosterone, luteinising and follicle-stimulating hormone concentrations. N-acetylcysteine treatment alone, improved sperm motility, count and viability, and reduced total sperm abnormalities. Co-treatment with N-acetylcysteine mitigated perfluorooctanoic acid-induced alterations in sperm function parameters. N-acetylcysteine abated (p < .05) perfluorooctanoic acid-induced oxidative stress in experimental rats testes and epididymis, and generally improved antioxidant enzyme activities and cellular thiol levels. Furthermore, N-acetylcysteine suppressed inflammatory responses and remedied perfluorooctanoic acid-mediated histological injuries in rat. Cooperatively, N- acetylcysteine enhanced reproductive function in perfluorooctanoic acid dosed rats, by lessening oxidative and nitrative stressors and mitigated inflammatory responses in the examined organ. 		С	С
D1066	実験動物 (生殖発 生毒性)	Narizzano, Allison M; Lent, Emily May; Hanson, Jarod M; East, Andrew G; Bohannon, Meredith E; Quinn, Michael J Jr	Reproductive and developmental toxicity of perfluorooctane sulfonate (PFOS) in the white-footed mouse (Peromyscus leucopus)	2022	Reprod Toxicol. 2022 Oct;113:120-127. doi: 10.1016/j.reprotox.2022.08.011. Epub 2022 Aug 17.	Concerns about per- and polyfluoroalkyl substances (PFAS) stem from their ubiquitous presence in the environment, bioaccumulation, resistance to degradation, and toxicity. Previously, toxicity data relevant to ecological risk assessment has largely been aquatic, terrestrial invertebrates, or avian in origin. In this study, repeated oral exposures of perfluorooctane sulfonate (PFOS) were administered to white-footed mice (Peromyscus leucopus) to evaluate effects on reproduction and development. Prenatal exposure to high doses of PFOS caused neonatal mortality, though growth and development were unaffected by low doses. Additionally, parental (P) generation animals exhibited increased liver:body weight, increased hepatocyte cytoplasmic vacuolization, and decreased serum thyroxine (T4) levels. Total litter loss was selected as the protective critical effect in this study resulting in a benchmark dose low (BMDL) of 0.12 mg/kg-d PFOS. Importantly, PFOS exposure has been linked to reduced adult recruitment in myriad species and at similar thresholds to this study. Similarities in critical/toxicologic effects across taxa may add confidence in risk assessments at sites with multiple taxa or environments.		В	С

分野 タイトル 発行年 書誌情報 要旨 (原文) No 著者 (参考) Preeclampsia, defined as a hypertensive disorder during pregnancy, is a major cause of mat Observational studies have shown that the exposure of per- and polyfluoroalkyl substances, (PFOS), is emerging as a significant environmental factor associated with preeclampsia risk Zhao, Ying; Zhao of correlative in nature, and unable to establish a causal relationship. Here, we established Huangiang; Xu, preeclampsia to explore the molecular mechanism of PFOS in placental trophoblast. In the n Huangfang; An, 実験動物 Perfluorooctane sulfonate exposure induces gavage at a dose of 10 mg/kg/d from embryonic day 7.5-16.5 was sufficient to induce preec 'ing; Ma, Bo; Lu Ecotoxicol Environ Saf. 2022 Dec 1;247:114256. doi: D1067 (生殖発 preeclampsia-like syndromes by damaging trophoblast 2022 hypertension, proteinuria, and renal glomerular endotheliosis, accompanied with placental al 10.1016/j.ecoenv.2022.114256. Epub 2022 Oct 31. Huiqing; Zhou 生毒性) n-vitro experiments of JEG-3 cells, PFOS exposure impaired trophoblast motility including t nitochondria in pregnant mice Qiongjie; Li, invasion and vascularization. Mechanistically, these pathological effects on cells resulted fro Xiaotian; Xiong, damages, characterized by excessive ROS generation, decreased ATP production and mitoc Yμ accompanied by the activation of p38 MAPK and JNK signaling pathways. This pioneering st the causality verified by the animal model and the in vitro experiments, which indicates that preeclampsia during pregnancy via impairing trophoblast mitochondria. Perfluorooctane sulfonic acid (PFOS) is a persistent environmental pollutant. Exposure to Pl abnormal fetal development. The long non-coding RNA (IncRNA) has been showed to play a Li, Jing; Quan, preeclampsia (PE) and other pregnancy complications. Whether the IncRNA contributes to P Xiaojie; Lei, remains unknown. In this study, we investigated the function of IncRNA MEG3 and its derive Saifei; Chen 実験動物 LncRNA MEG3 alleviates PFOS induced placental cel toxicity. Pregnant mice received gavage administration of different concentrations of PFOS Environ Pollut. 2022 Jan 15;293:118542. doi: Gang; Hong, D1068 (生殖発 growth inhibition through its derived miR-770 targeting 2022 GD0 to GD17, and HTR-8/SVneo cells were treated with PFOS in the concentrations of 0, 10 10.1016/j.envpol.2021.118542. Epub 2021 Nov 18. Jiawei; Huang, 生毒性) РТХЗ expression levels of miR-770 and its host gene MEG3 were reduced in mice placentas and H Zhenyao; Wang, PFOS. A significant hypermethylation was observed at MEG3 promoter in placentas of mice Qi; Song, Weiyi; also confirmed that MEG3 and miR-770 overexpression alleviated the cell growth inhibition Yang, Xinxin (Pentraxin 3) was identified as the direct target of miR-770 and it was enhanced after PFOS suggested that MEG3 alleviate PFOS-induced placental cell inhibition through MEG3/miR-7 Epidemiological studies show a strong association between environmental exposure to perfl preeclampsia and fetal growth restriction; however, the underlying mechanisms are unclear gestational PFOS exposure leads to pregnancy complications via alterations in uterine vascu angiotensin II-related mechanisms and endothelium-derived factors such as nitric oxide. Pre exposed to PFOS 0.005, 0.05, 0.5, 5, 10, and 50 μ g/mL through drinking water from gestatio $50 \ \mu$ g/mL were used to assess mechanisms. PFOS exposure dose dependently increased m Dangudubiyyam Maternal perfluorooctane sulfonic acid exposure fetal weights. Uterine artery blood flow was lower and resistance index was higher in the PF 実験動物 Sri Vidva: during rat pregnancy causes hypersensitivity to Biol Reprod. 2022 Oct 11;107(4):1072-1083. doi: artery contractile responses to angiotensin II were significantly greater, whereas contractile D1069 (生殖発 Mishra, Jay S; 2022 10.1093/biolre/ioac141. angiotensin II and attenuation of endotheliumphenylephrine were unaffected. Plasma angiotensin II levels were not significantly different 生毒性) Song, Ruolin: dependent vasodilation in the uterine arteries † however, PFOS exposure significantly increased Angiotensin II type 1 receptor (AGTR1) and Kumar, Sathish uterine arteries. Endothelium-dependent relaxation response to acetylcholine was significar endothelial nitric oxide synthase expression in the uterine arteries of PFOS dams. Left vent observed, along with increased ejection fraction and fractional shortening in PFOS dams. Th maternal PEOS levels decrease uterine blood flow and increase vascular resistance via heig vasoconstriction and impaired endothelium-dependent vasodilation, which provides a molec maternal PFOS levels with gestational hypertension and fetal growth restriction. Huang, Jiyan; Perfluorooctane sulfonate (PFOS) is associated with male reproductive disorder, but the rel Ren, Hang; Chen, this study, we used in vivo and in vitro models to explore the role of Sertoli cell-derived exos Anni; Li, Ting; signaling pathway on PFOS-induced suppression of testosterone biosynthesis. Forty male IC Wang, Hongxia; PFOS (0.5-10 mg/kg/bw) for 4 weeks. Bodyweight, organ index, sperm count, reproductive h liang, Lianlian; Perfluorooctane sulfonate induces suppression of Sertoli cells and Leydig cells were used to delineate the molecular mechanisms that mediate 実験動物 Zheng, Shaokai; testosterone biosynthesis via Sertoli cell-derived Environ Pollut. 2022 May 15;301:118960. doi: biosynthesis. Our results demonstrated that PFOS dose-dependently induced a decrease in D1070 (生殖発 2022 Qi, Han; Ji, exosomal/miR-9-3p downregulating StAR expression 10.1016/j.envpol.2022.118960. Epub 2022 Feb 9. testosterone, and damage in testicular interstitium morphology. In vitro models, PFOS signif 生毒性) Binyan; Wang, in Leydig cells Sertoli cells and SC-Exo, accompanied by a decrease in testosterone secretion and StAR ex Xipei; Qu, cells were exposed to SC-Exo. Meanwhile, inhibition of SC-Exo or miR-9-3p by their inhibito Jianhua; Zhao decreases in testosterone secretion and the mRNA and protein expression of the StAR gene present study highlights the role of the SC-Exo/miR-9-3p/StAR signaling pathway in PFOS-Jianya; Qiu, Lianglin biosynthesis, advancing our understanding of molecular mechanisms for PFOS-induced mal

	備考	出 情 対 報 象 抽	ン 文 ク 献 ① ラ	ン 文 ク 献 ② ラ
ernal and fetal mortality. such as perfluorooctane sulfonate . However, epidemiologic evidence is an animal model of PFOS-induced nouse model, PFOS exposure by lampsia-like symptoms such as bnormal stromal collagen deposition. he compromised abilities of migration, om SLC25A5-mediated mitochondrial hondrial membrane potential loss, and cudy provided biological plausibility to PFOS exposure may cause			С	С
FOS has been associated with role in fetal growth restriction (FGR), PFOS-induced toxicity in the placenta ad miR-770 in PFOS-induced placental (0.5, 2.5, and 12.5 mg/kg/day) from D(-1), 1, 10 μ M. We found that ITR-8/SVneo cells with exposure of gestational-treated with PFOS. We induced by PFOS. Furthermore, PTX3 e exposure. In summary, our results 70/PTX3 axis. uorooctane sulfonic acid (PFOS) and			С	C
We tested the hypothesis that ular endothelium-independent egnant Sprague-Dawley rats were anal day 4 to 20, and dams with PFOS naternal blood pressure but decreased TOS dams. In PFOS dams, uterine responses to K+ depolarization and between control and PFOS dams; decreased AGTR2 protein levels in itly reduced with decreased icular hypertrophy and fibrosis were nese results suggest that elevated htened angiotensin II-mediated cular mechanism linking elevated			С	С
ated mechanisms are still unclear. In somes (SC-Exo)/miR-9-3p/StAR CR mice were orally administrated normones were evaluated. Primary e the effects of PFOS on testosterone sperm count, low levels of icantly increased miR-9-3p levels in pression in Leydig cells when Leydig rs significantly rescued PFOS-induced in Leydig cells. In summary, the induced suppression of testosterone e reproductive disorders.			С	С

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 対 報 抽	ン 文 ク 献 ① ラ	ン 文 ク 献 ② ラ
D1071	実験動物 (生殖発 生毒性)	Wan, Hin Ting; Wong, Aman Yi- Man; Feng, Shi; Wong, Chris Kong-Chu	Effects of In Utero Exposure to Perfluorooctane Sulfonate on Placental Functions	2020	D Environ Sci Technol. 2020 Dec 15;54(24):16050-16061. doi: 10.1021/acs.est.0c06569. Epub 2020 Dec 1.	Perfluorooctane sulfonate (PFOS) is a metabolic-disrupting chemical. There is a strong association between maternal and cord blood PFOS concentrations, affecting metabolism in early life. However, the underlying effects have not been fully elucidated. In this study, using the maternal-fetal model, we investigated the impact of gestational PFOS exposure on the placental structure and nutrient transport. Pregnant mice were oral gavaged with PFOS (1 or 3 μ g PFOS/g body weight) from gestational day (GD) 4.5 until GD 17.5. Our data showed a significant reduction in fetal body weight at high dose exposure. There were no noticeable changes in placental weights and the relative areas of junctional and labyrinth zones among the control and exposed groups. However, a placental nutrient transport assay showed a significant reduction in maternal-fetal transport of the glucose and amino acid analogues. Western blot analysis showed a significant decrease in the expression levels of placental SNAT4 upon PFOS exposure. Moreover, in the high-dose exposed group, placenta and fetal livers were found to have significantly higher corticosterone levels, a negative regulator of fetal growth. The perturbation in the placental transport function and corticosterone levels accounted for the PFOS-induced reduction of fetal body weights.	評価書文 献と重複		В	В
D1072	実験動物 (生殖発 生毒性)	Shi, Feng; Almerick T Boncan, Delbert; Wan, Hin Ting; Chan, Ting Fung; Zhang, Eric L; Lai, Keng Po; Wong, Chris Kong-Chu	Hepatic metabolism gene expression and gut microbes in offspring, subjected to in-utero PFOS exposure and postnatal diet challenges	2022	2 2 10.1016/j.chemosphere.2022.136196. Epub 2022 Aug 27.	We examined the changes in hepatic metabolic gene expression and gut microbiota of offspring exposed to PFOS in-utero. At GD17.5, our data showed that PFOS exposure decreased fetal bodyweights and hepatic metabolic gene expressions but increased relative liver mass and lipid accumulation. At PND21, in-utero high-dose PFOS-exposed offspring exhibited significantly greater bodyweight (catch-up-growth), associated with significant induction of hepatic metabolic gene expression. In addition, 16SrRNA-sequencing of the cecal samples revealed an increase in carbohydrate catabolism but a reduction in microbial polysaccharide synthesis and short-chain fatty acid (SCFA) metabolism. From PND21-80, a postnatal diet-challenge for the offspring was conducted. At PND80 under a normal diet, in-utero high-dose PFOS-exposed adult offspring were significantly lesser than the corresponding low-dose and control groups. Even though in the high-fat-diet, the in-utero PFOS-exposed adult offspring showed significant upregulation of hepatic metabolic genes, the lower bodyweight suggests that they had difficulty utilizing high-fat nutrients. Noteworthy, the metagenomic data showed a significant reduction in the biosynthesis of microbial polysaccharides, vitamin B, and SCFAs in the PFOS-exposed adult offspring. Furthermore, the observed effects were significantly reduced in the PFOS-exposed adult offspring with the high-fat diet but supplemented with sucrose. Our study demonstrated that in-utero PFOS exposed adult offspring.			С	С
D1073	実験動物 (生殖発 生毒性)	Zhang, Huishan; Lu, Hemin; Yu, Lin; Yuan, Jiexin; Qin, Shan; Li, Cong; Ge, Ren- Shan; Chen, Haolin; Ye, Leping	Effects of gestational exposure to perfluorooctane sulfonate on the lung development of offspring rats	202	l Environ Pollut. 2021 Mar 1;272:115535. doi: 10.1016/j.envpol.2020.115535. Epub 2020 Aug 28.	Perfluorooctane sulfonate (PFOS) is a man-made fluorosurfactant widely used in industry and consumer products. Previous studies with rats suggested that gestational exposure to PFOS may affect the lung development in the offspring. The mechanism, however, is still unknown. In the present study, we have exposed 24 pregnant SD rats from gestational day 12-18 to different doses of PFOS (0, 1 or 5 mg/kg BW/day). The lungs of the offspring were analyzed at postnatal days 1, 3, 7 and 14. PFOS treatment appeared to reduce the alveolar numbers, resulting in simplified alveolar structure and thickened alveolar septa. Also, PFOS treated animals had increased lung inflammation with up-regulated inflammasome associated proteins NLRP3, ASC, Caspase-1 and GSDMD and increased inflammatory cytokines IL-18 and IL-1 β . At the same time, HIF-1 α and VEGFA were significantly down-regulated. Since HIF-1 α and VEGFA are critical factors promoting alveolar development and pulmonary angiogenesis, these results suggested that PFOS may affect lung development by inhibiting HIF-1 α and VEGFA expression. Our results here indicate that gestational exposure to PFOS may affect lung development in the offspring with pathological characteristics similar to bronchopulmonary dysplasia (BPD), a severe lung developmental defect. The results also suggest that environmental factors such as PFOS may contribute to the increasing incidence of developmental lung diseases, such as BPD, by elevating lung inflammation and inhibiting lung development.			C	С
D1074	実験動物 (生殖発 生毒性)	Liang, Yongchao; Lu, Jingjing; Yi, Wenjie; Cai, Ming; Shi, Weiqiang; Li, Bingyan; Zhang, Zengli; Jiang, Fei	1α ,25-dihydroxyvitamin D(3) supplementation alleviates perfluorooctanesulfonate acid-induced reproductive injury in male mice: Modulation of Nrf2 mediated oxidative stress response	2022	2 2 Environ Toxicol. 2022 Nov 2. doi: 10.1002/tox.23685. Online ahead of print.	Perfluorooctanesulfonate acid (PFOS) is a typical persistent organic pollutant that widely exists in the environment. To clarify the toxic effects and mechanisms of PFOS and to find effective intervention strategies have been attracted global attention. Here, we investigated the effects of PFOS on the male reproductive system and explored the potential protective role of 1 α ,25-dihydroxyvitamin D(3) (1 α ,25(OH)(2) D(3)). Our results showed that 1 α ,25(OH)(2) D(3) intervention significantly improved PFOS-induced sperm quality decline and testicular damage. Moreover, 1 α ,25(OH)(2) D(3) aggrandized the total antioxidant capacity. Furthermore, after PFOS exposure, the transcription factor nuclear factor erythroid-related factor 2 (Nrf2) was adaptively increased together with its target genes, such as HO-1, NQO1, and SOD2. Meanwhile, 1 α ,25(OH)(2) D(3) ameliorated PFOS-induced augment of Nrf2 and target genes. These findings indicated that 1 α ,25(OH)(2) D(3) might attenuate PFOS-induced reproductive injury in male mice via Nrf2-mediated oxidative stress.			С	с

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D1075	実験動物 (生殖発 生毒性)	Qiu, Lianglin; Wang, Hongxia; Dong, Tianyi; Huang, Jiyan; Li, Ting; Ren, Hang; Wang, Xipei; Qu, Jianhua; Wang, Shoulin	Perfluorooctane sulfonate (PFOS) disrupts testosterone biosynthesis via CREB/CRTC2/StAR signaling pathway in Leydig cells	2021	Toxicology. 2021 Feb 15;449:152663. doi: 10.1016/j.tox.2020.152663. Epub 2020 Dec 24.	Perfluorooctane sulfonate (PFOS), a stable end-product of perfluorinated compounds (PFCs), is associated with male reproductive disorders, but its underlying mechanisms are still unclear. We used in vivo and in vitro models to investigate the effects of PFOS on testosterone biosynthesis and related mechanisms. First, male ICR mice were orally administered PFOS (0-10 mg/kg/bw) for 4 weeks. Bodyweight, sperm count, reproductive hormones, mRNA expression of the genes related to testosterone biosynthesis, and the protein expression of protein kinase A (PKA), p38 mitogen-activated protein kinase (MAPK), cAMP-response element binding protein (CREB), CREB regulated transcription coactivator 2 (CRTC2) and steroidogenic acute regulatory protein (StAR) were evaluated. Furthermore, mouse primary Leydig cells were used to delineate the molecular mechanisms that mediate the effects of PFOS on testosterone biosynthesis. Our results demonstrated that PFOS dose-dependently decreased sperm count, testosterone level, CRTC2/StAR expression, and damaged testicular interstitium morphology, paralleled by increase in phosphorylated PKA, CREB and p38 in testes. Additionally, similar to the in vivo results, PFOS significantly decreased testosterone secretion, CRTC2/StAR expression, interaction between CREB and CRTC2 and binding of CREB/CRTC2 to StAR promoter region, paralleled by increase in phosphorylated-p38, PKA, and CREB expression. Meanwhile, inhibition of p38 by SB203580, or inhibition of PKA by H89 can significantly alleviate the above PFOS-induced effects. As such, the present study highlights a role of the CREB/CRTC2/StAR signaling pathway in PFOS-induced suppression of testosterone biosynthesis, advancing our understanding of molecular mechanisms for PFOS-induced male reproductive disorders.		C C
D1076	実験動物 (生殖発 生毒性)	Zhang, Yan; Wu, Xiaoping; Zhu, Kaili; Liu, Shangyu; Yang, Yuan; Yuan, Ding; Wang, Ting; He, Yumin; Dun, Yaoyan; Wu, Jie; Zhang, Changcheng; Zhao, Haixia	Icariin attenuates perfluorooctane sulfonate-induced testicular toxicity by alleviating Sertoli cell injury and downregulating the p38MAPK/MMP9 pathway	2022	Food Funct. 2022 Mar 21;13(6):3674-3689. doi: 10.1039/d1fo04135e.	Perfluorooctane sulfonate (PFOS) is widely recognized as causing Sertoli cell injury and testicular toxicity in males. Icariin is a flavonoid from Epimedium, which effectively improves spermatogenesis disturbance induced by several factors in clinic. However, it is unclear whether icariin improves PFOS-induced testicular toxicity. In vivo, fifty-two male mice were randomly separated into four groups: normal control group, model group, and low and high doses of icariin-treated groups, with 13 mice in each group. Except for the normal control group, the mice in the model group and icariin-treated groups were administered PFOS (10 mg kg(-1)) by gavage daily for 28 consecutive days, and concurrently treated with a diet containing different doses of icariin (0, 5 or 20 mg kg(-1)). In vitro, TM4 cells were treated with 150 μ M PFOS to induce Sertoli cell injury, and were then utilized for icariin treatment. Our results demonstrated that icariin attenuated PFOS-induced testicular toxicity by increasing the testicular, epididymal and seminal vesicle weights, epididymal and seminal vesicle indices, sperm parameters, and seminiferous epithelium height. In addition, icariin improved the PFOS-induced blood-testis barrier (BTB) disruption by alleviating the Sertoli cell junctional injury, but without affecting Sertoli cell numbers in the testis of mice. Moreover, icariin increased the expression levels of tight junction proteins (ZO-1, Occludin and Claudin-11) and gap junction proteins (CX43 and p-CX43), and decreased the expression levels of p-p38MAPK and matrix metalloproteinase 9 (MMP9) both in vivo and in vitro. Furthermore, alleviation of the Sertoli cell injury by icariin exerted similar effects as SB203580 (an inhibitor of p38MAPK) in TM4 cells. This study revealed that icariin effectively reduces PFOS-induced testicular toxicity by alleviating the Sa8MAPK/MMP9 pathway, indicating that icariin may be an attractive dietary supplement for the intervention of PFOS-induced testicular dysfunction.		C C
D1077	実験動物 (生毒性、 複合影 響)	Conley, Justin M; Lambright, Christy S; Evans, Nicola; Medlock- Kakaley, Elizabeth; Dixon, Aaron; Hill, Donna; McCord, James; Strynar, Mark J; Ford, Jermaine; Gray, L Earl Jr	Cumulative maternal and neonatal effects of combined exposure to a mixture of perfluorooctanoic acid (PFOA) and perfluorooctane sulfonic acid (PFOS) during pregnancy in the Sprague-Dawley rat	2022	Environ Int. 2022 Nov 12;170:107631. doi: 10.1016/j.envint.2022.107631. Online ahead of print.	Globally, biomonitoring data demonstrate virtually all humans carry residues of multiple per- and polyfluoroalkyl substances (PFAS). Despite pervasive co-exposure, limited mixtures-based in vivo PFAS toxicity research has been conducted. Perfluoroactanoic acid (PFOA) and perfluoroactane sulfonic acid (PFOS) are commonly detected PFAS in human and environmental samples and both produce adverse effects in laboratory animal studies, including maternal and offspring effects when orally administered during pregnancy and lactation. To evaluate the effects of combined exposure to PFOA and PFOS, we orally exposed pregnant Sprague-Dawley rats from gestation day 8 (GD8) to postnatal day 2 (PND2) to PFOA (10-250 mg/kg/d) or PFOS (0.1-5 mg/kg/d) individually to characterize effects and dose response curve parameters, followed by a variable-ratio mixture experiment with a constant dose of PFOS (2 mg/kg/d) mixed with increasing doses of PFOA (3-80 mg/kg/d). The mixture study design was intended to: 1) shift the PFOA dose response curves for endpoints shared with PFOS, 2) allow comparison of dose addition (DA) and response addition (RA) model predictions, 3) conduct relative potency factor (RPF) analysis for multiple endpoints, and 4) avoid overt maternal toxicity. Maternal serum and liver concentrations of PFOA and PFOS were consistent between the individual chemical and mixture experiments. Combined exposure tor multiple endpoints and these effects were well predicted by dose addition. For endpoints amenable to mixture model analyses, DA produced equivalent or better estimates of observed data than RA. All endpoints evaluated were accurately predicted by RPF and DA approaches except for maternal gestational weight gain, which produced less-than-additive results in the mixture. Data support the hypothesis of cumulative effects.		ВС

分野 著者 タイトル 発行年 書誌情報 要旨 (原文) No. (参考) Analyses of the combined effects of different EDCs are both important and difficult. This stu and combined effects of BPA and PFOS on heart development. Sprague-Dawley rats receive BPA for 19 days during pregnancy. The results show that the combined BPA and PFOS expo change in the fetal rat heart. An increase in the interventricular septal thickness (IVS) of app vs 464 μ m in combined exposure) was observed in the fetal rat hearts after the combined exposure Zhou, Ren; and 100 μ g/L BPA through drinking water. The total collagen and dynamin-related protein the fetal hearts exposed to the combination of 2000 μ g/L PFOS and 100 μ g/L BPA. Howev Cheng, Wei; 実験動物 Feng, Yan; significantly change. Based on the previous literature, we believe that the combined exposu (生殖発 Wang, Wei; Combined effects of BPA and PFOS on fetal cardiac Environ Toxicol Pharmacol. 2020 Nov;80:103434. doi: effect on the thickness of the IVS. The combined exposure to 40 μ g/L PFOS and 2 μ g/L BF D1078 生毒性、 2020 Liang, Fan; Luo, development: In vitro and in vivo experiments 10.1016/j.etap.2020.103434. Epub 2020 Jun 13. to the embryonic heart. The individual and combined effects and the mechanism of the effect 複合影 Fei; Yang, development were further investigated by an in vitro study. Embryonic stem cells were admi 響) Shoufei; Wang, ng/mL BPA and 100 ng/mL PFOS for 14 days during the cardiac differentiation period. The Yan combination of 100 ng/mL PFOS and 10 ng/mL BPA could increase the cardiomyocyte size inhibitor of Drp1, Mdivi-1, could inhibit the cardiomyocyte size enlargement but not the colla combined exposure. Thus, we believe that although the combined exposure to PFOS and BP biogenesis and collagen expression, these two effects seem to be relatively independent. Ba concludes that combined exposure to PFOS and BPA could specifically lead to increased col development. Narizzano, Allison M; Lent, 実験動物 Emily May; Corrigendum to "Reproductive and developmental (生殖発 Hanson, Jarod M toxicity of perfluorooctane sulfonate (PFOS) in the Reprod Toxicol. 2022 Dec;114:32. doi: D1079 生毒性、 2022 East, Andrew G; No abstract available white-footed mouse (Peromyscus leucopus)" [Reprod. 10.1016/j.reprotox.2022.10.004. Epub 2022 Oct 21. 複合影 Bohannon, Toxicol. 113 (2020) 120-127] 響) Meredith E; Quinn, Michael Yadav, Ajay; Verhaegen, Steven; Filis, Panagiotis; Prenatal exposure to persistent organic pollutants (POPs) is associated with neurodevelopm Domanska. Diana; Lyle we explored whether a human-relevant POP mixture affects the development of chicken em Robert; mixture of 29 POPs, with chemical composition and concentrations based on blood levels in Sundaram, evaluated exposure to a prominent compound in the mixture, perfluorooctane sulfonic acid (Arvind Y M; exposure group) were exposed by injection directly into the allantois at embryonic day 13 (E 実験動物 Leithaug, Exposure to a human relevant mixture of persistent and subjected to morphological, RNA-seq and shot-gun proteomics analyses. There was a re (生殖発 2022 Environ Int. 2022 Jun 27;166:107379. doi: 10.1016/j.envint.2022.107379. Online ahead of print. Magnus; Østby, organic pollutants or to perfluorooctane sulfonic acid layer of cerebellar cortex in both exposure scenarios. Exposure to the POP mixture significant D1080 生毒性、 13,800 transcripts, and 43 of 2,568 proteins, when compared to solvent control. PFOS alone Gunn Charlotte: alone dysregulates the developing cerebellum of 複合影 Aleksandersen, chicken embryo transcripts, and 69 of 2,555 proteins. Twenty-five genes and 15 proteins were common for b 響) Mona; Berntsen point to alterations in molecular events linked to retinoid X receptor (RXR) signalling, neuror Hanne Friis: cellular stress responses including unfolded protein response, lipid metabolism, and myelina Zimmer, Karin increased methionine oxidation, whereas PFOS decreased oxidation. Several of the altered g Elisabeth; wide variety of neurological disorders. We conclude that POP exposure can interfere with fur Fowler, Paul A; neurodevelopment, altering molecular pathways that are associated with adverse neurocogr Paulsen, Ragnhild Elisabeth; Ropstad, Erik

	備考	出 村 報 御	ン 文 ク 献 ① ラ	ン 文 ② ラ
dy attempts to evaluate the individual ed individual or combined PFOS and esure could lead to a morphological proximately 20 % (391 μ m in control exposure to nearly 2000 μ g/L PFOS 1 (Drp1) mRNA level was increased in ever, the cell number in the IVS did not re to BPA and PFOS had a synergistic PA failed to cause significant damage ests of BPA and PFOS on heart nistered individual or combined 10 results show that exposure to the and collagen content. A selective agen content increase caused by the PA could affect mitochondrial ased on these results, this research lagen and IVS thickening in heart			С	С
			D	D
nental disorders. In the present study, bryo cerebellum. We used a defined the Scandinavian population. We also (PFOS), alone. Embryos (n = 7-9 per 13). Cerebella were isolated at E17 eduction in thickness of the molecular ntly affected expression of 65 of affected expression of 60 of 13,859 oth exposure groups. These findings nal cell proliferation and migration, ation. Exposure to the POP mixture genes and proteins are involved in a ndamental aspects of nitive and behavioural outcomes.			С	С

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン文 ン文 ク献 り献 ① ラ ② ラ
D1081	実験動物 (生殖発 生毒性、 複合影 響)	Merrill, Alyssa K; Anderson, Timothy; Conrad, Katherine; Marvin, Elena; James-Todd, Tamarra; Cory- Slechta, Deborah A; Sobolewski, Marissa	Protracted Impairment of Maternal Metabolic Health in Mouse Dams Following Pregnancy Exposure to a Mixture of Low Dose Endocrine-Disrupting Chemicals, a Pilot Study	2021	Toxics. 2021 Dec 9;9(12):346. doi: 10.3390/toxics9120346.	Pregnancy, a period of increased metabolic demands coordinated by fluctuating steroid hormones, is an understudied critical window of disease susceptibility for later-life maternal metabolic health. Epidemiological studies have identified associations between exposures to various endocrine-disrupting chemicals (EDCs) with an increased risk for metabolic syndrome, obesity, and diabetes. Whether such adverse outcomes would be heightened by concurrent exposures to multiple EDCs during pregnancy, consistent with the reality that human exposures are to EDC mixtures, was examined in the current pilot study. Mouse dams were orally exposed to relatively low doses of four EDCs: (atrazine (10 mg/kg), bisphenol-A (50 µg/kg), perfluoroctanoic acid (0.1 mg/kg), 2,3,7,8-tetrachlorodibenzo-p-dioxin (0.036 µg/kg)), or the combination (MIX), from gestational day 7 until birth or for an equivalent 12 days in non-pregnant females. Glucose intolerance, serum lipids, weight, and visceral adiposity were assessed six months later. MIX-exposed dams exhibited hyperglycemia with a persistent elevation in blood glucose two hours after glucose administration in a glucose tolerance test, whereas no such effects were observed in MIX-exposed non-pregnant females. Correspondingly, MIX dams showed elevated serum low-density lipoprotein (LDL). There were no statistically significant differences in weight or visceral adipose; MIX dams showed an average visceral adipose volume to body volume ratio of 0.09, while the vehicle dams had an average ratio of 0.07. Collectively, these findings provide biological plausibility for the epidemiological associations observed between EDC exposures during pregnancy and subsequent maternal metabolic dyshomeostasis, and proof of concept data that highlight the importance of considering complex EDC mixtures based of off common health outcomes, e.g., for increased risk for later-life maternal metabolic effects following pregnancy.			сс
D1082	実験動物 (生毒性、 複合影 響)	Crute, Christine E; Hall, Samantha M; Landon, Chelsea D; Garner, Angela; Everitt, Jeffrey I; Zhang, Sharon; Blake, Bevin; Olofsson, Didrik; Chen, Henry; Murphy, Susan K; Stapleton, Heather M; Feng, Liping	Evaluating maternal exposure to an environmental per and polyfluoroalkyl substances (PFAS) mixture during pregnancy: Adverse maternal and fetoplacental effects in a New Zealand White (NZW) rabbit model	2022	Sci Total Environ. 2022 Sep 10;838(Pt 4):156499. doi: 10.1016/j.scitotenv.2022.156499. Epub 2022 Jun 6.	Mixtures of per- and polyfluoroalkyl substances (PFAS) are often found in drinking water, and serum PFAS are detected in up to 99% of the population. However, very little is known about how exposure to mixtures of PFAS affects maternal and fetal health. The aim of this study was to investigate maternal, fetal, and placental outcomes after preconceptional and gestational exposure to an environmentally relevant PFAS mixture in a New Zealand White (NZW) rabbit model. Dams were exposed via drinking water to control (no detectable PFAS) or a PFAS mixture for 32 days. This mixture was formulated with PFAS to resemble levels measured in tap water from Pittsboro, NC (10 PFAS compounds; total PFAS load = 758.6 ng/L). Maternal, fetal, and placental outcomes were evaluated at necropsy. Thyroid hormones were measured in maternal serum and kit blood. Placental gene expression was evaluated by RNAseq and qPCR. PFAS exposure resulted in higher body weight ($p = 0.01$), liver ($p = 0.01$) and kidney ($p = 0.01$) weights, blood pressure ($p = 0.05$), and BUN:CRE ratio ($p = 0.04$) in dams, along with microscopic changes in renal cortices. Fetal weight, measures, and histopathology were unchanged, but a significant interaction between dose and sex was detected in the fetal: placental weight ratio ($p = 0.036$). Placental macroscopic changes were present in PFAS-exposed dams. Dam serum showed lower T4 and a higher T3:T4 ratio, although not statistically significant. RNAseq revealed that 11 of the 14 differentially expressed genes (adj. $p < 0.1$) are involved in placentation or pregnancy complications. In summary, exposure elicited maternal weight gain and signs of hypertension, renal injury, sex-specific changes in placental response, and differential expression of genes involved in placentation and preeclampsia. Importantly, these are the first results to show adverse maternal and placental effects of an environmentally-relevant PFAS mixture in vivo.			в с
D1083	実験動物 (生殖発 生毒性)	Mutsuko Hirata- Koizumi, Sakiko Fujii, Kato Hina, Mariko Matsumoto, Mika Takahashi, Atsushi Ono, Akihiko Hirose	Repeated dose and reproductive/developmental toxicity of long-chain perfluoroalkyl carboxylic acids in rats: perfluorohexadecanoic acid and perfluorotetradecanoic acid	2015	Fundamental Toxicological Sciences, 2 巻 4 号 177-190, doi: 10.2131/fts.2.177, doi: 10.2131/fts.2.177	Perfluoroalkyl carboxylic acids (PFCAs) are global environmental contaminants that are the cause of concern due to their possible effects on wildlife and human health. Since few studies have investigated the toxicity of long-chain PFCAs, we have performed combined repeated dose toxicity studies with the reproduction/developmental toxicity screening tests. We previously examined perfluoroundecanoic acid (C11), perfluorododecanoic acid (C12), and perfluoroctadecanoic acid (C18). We herein reported our results for perfluorotetradecanoic acid (PFTeDA; C14) and perfluorohexadecanoic acid (PFHxDA: C16). Male and female rats were administered PFTeDA at 1, 3 or 10 mg/kg/day or PFHxDA at 4, 20 or 100 mg/kg/day by gavage, and each female was then mated with a male in the same dose group after 14 days. Males were dosed for a total of 42 days and females were dosed throughout the gestation period until day 5 after parturition. PFTeDA and PFHxDA caused hepatocyte hypertrophy and/or fatty changes in the liver at the middle and high doses. PFTeDA also induced follicular cell hypertrophy in the thyroid at the middle and high doses. The only reproductive/developmental effect observed was an inhibited postnatal body weight gain in pups in the 10 mg/kg/day PFTeDA group. Based on these results, the NOAELs for the repeated dose and reproductive/developmental toxicity were concluded to be 1 and 3 mg/kg/day for PFTeDA and 4 and 100 mg/kg/day for PFHxDA, respectively. Our current and previous results indicate that the toxicity of PFCAs decreases with increases in the carbon chain length from 12 to 18.			ВВ
D1084	実験動物 (生殖発 生毒性)	Liu Wei(中華人民 共和国), Li Xiao, Xu Lei, Liu Li, Jin Yihe, Sato Itaru, Tsuda Shuji	マウスの血中ペルフルオロオクタンスルホン酸濃度に及 ぼす妊娠、定期的出血および間欠曝露の影響 性差誘発 および曝露評価に影響を及ぼす因子について(Influence of gestation, regular bleeding and intermittent exposure on blood perfluorooctane sulfonate levels in mice: potential factors inducing sex difference and affecting exposure evaluation)(英語)	2010	The Journal of Toxicological Sciences(0388-1350)35巻3号 Page309-316(2010.06), doi: 10.2131/jts.35.309	ヒトバイオモニタリング研究から、血中ペルフルオロオクタンスルホン酸(PFOS)濃度は女性よりも男性の方が高いことが認められてい る。雌マウスにPFOSを50µg/L含有する水を6週間飲ませ、その後半数を雄と交配させた。これらマウスにPFOS含有水を引き続き飲 ませ、妊娠マウスの血中PFOS濃度を対照マウスと比較した。その結果、妊娠マウスの妊娠0日目における血中PFOS濃度は対照マウス の0.45倍で、その後も低値が維持された。次いで、PFOS含有水を9週間飲ませた雌雄マウスの尾静脈から3日毎に出血させ、血中PFOS 濃度を比較したところ、雄マウスのみ定期的出血群の方が有意に低値で、雌マウスでは定期的出血の有無による差を認めなかった。更 に、PFOS含有水を週に1日飲水させたマウスでは、雌雄ともPFOS曝露後に血中PFOS濃度が有意に上昇した。血中濃度からみたPFOS の排泄動態には性差が認められた。			сс

パーフルオロ化合物に係る国際機関等の評価及び科学的知見の情報収集並びに整理

別添-2 文献データベース文献リスト

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン 文 ク 献 ① ラ	ン 文 ク 献 ② ラ
D1085	実験動物 (生殖発 生毒性)	豊島 めぐみ(広島 大学原爆放射線医 科学研究所 ゲノ ム障害制御研究部 門)	残留性有機フッ素化合物の発達毒性評価	2008	上原記念生命科学財団研究報告集(2433-3441)22巻 Page1- 4(2008.12)	ペルフルオロオクタンスルホン酸(PFOS)は、表面処理剤や消火剤などに用いられている人工有機フッ素化合物であり、その毒性発現に はペルオキシソーム増殖因子活性化受容体(PPAR a)の関与が示唆されている。今回、PFOSの発達毒性によって引き起こされる疾患の うちロ蓋裂に着目し、その発症機序を解明すべくPPAR a 欠損マウスを用いてPPAR a 遺伝子の関与を中心に検討した。その結果、 PFOSはPPAR a を介して妊娠初期、特に着床後の胚の維持に影響することが示唆された。			С	С
D1086	ショウ ジョウバ エ (生毒 性)	Kim, Ju Hyeon; Barbagallo, Belinda; Annunziato, Kate; Farias- Pereira, Renalison; Doherty, Jeffery J; Lee, Jonghwa; Zina, Jake; Tindal, Cole; McVey, Cailin; Aresco, Racheal; Johnstone, Megan; Sant, Karilyn E; Timme-Laragy, Alicia; Park, Yeonhwa; Clark, John M	Maternal preconception PFOS exposure of Drosophila melanogaster alters reproductive capacity, development, morphology and nutrient regulation	2021	Food Chem Toxicol. 2021 May;151:112153. doi: 10.1016/j.fct.2021.112153. Epub 2021 Mar 25.	Perfluorooctanesulfonic acid (PFOS) is a persistent synthetic surfactant widely detected in the environment. Developmental PFOS exposures are associated with low birth weight and chronic exposures increase risk for obesity and type 2 diabetes. As an obesogen, PFOS poses a major public health exposure risk and much remains to be understood about the critical windows of exposure and mechanisms impacted, especially during preconception. Here, we leverage evolutionarily conserved pathways and processes in the fruit fly Drosophila melanogaster (wild-type Canton-S and megalin-UAS RNAi transgenic fly lines) to investigate the window of maternal preconception exposure to PFOS on reproductive and developmental toxicity, and examine receptor (megalin)-mediated endocytosis of nutrients and PFOS into the oocyte as a potential mechanism. Preconception exposure to 2 ng PFOS/female resulted in an internal concentration of 0.081 ng/fly over two days post exposure, no mortality and reduced megalin transcription. The number of eggs laid 1-3 days post exposure was reduced and contained 0.018 ng PFOS/egg. Following heat shock, PFOS was significantly reduced in eggs from megalin-knockdown transgenic females. Cholesterol and triglycerides were increased in eggs laid immediately following PFOS exposure by non-heat shocked transgenic females. Preconception exposure likewise increased cholesterol in early emerging wildtype F1 adults and also resulted in progeny with a substantial developmental delay, a reduction in adult weights, and altered transcription of Drosophila insulin-like peptide genes. These findings support an interaction between PFOS and megalin that interferes with normal nutrient transport during oocyte maturation and embryogenesis, which may be associated with later in life developmental delay and reduced weight.			С	С
D1087	ゼブラ フィッ シュ(生 殖発生毒 性)	Haimbaugh, Alex; Wu, Chia-Chen; Akemann, Camille; Meyer, Danielle N; Connell, Mackenzie; Abdi, Mohammad; Khalaf, Aicha; Johnson, Destiny; Baker, Tracie R	Multi- and Transgenerational Effects of Developmental Exposure to Environmental Levels of PFAS and PFAS Mixture in Zebrafish (Danio rerio)	2022	? Toxics. 2022 Jun 18;10(6):334. doi: 10.3390/toxics10060334.	Per- and polyfluoroalkyl substances (PFASs) are ubiquitous in the environment and are tied to myriad health effects. Despite the phasing out of the manufacturing of two types of PFASs (perfluorosulfonic acid (PFOS) and perfluoroctanoic acid (PFOA)), chemical composition renders them effectively indestructible by ambient environmental processes, where they thus remain in water. Exposure via water can affect both human and aquatic wildlife. PFASs easily cross the placenta, exposing the fetus at critical windows of development. Little is known about the effects of low-level exposure during this period; even less is known about the potential for multi- and transgenerational effects. We examined the effects of ultra-low, very low, and low-level PFAS exposure (7, 70, and 700 ng/L PFOA; 24, 240, 2400 ng/L PFOS; and stepwise mixtures) from 0-5 days post-fertilization (dpf) on larval zebrafish (Danio rerio) mortality, morphology, behavior and gene expression and fecundity in adult F0 and F1 fish. As expected, environmentally relevant PFAS levels did not affect survival. Morphological abnormalities were not observed until the F1 and F2 generations. Behavior was affected differentially by each chemical and generation. Gene expression was increasingly perturbed in each generation but consistently showed lipid pathway disruption across all generations. Dysregulation of behavior and gene expression is heritable, even in larvae with no direct or indirect exposure. This is the first report of the transgenerational effects of PFOA, PFOS, and their mixture in terms of zebrafish behavior and untargeted gene expression.			С	С
D1088	ゼブラ フィッ シュ (生 殖発生毒 性)	Yu, Jing; Cheng, Wanqing; Jia, Min; Chen, Ling; Gu, Cheng; Ren, Hong-Qiang; Wu, Bing	Toxicity of perfluorooctanoic acid on zebrafish early embryonic development determined by single-cell RNA sequencing	2022	J Hazard Mater. 2022 Apr 5;427:127888. doi: 10.1016/j.jhazmat.2021.127888. Epub 2021 Nov 25.	The perfluorooctanoic acid (PFOA) poses a high risk for aquatic organisms. Nevertheless, the current toxicity studies rarely report how PFOA affects different cell populations during the embryonic development of fish. Here, the zebrafish embryos at 2-30 hpf were exposed to 1-100 μ g/L PFOA. The heartbeat and locomotor behavior were significantly decreased after $\ge 25 \mu$ g/L PFOA exposure. The single-cell RNA sequencing showed that PFOA exposure influenced nine cell populations, including heart cells, hatching gland cells, macrophages, lens cells, ionocytes, melanoblasts, optic cup cells, periderm cells, and differentiating neurons cells. Among them, heart cells were the most affected cell population. Functions of cardiac muscle contraction, actin cytoskeleton and oxygen binding were significantly changed in the heart cells, which were involved in the altered expressions of tnni2a.4, acta1a, atp1a1a.2, mylpfa, and so on. Besides, the changes of apoptotic process, innate immune response, and translation in lens cells, hatching gland cells, macrophages and ionocytes should also be of concern. Our study indicates that 2-30 hpf of embryonic development is the sensitivity window for the PFOA exposure. Identification of the target cell population provides clear information of the toxic endpoint of PFOA, which sheds new light on the risk assessment of PFOA on aquatic organisms.			С	с

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No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 ク献 ク蘭 象抽 ① ラ ②
D1089	ゼブラ フィッ シュ (生 殖発生毒 性)	Sant, Karilyn E; Annunziato, Kate; Conlin, Sarah; Teicher, Gregory; Chen, Phoebe; Venezia, Olivia; Downes, Gerald B; Park, Yeonhwa; Timme-Laragy, Alicia R	Developmental exposures to perfluorooctanesulfonic acid (PFOS) impact embryonic nutrition, pancreatic morphology, and adiposity in the zebrafish, Danio rerio	2021	Environ Pollut. 2021 Apr 15;275:116644. doi: 10.1016/j.envpol.2021.116644. Epub 2021 Feb 4.	Perfluorooctanesulfonic acid (PFOS) is a persistent environmental contaminant previously found in consumer surfactants and industrial fire-fighting foams. PFOS has been widely implicated in metabolic dysfunction across the lifespan, including diabetes and obesity. However, the contributions of the embryonic environment to metabolic disease remain uncharacterized. This study seeks to identify perturbations in embryonic metabolism, pancreas development, and adiposity due to developmental and subchronic PFOS exposures and their persistence into later larval and juvenile periods. Zebrafish embryos were exposed to 16 or 32 μ M PFOS developmentally (1-5 days post fertilization; dpf) or subchronically (1-15 dpf). Embryonic fatty acid and macronutrient concentrations and expression of peroxisome proliferator-activated receptor (PPAR) isoforms were quantified in embryos. Pancreatic islet morphometry was assessed at 15 and 30 dpf, and adiposity and fish behavior were assessed at 15 dpf. Concentrations of lauric (C12:0) and myristic (C14:0) saturated fatty acids were increased by PFOS at 4 dpf, and PPAR gene expression was reduced. Incidence of aberrant islet morphologies, principal islet areas, and adiposity were increased in 15 dpf larvae and 30 dpf juvenile fish. Together, these data suggest that the embryonic period is a susceptible window of metabolic programming in response to PFOS exposures, and that these early exposures alone can have persisting effects later in the lifecourse.		сс
D1090	ゼブラ フィッ シュ (生 殖発生毒 性)	Wasel, Ola; Thompson, Kathryn M; Freeman, Jennifer L	Assessment of unique behavioral, morphological, and molecular alterations in the comparative developmental toxicity profiles of PFOA, PFHxA, and PFBA using the zebrafish model system	2022	Environ Int. 2022 Nov 17;170:107642. doi: 10.1016/j.envint.2022.107642. Online ahead of print.	Perfluoroalkyl substances (PFAS) are a class of synthetic chemicals that are persistent in the environment. Due to adverse health outcomes associated with longer chain PFAS, shorter chain chemicals were used as replacements, but developmental toxicity assessments of the shorter chain chemicals are limited. Toxicity of three perfluoroalkyl acids (PFAAs) [perfluorooctanoic acid (PFOA), composed of 8 carbon (C8), perfluorohexanoic acid (PFHxA, C6), and perfluorobutanoic acid (PFBA, C4)] was compared in developing zebrafish (Danio rerio). LC(50)s at 120 h post fertilization (hpf) assessed potency of each PFAA by exposing developing zebrafish (1-120 hpf) to range of concentrations. Zebrafish were then exposed to sublethal concentrations (0.4-4000 ppb, µg/L) throughout embryogenesis (1-72 hpf). Effects of the embryonic exposure on locomotor activities was completed with the visual motor response test at 120 hpf. At 72 hpf, morphological changes (total body length, head length, head width) and transcriptome profiles to compare altered molecular and disease pathways were determined. The LC(50) ranking followed trend as expected based on chain length. PFOA caused hyperactivity and PFBA hypoactivity, while PFHxA did not change behavior. PFOA, PFHxA, and PFBA caused morphological and transcriptomic alterations that were unique for each chemical and were concentration-dependent indicating different toxicity mechanisms. Cancer was a top disease for PFOA and FXR/RXR activation was a top canonical pathway for PFBA. Furthermore, comparison of altered biological and molecular pathways in zebrafish exposed to PFOA matched findings reported in prior epidemiological studies and other animal models, supporting the predictive value of the transcriptome approach and for predicting adverse health outcomes associated with PFHxA or PFBA exposure.		C C
D1091	ゼブラ フィッ シュ (生 殖発生毒 性)	Fey, Megan E; Goodrum, Philip E; Razavi, N Roxanna; Whipps, Christopher M; Fernando, Sujan; Anderson, Janet K	ls Mixtures' Additivity Supported by Empirical Data? A Case Study of Developmental Toxicity of PFOS and 6:2 FTS in Wildtype Zebrafish Embryos	2022	Toxics. 2022 Jul 25;10(8):418. doi: 10.3390/toxics10080418.	Per- and polyfluoroalkyl substances (PFASs) are a major priority for many federal and state regulatory agencies charged with monitoring levels of emerging contaminants in environmental media and setting health-protective benchmarks to guide risk assessments. While screening levels and toxicity reference values have been developed for numerous individual PFAS compounds, there remain important data gaps regarding the mode of action for toxicity of PFAS mixtures. The present study aims to contribute whole-mixture toxicity data and advance the methods for evaluating mixtures of two key components of aqueous film-forming foams: perfluorooctanesulfonic acid (PFOS), and 6:2 fluorotelomer sulfonic acid (6:2 FTS). Wildtype (AB) zebrafish embryos were exposed to PFOS and 6:2 FTS, both as individual components and as binary mixtures, from 2 to 122 h post-fertilization. Five treatment levels were selected to encompass environmentally relevant exposure levels. Experimental endpoints consisted of mortality, hatching, and developmental endpoints, including swim bladder inflation, yolk sac area, and larval body length. Results from dose-response analysis indicate that the assumption of additivity using conventional points of departure (e.g., NOAEL, LOAEL) is not supported for critical effect endpoints with these PFAS mixtures, and that the interactions vary as a function of the dose range. Alternative methods for quantifying relative potency are proposed, and recommendations for additional investigations are provided to further advance assessments of the toxicity of PFAS mixtures to aquatic organisms.		C C
D1092	ゼブラ フィッ シュ (生 殖発生毒 性)	Wang, Yonghua; Jiang, Shengnan; Wang, Beibei; Chen, Xi; Lu, Guanghua	Comparison of developmental toxicity induced by PFOA, HFPO-DA, and HFPO-TA in zebrafish embryos	2023	Chemosphere. 2023 Jan;311(Pt 1):136999. doi: 10.1016/j.chemosphere.2022.136999. Epub 2022 Oct 26.	Hexafluoropropylene oxide dimer acids (HFPO-DA) and hexafluoropropylene oxide trimer acids (HFPO-TA) are alternatives to perfluorooctanoic acid (PFOA). However, little information on the comparison of their toxicities is available. Here, zebrafish embryos were exposed to PFOA, HFPO-DA, and HFPO-TA with exposure concentrations of 5 and 500 μ g/L. Behavioral abnormal, enzyme activities and gene expression profiles in zebrafish embryos were determined. Results showed that exposure to PFOA and its alternatives increased heart rates and inhibited locomotor activity of zebrafish embryos. Further, their exposures changed the enzyme activities (acetylcholinesterase and oxidative stress-related enzymes), ATP content, and expressions of genes related to hypothalamic-pituitary-thyroid (HPT) axis, apoptosis, and lipid metabolism. Comparison analyses found that PFOA, HFPO-TA, and HFPO-DA exposure induced different effects on the embryonic development of zebrafish, which indicates the different modes of action. The HFPO-DA exposure induced specific effects on the disorder of lipid metabolism, HPT axis, and neurodevelopment. The HFPO-TA exposure also induced different effects from the PFOA exposure, which focused on lipid metabolism. The current data shows that the HFPO-DA and HFPO-TA might not be safe alternatives to PFOA. This study provides a new understanding of the biological hazards of PFOA alternatives in aquatic organisms, which can guide their usage.		СС

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨 (原文)	備考	出	ン 文 ク 献 ① ラ	ン 文 ク 献 ② ラ
D1093	ゼブラ フィッ シュ(生 殖発生毒 性)	Liu, Huinian; Chen, Yu; Hu, Wenli; Luo, Yuan; Zhu, Ping; You, Shiqi; Li, Yunxuan; Jiang, Zhaobiao; Wu, Xiushan; Li, Xin	Impacts of PFOA(C8), GenX(C6), and their mixtures on zebrafish developmental toxicity and gene expression provide insight about tumor-related disease	2022	Sci Total Environ. 2022 Nov 8;858(Pt 2):160085. doi: 10.1016/j.scitotenv.2022.160085. Online ahead of print.	Concerns about per- and polyfluoroalkyl substances (PFASs) have grown in importance in the fields of ecotoxicology and public health. This study aims to compare the potential effects of long-chain (carbon atoms \geq 7) and short-chain derivatives and their mixtures' exposure according to PFASs-exposed (1, 2, 5, 10, and 20 mg/L) zebrafish's (Danio rerio) toxic effects and their differential gene expression. Here, PFOA(C8), GenX(C6), and their mixtures (v/v, 1:1) could reduce embryo hatchability and increase teratogenicity and mortality. The toxicity of PFOA(C8) was higher than that of GenX(C6), and the toxicity of their mixtures was irregular. Their exposure (2 mg/L) caused zebrafish ventricular edema, malformation of the spine, blood accumulation, or developmental delay. In addition, all of them had significant differences in gene expression. PFOA(C8) exposure causes overall genetic changes, and the pathways of this transformation were autophagy and apoptosis. More importantly, in order to protect cells from PFOA(C8), GenX(C6), and their mixtures' influences, zebrafish inhibited the expression of ATPase and Ca(2+) transport gene (atp1b2b), mitochondrial function-related regulatory genes (mt-co2, mt-co3, and mt-cyb), and tumor or carcinogenic cell proliferation genes (laptm4b and ctsbb). Overall, PFOA(C8), GenX(C6), and their mixtures' exposures will affect the gene expression effects of zebrafish embryos, indicating that PFASs may pose a potential threat to aquatic biological safety. These results showed that the relevant genes in zebrafish that were inhibited by PFASs exposure were related to tumorigenesis. Therefore, the effect of PFASs on zebrafish can be further used to study the pathogenesis of tumors.			С	с
D1094	ゼブラ フィッ シュ(生 殖発生毒 性)	Xu, Mengmeng; Legradi, Jessica; Leonards, Pim	Using comprehensive lipid profiling to study effects of PFHxS during different stages of early zebrafish development	2022	Sci Total Environ. 2022 Feb 20;808:151739. doi: 10.1016/j.scitotenv.2021.151739. Epub 2021 Nov 27.	PFHxS (Perfluorohexane sulfonic acid) is one of the short-chain perfluoroalkyl substances (PFASs) which are widely used in many industrial and consumer applications. However, limited information is available on the molecular mechanism of PFHxS toxicity (e.g. lipid metabolism). This study provides in-depth information on the lipid regulation of zebrafish embryos with and without PFHxS exposure. Lipid changes throughout zebrafish development (4 to 120 h post fertilization (hpf)) were closely associated with lipid species and lipid composition (fatty acyl chains). A comprehensive lipid analysis of four different PFHxS exposures (0, 0.3, 1, 3, and 10 μ M) at different zebrafish developmental stages (24, 48, 72, and 120 hpf) was performed. Data on exposure concentration, lipids, and developmental stage showed that all PFHxS concentrations dysregulated the lipid metabolism and these were developmental-dependent. The pattern of significantly changed lipids revealed that PFHxS caused effects related to oxidative stress, inflammation, and impaired fatty acid β -oxidation. Oxidative stress and inflammation caused the remodeling of glycerophospholipid (phosphatidylcholine (PC) and phosphatidylethanolamine (PE)), with increased incorporation of omega-3 PUFA and a decreased incorporation of omega-6 PUFA.			С	с
D1095	ゼブラ フィッ シュ(生 殖発生毒 性)	Dong, Guangzhu; Zhang, Rui; Huang, Hongyu; Lu, Chuncheng; Xia, Yankai; Wang, Xinru; Du, Guizhen	Exploration of the developmental toxicity of TCS and PFOS to zebrafish embryos by whole-genome gene expression analyses	2021	Environ Sci Pollut Res Int. 2021 Oct;28(40):56032-56042. doi: 10.1007/s11356-021-14527-9. Epub 2021 May 27.	Triclosan (TCS) and perfluorooctane sulfonate (PFOS) are known to have both endocrine disrupting and developmental toxicity effects on zebrafish embryos. Currently, potential molecular mechanisms underlying these toxicological phenomena require further studies. To address this gap in the literature, we used whole transcriptome microarrays to being to address the potential molecular mechanisms underlying developmental toxicity of TCS and PFOS on zebrafish embryos. Zebrafish embryos were exposed to 300 μ g/L TCS and 500 μ g/L PFOS from 4 to 120 h post fertilization (hpf). Phenotypically, the hatching rate of zebrafish embryos was significantly reduced after TCS exposure at 72 hpf. Additionally, body length was significantly decreased in the TCS treatment group at 120 hpf. Gene ontology analysis of differentially expressed genes revealed that lipid metabolism, steroid metabolism, and organ development-related biological processes were significantly enriched in TCS- and PFOS-treated zebrafish embryos. Furthermore, signaling network analysis indicated that the steroid biosynthesis process was the most significant biological process disrupted by TCS in 120 hpf zebrafish embryos, while organ development was the most significant biological process disrupted by PFOS exposure. Our findings enhance the understanding of the specific types of embryotoxicity elicited by TCS and PFOS, and also provide information that can be used to inform future mechanistic studies.			С	с
D1096	ゼブラ フィッ シュ(生 殖発生毒 性)	Christou, Maria; Ropstad, Erik; Brown, Stephen; Kamstra, Jorke H; Fraser, Thomas W K	Developmental exposure to a POPs mixture or PFOS increased body weight and reduced swimming ability but had no effect on reproduction or behavior in zebrafish adults	2021	Aquat Toxicol. 2021 Aug;237:105882. doi: 10.1016/j.aquatox.2021.105882. Epub 2021 Jun 4.	Complex mixtures of persistent organic pollutants (POPs) are regularly detected in the environment and animal tissues. Often these chemicals are associated with latent effects following early-life exposures, following the developmental origin of health and disease paradigm. We investigated the long-term effects of a human relevant mixture of 29 POPs on adult zebrafish following a developmental exposure, in addition to a single PFOS exposure for comparison, as it was the compound with the highest concentration within the mixture. Zebrafish embryos were exposed from 6 to 96 h post fertilization to x10 and x70 the level of POP mixture or PFOS (0.55 and 3.83 μ M) found in human blood before being transferred to clean water. We measured growth, swimming performance, and reproductive output at different life stages. In addition, we assessed anxiety behavior of the adults and their offspring, as well as performing a transcriptomic analysis on the adult zebrafish brain, as the POP mixture and PFOS concentrations used are known to affect larval behavior. Exposure to POP mixture and PFOS reduced swimming performance and increased length and weight, compared to controls. No effect of developmental exposure was observed on reproductive output or anxiety behavior. Additionally, RNA-seq did not reveal pathways related to anxiety although pathways related to synapse biology were affected at the x10 PFOS level. Furthermore, pathway analysis of the brain transcriptome of adults exposed as larvae to the low concentration of PFOS revealed enrichment in pathways such as calcium, MAPK, and GABA signaling, all of which are important for learning and memory. Based on our results we can conclude that some effects on the endpoints measured were apparent, but if these effects lead to adversities at population levels remains elusive.			С	с

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨 (原文)	備考	出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D1097	ゼブラ フィッ シュ(生 殖発生毒 性)	Smirnova, Anna; Mentor, Anna; Ranefall, Petter; Bornehag, Carl- Gustaf; Brunströ m, Björn; Mattsson, Anna; Jönsson, Maria	Increased apoptosis, reduced Wnt/β-catenin signaling, and altered tail development in zebrafish embryos exposed to a human-relevant chemical mixture	2021	Chemosphere. 2021 Feb;264(Pt 1):128467. doi: 10.1016/j.chemosphere.2020.128467. Epub 2020 Sep 30.	A wide variety of anthropogenic chemicals is detected in humans and wildlife and the health effects of various chemical exposures are not well understood. Early life stages are generally the most susceptible to chemical disruption and developmental exposure can cause disease in adulthood, but the mechanistic understanding of such effects is poor. Within the EU project EDC-MixRisk, a chemical mixture (Mixture G) was identified in the Swedish pregnancy cohort SELMA by the inverse association between levels in women at around gestational week ten with birth weight of their children. This mixture was composed of mono-ethyl phthalate, mono-butyl phthalate, mono-benzyl phthalate, mono-ethylhexyl phthalate, mono-isononyl phthalate, triclosan, perfluorohexane sulfonate, perfluorooctanoic acid, and perfluorooctane sulfonate. In a series of experimental studies, we characterized effects of Mixture G on early development in zebrafish models. Here, we studied apoptosis and Wnt/ β -catenin signaling which are two evolutionarily conserved signaling pathways of crucial importance during development. We determined effects on apoptosis by measuring TUNEL staining, caspase-3 activity, and acridine orange staining in wildtype zebrafish embryos, while Wnt/ β -catenin signaling was assayed using a transgenic line expressing an EGFP reporter at β -catenin-regulated promoters. We found that Mixture G increased apoptosis, suppressed Wnt/ β -catenin signaling in the caudal fin, and altered the shape of the caudal fin at water concentrations only 20-100 times higher than the geometric mean serum concentration in the human cohort. These findings call for awareness that pollutant mixtures like mixture G may interfere with a variety of developmental processes, possibly resulting in adverse health effects.		сс
D1098	ゼブラ フィッ シュ(生 殖発生毒 性)	Rericha, Yvonne; Cao, Dunping; Truong, Lisa; Simonich, Michael; Field, Jennifer A; Tanguay, Robyn L	Behavior Effects of Structurally Diverse Per- and Polyfluoroalkyl Substances in Zebrafish	2021	Chem Res Toxicol. 2021 Jun 21;34(6):1409-1416. doi: 10.1021/acs.chemrestox.1c00101. Epub 2021 May 21.	Per- and polyfluoroalkyl substances (PFAS) are ubiquitously detected in the environment, and some pose significant human and environmental health concerns globally. While some PFAS induce adverse health effects, relatively few toxicological studies adequately address the broad structural diversity of this chemical class. In the current study, we evaluated 58 individual PFAS spanning 14 structural subclasses and 2 mixtures at single concentrations for developmental toxicity in zebrafish using highly sensitive behavior endpoints. Following developmental exposure to PFAS, zebrafish were assessed for mortality and challenged with an embryonic photomotor response (EPR) assay at 24 h postfertilization (hpf) and with larval photomotor response (LPR) and larval startle response assays at 120 hpf. We found that none of the tested PFAS exposures elicited significant mortality or aberrant EPR; however, exposure to 21 individual PFAS from multiple structural subclasses and 1 mixture induced aberrant larval behavior. We then evaluated developmental toxicity across a concentration range of 0-100 μ M for 10 perfluoroalkyl carboxylic acids (PFCAs; 4-carbon perfluorobutanoic acid through the 13-carbon perfluorotridecanoic acid). Exposure to the PFCAs did not cause significant mortality or morphological effects, with the exception of perfluoroactanoic acid and perfluoronnanoic acid, and did not induce aberrant EPR. All PFCAs, except for longer-chain perfluorododecanoic acid caused abnormal LPR following exposure to at least one concentration. In this study, we evaluated a broad set of PFAS not previously assessed for in vivo sublethal behavior endpoints and confirmed previous findings that exposure to some PFAS induces abnormal behavior in developing zebrafish. The data from this study will guide the selection of PFAS for which to investigate modes of toxic action.		сс
D1099	ゼブラ フィッ シュ(生 殖発生毒 性)	Truong, Lisa; Rericha, Yvonne; Thunga, Preethi; Marvel, Skylar; Wallis, Dylan; Simonich, Michael T; Field, Jennifer A; Cao, Dunping; Reif, David M; Tanguay, Robyn L	Systematic developmental toxicity assessment of a structurally diverse library of PFAS in zebrafish	2022	J Hazard Mater. 2022 Jun 5;431:128615. doi: 10.1016/j.jhazmat.2022.128615. Epub 2022 Mar 2.	Per- and polyfluoroalkyl substances (PFAS) are a class of widely used chemicals with limited human health effects data relative to the diversity of structures manufactured. To help fill this data gap, an extensive in vivo developmental toxicity screen was performed on 139 PFAS provided by the US EPA. Dechorionated embryonic zebrafish were exposed to 10 nominal water concentrations of PFAS (0.015-100 μ M) from 6 to 120 h post-fertilization (hpf). The embryos were assayed for embryonic photomotor response (EPR), larval photomotor response (LPR), and 13 morphological endpoints. A total of 49 PFAS (35%) were bioactive in one or more assays (11 altered EPR, 25 altered LPR, and 31 altered morphology). Perfluorooctanesulfonamide (FOSA) was the only structure that was bioactive in all 3 assays, while Perfluorodecanoic acid (PFDA) was the most potent teratogen. Low PFAS volatility was associated with developmental toxicity (p < 0.01), but no association was detected between bioactivity and five other physicochemical parameters. The bioactive PFAS were enriched for 6 supergroup chemotypes. The results illustrate the power of a multi-dimensional in vivo platform to assess the developmental (neuro)toxicity of diverse PFAS and in the acceleration of PFAS safety research.		c c
D1100	ニワトリ 胚(生殖 発生毒 性)	Jiang, Qixiao; Xu, Xiaohui; DeWitt, Jamie C; Zheng, Yuxin	Using Chicken Embryo as a Powerful Tool in Assessment of Developmental Cardiotoxicities	2021	J Vis Exp. 2021 Mar 21;(169). doi: 10.3791/62189.	Chicken embryos are a classical model in developmental studies. During the development of chicken embryos, the time window of heart development is well-defined, and it is relatively easy to achieve precise and timely exposure via multiple methods. Moreover, the process of heart development in chicken embryos is similar to mammals, also resulting in a four-chambered heart, making it a valuable alternative model in the assessment of developmental cardiotoxicities. In our lab, the chicken embryo model is routinely used in the assessment of developmental cardiotoxicities following exposure to various environmental pollutants, including per-and polyfluoroalkyl substances (PFAS), particulate matter (PMs), diesel exhaust (DE) and nano materials. The exposure time can be freely selected based on the need, from the beginning of development (embryonic day 0, ED0) all the way to the day prior to hatch. The major exposure methods include air-cell injection, direct microinjection, and air-cell inhalation (originally developed in our lab), and the currently available endpoints include cardiac function (electrocardiography), morphology (histological assessments) and molecular biological assessments (immunohistochemistry, qRT-PCR, western blotting, etc.). Of course, the chicken embryo model has its own limitations, such as limited availability of antibodies. Nevertheless, with more laboratories starting to utilize this model, it can be used to make significant contributions to the study of developmental cardiotoxicities.		сс

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D1101	メタボロ ミクス (生殖毒 性)	Huang, Qingyu; Luo, Lianzhong; Han, Xuejingping; Li, Fuping; Zhang, Xi; Tian, Meiping	Low-dose perfluorooctanoic acid stimulates steroid hormone synthesis in Leydig cells: Integrated proteomics and metabolomics evidence	2022	J Hazard Mater. 2022 Feb 15;424(Pt D):127656. doi: 10.1016/j.jhazmat.2021.127656. Epub 2021 Nov 2.	Perfluorooctanoic acid (PFOA), one of the well-known perfluoroalkyl substances (PFASs), has been widespread in the environment and associated with male reproductive toxicity. However, the molecular mechanism involved in low-level PFOA-induced male endocrine disruption remains to be elucidated. In this study, we performed a combined proteomics and metabolomics analysis to investigate the proteomic and metabolic alterations in MLTC-1 Leydig cells responsive to low levels of PFOA exposure. The results showed that PFOA significantly regulated the expressions of 67 proteins and 17 metabolites, among which 18 proteins and 7 metabolites were specifically tied to lipid and fatty acid metabolism as well as testicular steroidogenesis. It is further suggested that low-dose PFOA stimulates steroid hormone synthesis by accelerating fatty acid metabolism and steroidogenic process, which is involved in the repression of p38 and cAMP-dependent ERK signaling pathway. The animal studies also revealed that environmentally relevant levels of PFOA increased serum steroid hormone levels accompanied by the activated cAMP and inhibited p38/ERK pathway in testis, which confirmed our in vitro findings. Overall, the present study will provide novel insights into the toxicological mechanisms of low-level PFOA-mediated steroidogenic disturbance, and may implicate the reproductive health risk of humans with environmental PFOA exposure.		c c
D1102	МОА	Hu, Wen-Yang; Lu, Ranli; Hu, Dan Ping; Imir, Ozan Berk; Zuo, Qianying; Moline, Dan; Afradiasbaghara ni, Parivash; Liu, Lifeng; Lowe, Scott; Birch, Lynn; Griend, Donald J Vander; Madak-Erdogan, Zeynep; Prins, Gail S	Per- and polyfluoroalkyl substances target and alter human prostate stem-progenitor cells	2022	Biochem Pharmacol. 2022 Mar;197:114902. doi: 10.1016/j.bcp.2021.114902. Epub 2021 Dec 27.	Per- and polyfluorinated alkyl substances (PFAS) are a large family of widely used synthetic chemicals that are environmentally and biologically persistent and present in most individuals. Chronic PFAS exposure have been linked to increased prostate cancer risk in occupational settings, however, underlying mechanisms have not been interrogated. Herein we examined exposure of normal human prostate stem-progenitor cells (SPCs) to 10 nM PFOA or PFOS using serial passage of prostasphere cultures. Exposure to either PFAS for 3-4 weeks increased spheroid numbers and size indicative of elevated stem cell self-renewal and progenitor cell proliferation. Transcriptome analysis using single-cell RNA sequencing (scRNA-seq) showed 1) SPC expression of PPARs and RXRs able to mediate PFAS effects, 2) the emergence of a new cell cluster of aberrantly differentiated luminal progenitor cells upon PFOS/PFOA exposure, and 3) enrichment of cancer-associated signaling pathways. Metabolomic analysis of PFAS-exposed prostaspheres revealed increased glycolytic pathways including the Warburg effect as well as strong enrichment of serine and glycine metabolism which may promote a pre-malignant SPC fate. Finally, growth of in vivo xenografts of tumorigenic RWPE-2 human prostate cells, shown to contain cancer stem-like cells, was markedly enhanced by daily PFOS feeding to nude mice hosts. Together, these findings are the first to identify human prostate SPCs as direct PFAS targets with resultant reprogrammed transcriptomes and metabolomes that augment a preneoplastic state and may contribute to an elevated prostate cancer risk with chronic exposures.		c c
D1103	in vitro (発がん 性)	Liu, Yaqing; Li, Jian; Ding, Hui; Ge, Dahe; Wang, Juntao; Xu, Chunjin	Perfluorooctane sulfonate (PFOS) triggers migration and invasion of esophageal squamous cell carcinoma cells via regulation of Zeb1	2022	Drug Chem Toxicol. 2022 Nov;45(6):2804-2813. doi: 10.1080/01480545.2021.1991775. Epub 2021 Nov 3.	Esophageal squamous cell carcinoma (ESCC) is one of the most prevalent and deadly cancers worldwide, especially in Eastern Asia. As a potential endocrine-disrupting chemical (EDC), perfluorooctane sulfonate (PFOS) can mimic estrogen, disturb the estrogen signals, and then cause various diseases. Although ESCC can be directly exposed to PFOS during food digestion, the effects and mechanisms of PFOS on the development of ESCC are still not well illustrated. This study showed that PFOS can promote the migration and invasion of ESCC cells. Further, PFOS treatment can increase the expression of matrix metalloproteinase-2 (MMP-2) and MMP-9, while decreasing the expression of E-Cadherin (E-Cad). Zeb1, an important transcription factor for cell motility, was essential for PFOS induced migration and invasion of ESCC cells. PFOS can increase the expression of Zeb1 via upregulation of its transcription and proteins stability. A-kinase interacting protein 1 (AKIP1) and ataxia- telangiectasia mutated (ATM) were responsible for PFOS induced transcription and proteins stability of Zeb1 in ESCC cells, respectively. Collectively, our data indicated that environmental exposure and body accumulation of PFOS might be an important risk factor for ESCC progression.		В
D1104	in vitro (発がん 性)	Singh, Nalin; Hsieh, Ching Yi Jennifer	Exploring Potential Carcinogenic Activity of Per- and Polyfluorinated Alkyl Substances Utilizing High- Throughput Toxicity Screening Data	2021	Int J Toxicol. 2021 Jul-Aug;40(4):355-366. doi: 10.1177/10915818211010490. Epub 2021 May 4.	Per- and polyfluorinated alkyl substances (PFAS) are ubiquitous, persistent, and toxic chemicals that pose public health risks. Recent carcinogenicity concerns have arisen based on epidemiological studies, animal tumor findings, and mechanistic data. Thousands of PFAS exist; however, current understanding of their toxicity is informed by studies of a select few, namely, perfluorooctanoic acid and perfluorooctanesulfonic acid. Hence, the computational, high-throughput screening tool, the US EPA CompTox Chemical Dashboard's ToxCast, was utilized to explore the carcinogenicity potential of PFAS. Twenty-three major PFAS that had sufficient in vitro ToxCast data and covered a range of structural subclasses were analyzed with the visual analytics software ToxPi, yielding a qualitative and quantitative assessment of PFAS activity in realms closely linked with carcinogenicity. A comprehensive literature search was also conducted to check the consistency of analyses with other mechanistic data streams. The PFAS were found to induce a vast range of biological perturbations, in line with several of the International Agency for Research on Cancer-defined key carcinogen characteristics. Patterns observed varied by length of fluorine-bonded chains and/or functional group within and between each key characteristic, suggesting some structure-based variability in activity. In general, the major conclusions drawn from the analysis, that is, the most notable activities being modulation of receptor-mediated effects and induction of oxidative stress, were supported by literature findings. The study helps enhance understanding of the mechanistic pathways that underlie the potential carcinogenicity of various PFAS and hence could assist in hazard identification and risk assessment for this emerging and relevant class of environmental toxicants		В

パーフルオロ化合物に係る国際機関等の評価及び科学的知見の情報収集並びに整理

別添-2 文献データベース文献リスト

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D1105	in vitro (発がん 性)	Rickard, Brittany P; Tan, Xianming; Fenton, Suzanne E; Rizvi, Imran	Select Per- and Polyfluoroalkyl Substances (PFAS) Induce Resistance to Carboplatin in Ovarian Cancer Cell Lines	2022	Int J Mol Sci. 2022 May 5;23(9):5176. doi: 10.3390/ijms23095176.	Per- and polyfluoroalkyl substances (PFAS) are ubiquitous environmental contaminants associated with adverse reproductive outcomes including reproductive cancers in women. PFAS can alter normal ovarian function, but the effects of PFAS on ovarian cancer progression and therapy response remain understudied. Ovarian cancer is the most lethal gynecologic malignancy, and a major barrier to effective treatment is resistance to platinum-based chemotherapy. Platinum resistance may arise from exposure to external stimuli such as environmental contaminants. This study evaluated PFAS and PFAS mixture exposures to two human ovarian cancer cell lines to evaluate the ability of PFAS exposure to affect survival fraction following treatment with carboplatin. This is the first study to demonstrate that, at sub-cytotoxic concentrations, select PFAS and PFAS mixtures increased survival fraction in ovarian cancer cells following carboplatin treatment, indicative of platinum resistance. A concomitant increase in mitochondrial membrane potential, measured by the JC-1 fluorescent probe, was observed in PFAS-exposed and PFAS + carboplatin-treated cells, suggesting a potential role for altered mitochondrial function that requires further investigation.		С
D1106	MOA(発 がん性)	Jabeen, Musarrat; Fayyaz, Muhammad; Irudayaraj, Joseph	Epigenetic Modifications, and Alterations in Cell Cycle and Apoptosis Pathway in A549 Lung Carcinoma Cell Line upon Exposure to Perfluoroalkyl Substances	2020) Toxics. 2020 Nov 23;8(4):112. doi: 10.3390/toxics8040112.	Per- and polyfluoroalkyl substances (PFAS) are a group of human-made compounds with strong C-F bonds, and have been used in various manufacturing industries for decades. PFAS have been reported to deleterious effect on human health, which has led to studies identifying the possible toxicity and toxicity routes of these compounds. We report that these compounds have the potential to cause epigenetic modifications, and to induce dysregulation in the cell proliferation cycle as well as apoptosis in A549 lung cancer cells when exposed to 10-, 200- and 400 μ M concentrations of each compound. Our studies show that exposure to perfluorooctanoic acid (PFOA) and perfluorooctane sulfonic acid (PFOS) may cause hypomethylation in the epigenome, but changes in the epigenetic makeup are not evident upon exposure to GenX. We establish that exposure to lower doses of these compounds causes the cells' balance to shift to cell proliferation, whereas exposure to higher concentrations shifts the balance more towards apoptosis. Furthermore, the apoptosis pathway upon exposure to GenX, PFOA, and PFOS has also been identified. Our findings suggest that exposure to any of these compounds may have profound effects in patients with pre-existing lung conditions or could trigger lung cancinogenesis.		В
D1107	MOA(発 がん性)	Fangninou, Fangnon Firmin; Yu, Zhenyang; Li, Zhuo; Guadie, Awoke; Li, Wenzhe; Xue, Lei; Yin, Daqiang	Metastatic effects of environmental carcinogens mediated by MAPK and UPR pathways with an in vivo Drosophila Model	2023	J Hazard Mater. 2023 Jan 5;441:129826. doi: 10.1016/j.jhazmat.2022.129826. Epub 2022 Aug 25.	Metastasis includes tumor invasion and migration and underlies over 90% of cancer mortality. The metastatic effects of environmental carcinogens raised serious health concerns. However, the underlying mechanisms remained poorly studied. In the present study, an in vivo Ras(V12)/lgl(-/-) model of the fruitfly, Drosophila melanogaster, with an 8-day exposure was employed to explore the metastatic effects of 3,3',4,4',5-pentachlorobiphenyl (PCB126), perfluorooctanoic acid (PFOA) and cadmium chloride (CdCl(2)). At 1.0 mg/L, PCB126, PFOA, and CdCl(2) significantly increased tumor invasion rates by 1.32-, 1.33-, and 1.29-fold of the control, respectively. They also decreased the larval body weight and locomotion behavior. Moreover, they commonly disturbed the expression levels of target genes in MAPK and UPR pathways, and their metastatic effects were significantly abolished by the addition of p38 inhibitor (SB203580), JNK inhibitor (SP600125) and IRE1 inhibitor (KIRA6). Notably, the addition of the IRE inhibitor significantly influenced sna/E-cad pathway which is essential in both p38 and JNK regulations. The results demonstrated an essential role of sna/E-cad in connecting the effects of carcinogens on UPR and MAPK regulations and the resultant metastasis.		С
D1108	実験動物 (発がん 性)	Kamendulis, Lisa M; Hocevar, Jessica M; Stephens, Mikayla; Sandusky, George E; Hocevar, Barbara A	Exposure to perfluorooctanoic acid leads to promotion of pancreatic cancer	2022	Carcinogenesis. 2022 Jun 4;43(5):469-478. doi: 10.1093/carcin/bgac005.	Pancreatic cancer is the fourth leading cause of cancer deaths in the United States. Perfluorooctanoic acid (PFOA), a persistent environmental pollutant, has been shown to induce pancreatic acinar cell tumors in rats. Human epidemiologic studies have linked PFOA exposure to adverse chronic health effects including several types of cancer. Previously, we demonstrated that PFOA induces oxidative stress and focal ductal hyperplasia in the mouse pancreas. Here, we evaluated whether PFOA promotes pancreatic cancer using the LSL-KRasG12D;Pdx-1 Cre (KC) mouse model of pancreatic cancer. KC mice were exposed to 5 ppm PFOA in drinking water starting at 8 weeks of age and analyzed at 6 and 9 months of age. At the 6-month time point, PFOA exposure increased pancreatic intraepithelial neoplasia (PanIN) area by 58%, accompanied by a 2-fold increase in lesion number. Although PanIN area increased at 9 months, relative to 6 months, no treatment effect was observed. Collagen deposition was enhanced by PFOA at both the 6- and 9-month time points. PFOA also induced oxidative stress in the pancrease evidenced by elevated antioxidant activity of superoxide dismutase (Sod), catalase and thioredoxin reductase, and a ~3-fold increase in Sod1 mRNA and protein levels at 6 months. Although antioxidant activity was not enhanced by PFOA exposure at the 9-month time point, increased pancreatic oxidative damage was observed. Collectively, these results show that PFOA elicited temporal increases in PanIN lesion area and desmoplasia concomitant with the induction of oxidative stress, demonstrating that it functions to promote pancreatic cancer progression.		1 A

分野 タイトル 発行年 書誌情報 要旨 (原文) No 著者 (参考) Perfluorinated compounds are emerging organic pollutants widely used in building materials Herein, silico analysis was conducted using bioinformatics approach to assess the potentia and perfluorinated compounds. Transcriptome profiles and data of perfluorinated compound Genome Atlas (TCGA) and the Genotype-Tissue Expression and Comparative Toxicogenomi Ye, Shaopei; Liu 実験動物 The comprehensive analysis based study of and Kyoto Encyclopedia of Genes and Genomes (KEGG) analyses showed that interactive ge Ecotoxicol Environ Saf. 2022 Jan 1;229:113059. doi: Qin; Huang, Ke; (発がん D1109 perfluorinated compounds-Environmental explanation cancer (BC). Transcriptome profiles were used to verify the expression of m6A-related gener 2022 10.1016/j.ecoenv.2021.113059. Epub 2021 Dec 8. Jiang, Xinlu of bladder cancer progression Most m6A-related genes predicted BC prognosis. Survival analysis and ROC curves demons 性) Zhang, Xu m6A-related genes were associated with BC prognosis. Perfluorooctanoic acid (PFOA) signi ability and promoted cell invasion capacity. In addition, PFOA significantly increased the cell T24 and BIU-87 cell lines compared with the control group. Taken together, these results sh could promote BC progression. DATA AVAILABILITY: Data and materials are available withir Boyd, Raya I; Poly- and perfluoroalkylated substances (PFAS) are chemicals that persist and bioaccumula Ahmad, Saeed: in nearly all human populations through several routes of exposure. Human occupational an Singh, Ratnakar been associated with several cancers, including cancers of the kidney, testis, prostate, and Fazal, Zeeshan 実験動物 Cancers (Basel). 2022 Jun 14;14(12):2919. doi: PFAS are not directly mutagenic, many diverse mechanisms of carcinogenicity have been prooward a Mechanistic Understanding of Poly- and Prins. Gail S D1110 (発がん organize these mechanisms into three major proposed pathways of PFAS action-metabolisr Madak Erdogan, Perfluoroalkylated Substances and Cancer 10.3390/cancers14122919. (件) perturbation-and discuss how these distinct but interdependent pathways may explain man Zeynep; effects of the PFAS class of environmental contaminants. Notably, each of the pathways is p Irudayaraj, dose and window of exposure which may, in part, explain the variable epidemiologic and exp Joseph; Spinella cancer. We highlight testicular and prostate cancer as models to validate this concept. Michael J Per- and polyfluoroalkyl substances (PFAS) are a family of man-made chemicals with currer While toxicological data are available for some of the legacy PFAS, such as PFOA and PFOS. both emerging and legacy PFAS' toxicity due to the diversity of the PFAS. Therefore, a bette structure-activity relationship may prove helpful. The present study investigated a potential between PFAS and hepatotoxicity. As such, the effects of thirteen PFAS with varying carbon groups (in a concentration range of 0-800 μ M) on the cell viability of HepG2 cells and intrac formation have been tested using the MTT and DCFH assay, respectively. The exposure tim Amstutz, V H; intracellular PFAS levels were determined in HepG2 after 24 h exposure. The present study n vitro Cengo, A; Investigating the cytotoxicity of per- and Toxicology. 2022 Oct;480:153312. doi: PFAS is dependent on their chain-length as cell viability decreased with increasing chain-le D1111 (肝毒 Gehres, F: Siim, polyfluoroalkyl substances in HepG2 cells: A 10.1016/j.tox.2022.153312. Epub 2022 Sep 6. Calculated Relative Potency Factors (RPF), based on the TC(50) values, were used for a ten 性) D T H M; Vrolijk, structure-activity relationship approach hepatotoxicity: PFNA > PFDA > PFOS ≥ PFOA > PFHxS > PFBS >> PFHpA = PFHxA = PFB/ ME 3:1 FTOH. Similar results were observed regarding intracellular reactive oxygen species gen tentative ranking of: PFNA > PFOS > PFOA \geq PFDA > PFHxS > PFBS > PFBA > PFHpA \geq PF = 3:1 FTOH. Moreover, a concentration-dependent reactive oxygen species generation has PFCAs, but not for the FTOHs. In conclusion, the carbon chain-length and functional head-g toxicity for the two toxicological endpoints assessed in the present study. Moreover, no effect FTOHs. As such, the present study established a potential structure-activity relationship that predictive model to help with the risk assessment of PFAS in the future. Palazzolo, Short-chain per-fluoroalkyl substances (PFAS) have replaced long-chains in many application Stefano; of action and interactions due to the large number of these compounds and their mixtures is Caligiuri, aims to compare the effects on mouse liver organoids (target organ for bioaccumulation) of Isabella; Sfriso, sulfonate -PFOS-, perfluorooctanoic acid -PFOA) and two short-chain PFAS commonly utiliz Andrea Augusto acid -HFBA-, Pentafluoropropionic anhydride-PFPA) to identify the mode of action of these in vitro Mauceri, Matteo Cytomorphological aberrations and ALT/GDH enzyme disruption were identified but no acut Early Warnings by Liver Organoids on Short- and D1112 (肝毒 Rotondo 2022 Toxics. 2022 Feb 18:10(2):91. doi: 10.3390/toxics10020091 was detected by the two tested short-chain PFAS. After cytomorphological analysis, it is evid Long-Chain PFAS Toxicity 性) Rossella; organoid morphology inducing a reduction of cytostructural complexity and aberrant cytologi of 670 \pm 30 μ M and 895 \pm 7 μ M were measured for PFOS and PFOA, respectively, together Campagnol Davide; disruption, caspase 3 and 7 apoptosis activation and deep loss of architectural complexity of Canzonieri. M. Eventually, biochemical markers and histology analysis confirmed the sensitivity of organ Vincenzo; and reproducible platform to test many PFAS and mixtures saving time and at low cost in co Rizzolio, Flavio testing could be introduced as an innovative platform to assess the toxicity to fast recognize

	備考	出 対 象 抽	ン 文 ク 献 ① ラ	ン 文 ク 献 ② ラ
s, textiles, and electric equipment. relationship between bladder cancer ds were obtained from The Cancer cs databases. Gene Ontology (GO9 enes were mainly enriched in bladder s at the mRNA and protein levels. trated that the expression levels of ficantly increased the cell proliferation I viability and cell invasion capacity of ow that perfluorinated compounds in the manuscript.			E	3
ate in the environment and are found d community exposure to PFAS has iver. While evidence suggests that oposed. In this mini-review, we n, endocrine disruption, and epigenetic y of the proposed pro-carcinogenic oredicted to be highly sensitive to the perimental evidence linking PFAS and			(2
ntly over 4'700 compounds identified. , a knowledge gap remains concerning r understanding of the PFAS structure-activity relationship a chain-length and functional head- ellular reactive oxygen species es were either 3 or 24 h. In addition, demonstrated that the cytotoxicity of ngth at both exposure times. Itative ranking of PFAS regarding their A = PFPrA = 6:2 FTOH = 4:2 = FTOH = heration at both exposure times, with a FHXA > PFPrA > 6:2 FTOH = 4:2 FTOH been observed for all PFSAs and group of a PFAS determine their in vitro cts were observed for the tested at opens the possibility of developing a			D	В
ons, however the toxicity and its mode s still poorly understood. The paper two long-chain PFAS (perfluorooctane eed in the industry (heptafluorobutyric classes of contaminants. e toxicity endpoint neither apoptosis dent that short-chain PFAS affected ical features. Conversely, EC50 values r with strong ALT/GDH enzyme f organoids in the range of 500-1000 μ noid tests that could be used as a fast emparison with in vivo tests. Organoids e potentially dangerous pollutants.			D	В

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン 文 ク 献 ① ラ	ン 文 ク 献 ② ラ
D1113	in vitro (肝毒 性)	Sun, Weiqiang; Ma, Xinzhuang; Zhou, Yongbing; Wang, Li; Liu, Hui	[Effect of perfluorooctanoic acid on lipid accumulation in rat liver cells BRL-3A and its possible mechanism]	2022	, Wei Sheng Yan Jiu. 2022 Jan;51(1):107-112. doi: 10.19813/j.cnki.weishengyanjiu.2022.01.018.	OBJECTIVE: To investigate the effect of perfluorooctanoic acid on rat hepatocytes BRL-3 A cell viability and the expression of transcription factor nuclear factor erythroid 2-related factor 2(Nrf2) and arginosuccinate synthase(Ass1). METHODS: Rat hepatocytes BRL-3 A were cultured and divided into control group(0 μ mol/L PFOA), low-dose group(6.25 μ mol/L PFOA), and medium-dose group(25 μ mol/L PFOA), high-dose group(100 μ mol/L PFOA). After 48 hours, cell viability was detected by MTT, ROS content was detected by free radical indicator H_2DCFDA, enzyme activity related to oxidative stress was detected by the kit, Nrf2 and Ass1 protein expression level was detected by Western blot and immunocytochemistry(ICC). RESULTS: Compared with the control group, with the increase of the PFOA concentration, the cell viability of the middle and high dose groups had a downward trend, but there was no statistical significance(P>0.05). The intracellular ROS content increased, among which in the middle and high dose groups significantly increased(P<0.05), and the average fluorescence intensity was(5417.66 ± 161.09) and(5725.50 ± 166.83), respectively. Compared with the control group, the content of intracellular TG, TC and MDA in the low and medium dose groups did not change significantly, and the content of TG, TC and MDA in the high-dose group was significantly increased(P<0.05), which was(0.21 ± 0.05) mmol/L, (14.5 ± 6.07) mmol/L and(1.23 ± 0.33) nmol/mL, respectively. According to the ICC and Western blot result, the expression level of Nrf2 protein increased significantly in the high-dose group(P<0.05). CONCLUSION: Exposure to a certain dose of PFOA can lead to the accumulation of ROS in BRL-3 A cells. Nrf2 and Ass1 can play a certain role in eliminating ROS and ammonia detoxification by increasing their expression under the oxidative damage of rat liver cells caused by PFOA.			С	В
D1114	in vitro (肝毒 性)	Dong, Zhanchen; Qiu, Tianming; Zhang, Jingyuan; Sha, Shanshan; Han, Xiuyan; Kang, Jian; Shi, Xiaoxia; Sun, Xiance; Jiang, Liping; Yang, Guang; Yao, Xiaofeng; Ma, Yufang	Perfluorooctane sulfonate induces autophagy- dependent lysosomal membrane permeabilization by weakened interaction between tyrosinated alpha- tubulin and spinster 1	2021	Food Chem Toxicol. 2021 Nov;157:112540. doi: 10.1016/j.fct.2021.112540. Epub 2021 Sep 6.	Perfluorooctane sulfonate (PFOS) is one kind of persistent organic pollutants. In previous study, we found that PFOS induced autophagy-dependent lysosomal membrane permeabilization (LMP) in hepatocytes, and siRNA against lysosomal permease spinster 1 (SPNS1) relieved PFOS-induced LMP. However, whether and how SPNS1 functioned as the link between autophagy and LMP was still not defined. In this study, we constructed a stable cell line expressing high levels of SPNS1. We found that SPNS1 interacted specifically with α -tubulin of tyrosinated isotype by pull-down assay. After treatment with PFOS, the level of tyrosinated α -tubulin was autophagy-dependently decreased. SPNS1-tyrosinated α -tubulin interaction was disrupted subsequently, which led to LMP eventually. We also found that stable high-expression of SPNS1 in hepatocytes accelerated lysosomal acidification, and deteriorated PFOS-induced LMP. This study pointed out that SPNS1-tyrosinated α -tubulin interaction we have a stable of the cross-talk between autophagy and LMP induced by PFOS, shedding new light on the mechanism of PFOS hepatotoxicity.			С	В
D1115	in vitro (肝毒 性)	Charazac, Auré lie; Hinault, Charlotte; Dolfi, Bastien; Hautier, Solène; Decondé Le Butor, Célia; Bost, Frédéric; Chevalier, Nicolas	Low Doses of PFOA Promote Prostate and Breast Cancer Cells Growth through Different Pathways	2022	, Int J Mol Sci. 2022 Jul 18;23(14):7900. doi: 10.3390/ijms23147900.	Endocrine Disrupting Compounds (EDCs) are found in everyday products. Widely distributed throughout the environment, persistent organic pollutants (POPs) are a specific class of EDCs that can accumulate in adipose tissue. Many of them induce adverse effects on human health-such as obesity, fertility disorders and cancers-by perturbing hormone effects. We previously identified many compounds with EDC activity in the circulation of obese patients who underwent bariatric surgery. Herein, we analyzed the effects of four of them (aldrin, BDE28, PFOA and PCB153) on two cancer cell lines of hormone-sensitive organs (prostate and breast). Each cell line was exposed to serial dilutions of EDCs from 10(-6) M to 10(-12) M; cytotoxicity and proliferation were monitored using the IncuCyte(®) technology. We showed that none of these EDCs induce cytotoxicity and that PFOA and PCB153, only at very low doses (10(-12) M), increase the proliferation of DU145 (prostate cancer) and MCF7 (breast cancer) cells, while the same effects are observed with high concentrations (10(-6) M) for aldrin or BDE28. Regarding the mechanistic aspects, PFOA uses two different signaling pathways between the two lines (the Akt/mTORC1 and PlexinD1 in MCF7 and DU145, respectively). Thus, our study demonstrates that even at picomolar (10(-12) M) concentrations PFOA and PCB153 increase the proliferation of prostate and PCB153			D	В

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨 (原文)	備考	出 情 対 報 象 抽	ン 文 ク 献 ① ラ	ン : ク i ②	文 献 ラ
D1116	in vitro (肝毒 性)	Lim, Joe Jongpyo; Suh, Youjun; Faustman, Elaine M; Cui, Julia Yue	Perfluorinated Carboxylic Acids with Increasing Carbon Chain Lengths Upregulate Amino Acid Transporters and Modulate Compensatory Response of Xenobiotic Transporters in HepaRG Cells	2022	Drug Metab Dispos. 2022 Oct;50(10):1396-1413. doi: 10.1124/dmd.121.000477. Epub 2021 Dec 2.	Perfluorinated carboxylic acids (PFCAs) are widespread environmental pollutants for which human exposure has been documented. PFCAs at high doses are known to regulate xenobiotic transporters partly through peroxisome proliferator-activated receptor alpha (PPAR α) and constitutive androstane receptor (CAR) in rodent models. Less is known regarding how various PFCAs at a lower concentration modulate transporters for endogenous substrates, such as amino acids in human hepatocytes. Such studies are of particular importance because amino acids are involved in chemical detoxification, and their transport system may serve as a promising therapeutic target for structurally similar xenobiotics. The focus of this study was to further elucidate how PFCAs modulate transporters involved in intermediary metabolism and xenobiotic biotransformation. We tested the hepatic transcriptomic response of HepaRG cells exposed to 45 μ M of perfluorooctanoic acid, perfluorononanoic acid, or perfluorodecanoic acid in triplicates for 24 hours (vehicle: 0.1% DMSO), as well as the prototypical ligands for PPAR α (WY-14643, 45 μ M) and CAR (6-(4-chlorophenyl)imidazo[2,1-b][1,3]thiazole-5-carbaldehyde O-(3,4-dichlorobenzyl)oxime [CITCO], 2 μ M). PFCAs with increasing carbon chain lengths (C8-C10) regulated more liver genes, with amino acid metabolism and transport ranked among the top enriched pathways and PFDA ranked as the most potent PFCA tested. Genes encoding amino acid transporters, which are essential for protein synthesis, were novel inducible targets by all three PFCAs, suggesting a potentially protective mechanism to reduce further toxic insults. None of the transporter regulations appeared to be through PPAR α or CAR but potential involvement of nuclear factor erythroid 2-related factor 2 is noted for all 3 PFCAs. In conclusion, PFCAs with increasing carbon chain lengths up-regulate amino acid transporters and modulate xenobiotic transporters to limit further toxic exposures in HepaRG cells. SIGNIFICANCE STATEMENT: Little is k			С	В	
D1117	MOA(肝 毒性)	Liu, Hui; Cheng, Jingjing; Zhou, Yongbing; Liu, Fangfang; Griffin, Nathan; Faulkner, Sam; Wang, Li	Interactions of perfluorooctanoic acid with acyl-CoA thioesterase 1 (Acot1)	2021	Comp Biochem Physiol C Toxicol Pharmacol. 2021 Dec;250:109159. doi: 10.1016/j.cbpc.2021.109159. Epub 2021 Aug 6.	Perfluorooctanoic acid (PFOA), a typical representative of per- and polyfluoroalkyl substances (PFASs), is a widely utilized persistent organic pollutant (POP) known to induce liver toxicity in laboratory animals and wildlife. Evidence suggests that PFOA interacts with Acyl-CoA thioesterase 1 (Acot1) to modulate levels of β -oxidation. Specifically, PFOA accelerates β -oxidation, while Acot1 is inhibitory. Few studies have investigated the specific relationship between PFOA and Acot1 and the mechanism of their interaction remains unclear. In the following study, purified rat Acot1 protein was synthesized via bacterial recombination and the structural features that facilitate its binding to PFOA were assessed via molecular docking technology. Additionally, through use of circular dichroism spectroscopy (CD) and isothermal titration calorimetry (ITC) we demonstrate that PFOA binds to WT-Acot1 through electrostatic attraction and low strength non-covalent hydrogen bonding at a molar ratio of 1:1. Furthermore, we identify N326 and H373 amino acid residues as key regulators of the binding process. Together, these findings clarify the interaction pattern of PFOA and Acot1 proteins and provide insight into the specific molecular mechanisms that induce PFOA toxicity in humans and animals.			С	В	
D1118	MOA(肝 毒性)	Marques, Emily; Pfohl, Marisa; Wei, Wei; Tarantola, Giuseppe; Ford, Lucie; Amaeze, Ogochukwu; Alesio, Jessica; Ryu, Sangwoo; Jia, Xuelian; Zhu, Hao; Bothun, Geoffrey D; Slitt, Angela	Replacement per- and polyfluoroalkyl substances (PFAS) are potent modulators of lipogenic and drug metabolizing gene expression signatures in primary human hepatocytes	2022	Toxicol Appl Pharmacol. 2022 May 1;442:115991. doi: 10.1016/j.taap.2022.115991. Epub 2022 Mar 23.	Per- and polyfluoroalkyl substances (PFAS) are a class of environmental toxicants, and some, such as perfluorooctanesulfonic acid (PFOS) and perfluorooctanoic acid (PFOA), have been associated with hepatic steatosis in rodents and monkeys. It was hypothesized that perfluorosulfonic acids (C4, 6, 8), perfluorocarboxylic acids (C4-14), perfluoro(2-methyl-3-oxahexanoic) acid (HFPO-DA), 1H, 1H, 2H, 2H-perfluorooctanesulfonic acid (6:2 FTS) along with 3 PFOS precursors could induce expression of lipid metabolism genes and lipid deposition in human hepatocytes. Five-donor pooled cryopreserved human hepatocytes were cultured and treated with 0.1% DMSO vehicle or various PFAS (0.25 to 25 μ M) in media. After a 48-h treatment, mRNA transcripts related to lipid transport, metabolism, and synthesis were measured using a Quantigene Plex assay. After 72-h treatments, hepatocytes were stained with Nile Red dye to quantify intracellular lipids. Overall, PFAS were transcriptionally active at 25 μ M. In this model, lipid accumulation was not observed with C8-C12 treatments. Shorter chain PFAS (C4-C5), 6:2 FTS, and PFOS precursor, metFOSA, induced significant liver lipid accumulation, and gene activation at lower concentrations than legacy PFAS. In summary short chain PFAS and other alternative PFAS were more potent gene inducers, and potential health effects of replacement PFAS should be critically evaluated in humans.			D	В	

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン 文 ク 献 ① ラ	ン ク ②	文 献 ラ
D1119	MOA(肝 毒性)	Amstutz, V H; Cengo, A; Sijm, D T H M; Vrolijk, M F	The impact of legacy and novel perfluoroalkyl substances on human cytochrome P450: An in vitro study on the inhibitory potential and underlying mechanisms	2022	Toxicology. 2022 Feb 28;468:153116. doi: 10.1016/j.tox.2022.153116. Epub 2022 Feb 1.	Per- and polyfluoroalkyl substances (PFASs) are a group of synthetic compounds with a wide range of industrial applications. PFOA and PFOS have been the most extensively studied and have been associated with hepatotoxicity. Recently, the interaction with cytochrome P450 (CYP) has been proposed as a potential key molecular event leading to PFAS-induced hepatotoxicity. In the present study, we aimed to determine a structure-activity relationship between thirteen PFASs and their inhibitory potential on the activities of four CYPs (CYP2E1, CYP2D6, CYP3A4 and CYP2C19). The influence of PFASs (5-3200 μ M) on CYP enzyme activities was measured using the Vivid® P450 metabolism assays. Using the same assays, Michaelis-Menten saturation curves were determined to explore the type of PFAS-induced CYP inhibition. Most PFASs were capable of inhibiting activity of the tested CYPs, as shown by their ICS0 values. CYP2E1 is particularly inhibited by 3:1 FTOH, PFOA, and PFOS, whereas CYP2D6 is inhibited by PFHxS, PFHpA, PFOA, PFOS, PFNA, and PFDA. Additionally, CYP3A4 is most strongly inhibited by PFHxS, PFOA, PFOS, PFNA, and PFDA. Finally, CYP2C19 is inhibited by PFBS, PFHxS, PFHpA, PFOA, PFOS, PFNA, and PFDA. Interestingly, PFHxA and PFHxS induced an increase in CYP2E1 activity, whereas 4:2 FTOH strongly induced CYP2D6 activity. The mechanism of inhibition of CYPs by PFASs differed per CYP isoenzyme. CYP3A4 was competitively inhibited by PFBS, PFHxS, PFOS, PFNA and PFDA and non- competitively by PFOA. Additionally, CYP2C19 was competitively inhibited by PFBS, PFHxS, PFOS and PFNA, whereas PFBS and PFHxS induced a mixed inhibition. Inhibition of CYP2C19 by PFHpA was atypical with an increased Vmax and a decreased Km. Finally, PFHxS competitively inhibited CYP2D6, whereas PFBS, PFOA, PFOS, PFDA and PFNA induced an atypical inhibition. Our results show that CYP inhibition by PFASs appears to be structure-dependent as well as CYP dependent. Inhibition of CYP2D6, CYP2C19 and CYP3A4 increased with increasing chain-lengths between s			D	E	3
D1120	MOA(肝 毒性)	Abudayyak, Mahmoud; Özta ş, Ezgi; Özhan, G ül	Determination of Perflourooctanoic Acid Toxicity in a Human Hepatocarcinoma Cell Line	2021	J Health Pollut. 2021 Aug 17;11(31):210909. doi: 10.5696/2156-9614-11.31.210909. eCollection 2021 Sep.	BACKGROUND: Perfluorooctanoic acid (PFOA) is used in different industrial and commercial products. Research shows the presence of PFOA in home dusts, tap and surface water, and in biological samples. The International Agency for Research on Cancer (IARC) has classified PFOA as a possible carcinogen for humans. The liver is thought to be a target organ of PFOA accumulation and toxicity. OBJECTIVE: Some studies have found toxic effects on the liver and related mechanisms; however, more studies are needed to better understand PFOA - induced hepatotoxicity. METHODS: In the present study, a human hepatocarcinoma cell line was exposed to PFOA for 24 hours and cell viability, apoptosis, the oxidative system and immune response were evaluated. RESULTS: While apoptosis was the main cell death pathway at low concentration (86.5%), the necrotic cell fraction increased with higher concentrations (46.7%). Significant changes in the reactive oxygen species (5.3-folds) glutathione (GSH) (1.7-folds) and catalase (CAT) (1.4-folds) levels were observed, as well as changes to interleukin-6 (≤1.8-fold) and interleukin-8 levels (35-40%). CONCLUSIONS: In light of the data, PFOA is potentially hepatotoxic through the investigated pathways. The results represent a background for future in vivo mechanistic studies. COMPETING INTERESTS: The authors declare no competing financial interests.			D	Е	3
D1121	MOA(肝 毒性)	Wang, Qian; Chen, Wenying; Zhang, Boyang; Gao, Zilu; Zhang, Qipeng; Deng, Huiqiong; Han, Lingyun; Shen, Xiao Li	Perfluorooctanoic acid induces hepatocellular endoplasmic reticulum stress and mitochondrial- mediated apoptosis in vitro via endoplasmic reticulum- mitochondria communication	2022	Chem Biol Interact. 2022 Feb 25;354:109844. doi: 10.1016/j.cbi.2022.109844. Epub 2022 Feb 4.	Perfluorooctanoic acid (PFOA) is a persistent organic pollutant that is widely distributed in the natural environment. Cohort study showed that PFOA-producing workers displayed a significant increase for mortality of liver cancer and liver cirrhosis. However, the underlying mechanism of PFOA-induced hepatotoxicity is far from clear. In this research, cell viability, apoptosis rate, reactive oxygen species, mitochondrial membrane potential ($\Delta \Psi m$), calcium ion levels, and protein expressions of human liver L02 cells in response to PFOA were determined. Results indicated that a 24 h-treatment with 64 and 256 μ M PFOA could remarkably induce mitochondrial-mediated apoptosis via initiating the vicious cycle between endoplasmic reticulum stress and oxidative stress, thereby increasing the level of calcium ion and decreasing the level of $\Delta \Psi m$, simultaneously elevating the protein expressions of Cyclophilin D (CYPD), Bcl-2 homologous antagonist/killer (Bak), Bcl-2-associated X protein (Bax), Bcl-2-like protein 11 (Bim), cytochrome C (Cyt-C), 78 kDa glucose-regulated protein (GRP78), CCAAT/enhancer-binding protein (C/EBP) homologous protein (CHOP), and thioredoxin-interacting protein (TXNIP), while inhibiting the protein expression of tumor necrosis factor receptor-associated protein 1 (TRAP1), Lon protease 1 (Lonp1), Pro-caspase-9, B-cell lymphoma-2 (Bcl-2), and Sigma 1-type opioid receptor (Sig-1R) (p < 0.05). To sum up, PFOA-induced hepatocellular endoplasmic reticulum stress and mitochondrial-mediated apoptosis in vitro was regulated by endoplasmic reticulum (ER)-mitochondria communication via mitochondria-associated ER membranes (MAMs).			D	E	3

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D1122	MOA(肝 毒性)	Reardon, Anthony J F; Rowan-Carroll, Andrea; Ferguson, Stephen S; Leingartner, Karen; Gagne, Remi; Kuo, Byron; Williams, Andrew; Lorusso, Luigi; Bourdon- Lacombe, Julie A; Carrier, Richard; Moffat, Ivy; Yauk, Carole L; Atlas, Ella	Potency Ranking of Per- and Polyfluoroalkyl Substances Using High-Throughput Transcriptomic Analysis of Human Liver Spheroids	2021	Toxicol Sci. 2021 Oct 27;184(1):154-169. doi: 10.1093/toxsci/kfab102.	Per- and polyfluoroalkyl substances (PFAS) are some of the most prominent organic contaminants in human blood. Although the toxicological implications of human exposure to perfluorooctane sulfonate (PFOS) and perfluorooctanoate (PFOA) are well established, data on lesser-understood PFAS are limited. New approach methodologies (NAMs) that apply bioinformatic tools to high-throughput data are being increasingly considered to inform risk assessment for data-poor chemicals. The aim of this study was to compare the potencies (ie, benchmark concentrations: BMCs) of PFAS in primary human liver microtissues (3D spheroids) using high-throughput transcriptional profiling. Gene expression changes were measured using TempO-seq, a templated, multiplexed RNA-sequencing platform. Spheroids were exposed for 1 or 10 days to increasing concentrations of 23 PFAS in 3 subgroups: carboxylates (PFCAs), sulfonates (PFSAs), and fluorotelomers and sulfonamides. PFCAs and PFSAs exhibited trends toward increased transcriptional potency with carbon chain-length. Specifically, longer-chain compounds (7-10 carbons) were more likely to induce changes in gene expression and have lower transcriptional BMCs. The combined high-throughput transcriptional changes support the capability of NAMs to efficiently assess the effects of PFAS in liver microtissues. The data enable potency ranking of PFAS for human liver cell spheroid cytotoxicity and transcriptional changes, and assessment of in vitro transcriptomic points of departure. These data improve our understanding of the possible health effects of PFAS and will be used to inform read-across for human health risk assessment.		D B
D1123	MOA(肝 毒性)	De Toni, Luca; Di Nisio, Andrea; Rocca, Maria Santa; Guidolin, Diego; Della Marina, Alice; Bertazza, Loris; Sut, Stefania; Purpura, Edoardo; Pannella, Micaela; Garolla, Andrea; Foresta, Carlo	Exposure to Perfluoro-Octanoic Acid Associated With Upstream Uncoupling of the Insulin Signaling in Human Hepatocyte Cell Line	2021	Front Endocrinol (Lausanne). 2021 Sep 3;12:632927. doi: 10.3389/fendo.2021.632927. eCollection 2021.	Perfluoro-alkyl substances (PFAS) are chemical pollutants with prevalent stability and environmental persistence. Exposure to PFAS, particularly perfluoro-octanoic acid (PFOA), has been associated with increased diabetes-related cardiovascular mortality in subjects residing areas of high environmental contamination, however the exact pathogenic mechanism remains elusive. Here we used HepG2 cells, an in vitro model of human hepatocyte, to investigate the possible role of PFOA exposure in the alteration of hepatic glucose metabolism. HepG2 cells were exposed for 24 hours to PFOA at increasing concentration from 0 to 1000 ng/mL and then stimulated with 100 nm Insulin (Ins). The consequent effect on glycogen synthesis, glucose uptake and Glut-4 glucose transporter translocation was then evaluated by, respectively, Periodic Acid Schiff (PAS) staining, 2-deoxyglucose (2-DG) uptake assay and immunofluorescence. Exposure to PFOA was associated with reduced glycogen synthesis and glucose uptake, at concentration equal or greater than, respectively, 0,1 ng/mL and 10 ng/mL, with parallel impaired membrane translocation of Glut-4 upon Ins stimulation. Western blot analysis showed early uncoupling of Insulin Receptor (InsR) activation from the downstream Akt and GSK3 phosphorylation. Computational docking analysis disclosed the possible stabilizing effect of PFOA on the complex between InsR and GM3 ganglioside, previously shown to be associated with the low grade chronic inflammation-related insulin resistance. Consistently, long term treatment with glucosyl-ceramide synthase inhibitor PDMP was able to largely restore glycogen synthesis, glucose uptake and Glut-4 translocation upon Ins stimulation in HepG2 exposed to PFOA. Our data support a novel pathogenic mechanism linking exposure to PFOA to derangement of hepatocyte cell metabolism.		СВ
D1124	MOA(肝 毒性)	Qin, Jingru; Song, Jianhua; Liang, Yujia; Jiao, Aijun; Yang, Bin	In Silico Analysis Identifies the Anti-Liver Injury Targets of Diammonium Glycyrrhizinate: Validated in Perfluorooctanoic Acid-Lesioned Mouse Model	2022	Chem Biodivers. 2022 Aug;19(8):e202100938. doi: 10.1002/cbdv.202100938. Epub 2022 Jul 28.	Liver injury refers to a pathological condition that causes dysfunction to hepatic parenchymal cells. And diammonium glycyrrhizinate (DG) is clinically prescribed for hepatoprotection. To date, detailed information regarding DG against liver injury in molecular mechanisms remains unrevealed totally. In the present study, we applied network pharmacology and molecular docking to decipher substantial genes, biological functions of DG for treating liver injury. Furthermore, preclinical experiments using perfluorooctanoic acid (PFOA)-induced liver injury in mice were used to validate the bioinformatic findings. Our results showed that the target network of DG and liver injury predominantly shared 90 genes. Eleven core genes of DG treating liver injury including ALB, TP53, TNF, CASP3, PTGS2, JUN, TLR4, IL10, STAT3, NOS3, FOS. The gene ontology and KEGG enrichment further highlighted their importance in regulation of cell proliferation, regulation of transcription, inflammatory response, regulation of NF-kappaB import into nucleus, regulation of apoptotic process, T cell receptor signaling pathway, and Toll-like receptor signaling pathway. Moreover, DG treatment was found to rescue the PFOA-induced liver injury through the modulation of identified genes including TNF, CASP3, PTGS2, and ALB. Current integrated data from bioinformatics method and experimental validation uncovered that DG exerts potent actions to treat liver injury through regulating core targets associated with inflammation and immunomodulation.		D B

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 村 報 象 抽	ン 文 ① ラ	ン 文 ク 献 ② ラ
D1125	MOA(肝 毒性)	Liu, Ying; Lin, Nan; Dai, Cao; Xu, Jianliang; Zhang, Yi; Xu, Mingxing; Wang, Fei; Li, Yanjie; Chen, Da	Occurrence and distribution of per- and polyfluoroalkyl substances (PFASs) in human livers with liver cancer	2021	Environ Res. 2021 Nov;202:111775. doi: 10.1016/j.envres.2021.111775. Epub 2021 Jul 29.	Per- and polyfluoroalkyl substances (PFASs) are anthropogenic compounds that are widely accumulated in human tissues, and the liver is considered a primary target organ for PFASs exposure. The occurrence and distribution of 21 PFASs in liver tissues with tumors (n = 55) and without tumors (n = 55) are investigated in this study. Eleven perfluorinated carboxylic acids (PFCAs) and five perfluorinated sulfonic acids (PFSAs) were detected at high frequencies ($45.5\%-100$ %), while the detection frequencies of five perfluoroalkyl phosphate (PFPAs) were relatively lower (≤ 29.1 %). PFSAs and PFCAs accounted for up to 82.5%-92.7 % of the total PFASs. Although it was not found to be statistically significant, the concentrations of the total PFASs were slightly higher in the tumor liver samples (mean 64.3, range 5.70-303 ng/g) than those in the non-tumor liver samples (mean 62.7, range 4.08-240 ng/g). The perfluoroctanoic acid (PFOA), perfluorotridecanoic acid (PFTrDA), and perfluorobutanesulphonate (PFBS) showed significant differences ($p < 0.05$) between the tumor and non-tumor liver samples, and the different distribution levels of these three PFASs may have been a consequence of oxidative stress. The total concentrations of PFASs in the three age groups were in the decreasing order of middle-aged people ($45-60$) > old people (>60) > young people (<45). The PFASs in females were generally lower than in males, which may have been related to women's special excretion methods (such as childbirth and breastfeeding). The results should be valuable for further mechanistic studies regarding the toxic effects of PFASs in human livers.			В	A
D1126	MOA(肝 毒性)	Wang, Pingwei; Liu, Dongge; Yan, Shuqi; Cui, Jiajing; Liang, Yujun; Ren, Shuping	Adverse Effects of Perfluorooctane Sulfonate on the Liver and Relevant Mechanisms	2022	Toxics. 2022 May 19;10(5):265. doi: 10.3390/toxics10050265	Perfluorooctane sulfonate (PFOS) is a persistent, widely present organic pollutant. PFOS can enter the human body through drinking water, ingestion of food, contact with utensils containing PFOS, and occupational exposure to PFOS, and can have adverse effects on human health. Increasing research shows that the liver is the major target of PFOS, and that PFOS can damage liver tissue and disrupt its function; however, the exact mechanisms remain unclear. In this study, we reviewed the adverse effects of PFOS on liver tissue and cells, as well as on liver function, to provide a reference for subsequent studies related to the toxicity of PFOS and liver injury caused by PFOS.			D	В
D1127	MOA(肝 毒性)	Zeng, Huai-Cai; Zhu, Bi-Qi; Wang, You- Quan; He, Qing- Zhi	ROS-Triggered Autophagy Is Involved in PFOS- Induced Apoptosis of Human Embryo Liver L-02 Cells	2021	Biomed Res Int. 2021 Apr 5;2021:6625952. doi: 10.1155/2021/6625952. eCollection 2021.	The liver is the primary target organ for perfluorooctane sulphonate (PFOS), a recently discovered persistent organic pollutant. However, the mechanisms mediating hepatotoxicity remain unclear. Herein, we explored the relationship between reactive oxygen species (ROS) and autophagy and apoptosis induced by PFOS in L-02 cells, which are incubated with different concentrations of PFOS (0, 50, 100, 150, 200, or 250 μ mol/L) for 24 or 48 hrs at 37° C. The results indicated that PFOS exposure decreased cell activities, enhanced ROS levels in a concentration-dependent manner, decreased mitochondrial membrane potential (MMP), and induced autophagy and apoptosis. Compared with the control, 200 μ mol/L PFOS increased ROS levels; enhanced the expression of Bax, cleaved-caspase-3, and LC3-II; induced autophagy; decreased MMP; and lowered Bcl-2, p62, and Bcl-2/Bax ratio. The antioxidant N-acetyl cysteine (NAC) protected MMP against PFOS-induced changes and diminished apoptosis and autophagy. Compared with 200 μ mol/L PFOS treatment, NAC pretreatment reversed the increase in ROS, Bax, and cleaved-caspase-3 protein caused by PFOS. The autophagy inhibitor 3-methyladenine and chloroquine decreased apoptosis and cleaved-caspase-3 protein level and increased the Bcl-2/Bax ratio. In summary, our results suggest that ROS-triggered autophagy is involved in PEOS-induced apoptosis in L-02 cells.			с	В
D1128	コイ (肝 毒性)	Manera, Maurizio; Castaldelli, Giuseppe; Fano, Elisa A; Giari, Luisa	Perfluorooctanoic acid-induced cellular and subcellular alterations in fish hepatocytes	2021	Environ Toxicol Pharmacol. 2021 Jan;81:103548. doi: 10.1016/j.etap.2020.103548. Epub 2020 Nov 12.	Liver perfluorooctanoic acid (PFOA) pathophysiology and related morphofunction disturbances were studied in common carp at the cellular and subcellular level and with box-counting fractal analysis of ultrathin sections to assess the effect of PFOA exposure on hepatocyte structure complexity and heterogeneity. Three experimental groups were investigated: unexposed; low exposure (200 ng L(-1) PFOA); high exposure (2 mg L(-1) PFOA). PFOA-exposed cells showed differences from controls at both tested concentrations, manifested mainly as cloudy swelling and reversible vacuolar degeneration. Subcellular modifications primarily involved mitochondria and secondarily endoplasmic reticulum, with evidence of increased subcellular turnover. The alterations were consistent with oxidative stress related pathophysiology. Fractal analysis discriminated exposed from unexposed fish and low from high PFOA exposure based on lacunarity and fractal dimension, respectively. The absence of irreversible organelle alterations and apoptosis/necrosis, along with the increase of cellular complexity, led to the conclusion that the patterns observed represented an adaptive recovery response.			с	с
D1129	実験動物 (肝毒 性)	Owumi, Solomon; Bello, Taofeek; Oyelere, Adegboyega K	N-acetyl cysteine abates hepatorenal toxicities induced by perfluorooctanoic acid exposure in male rats	2021	Environ Toxicol Pharmacol. 2021 Aug;86:103667. doi: 10.1016/j.etap.2021.103667. Epub 2021 Apr 29.	Ingestion of perfluorooctanoic acid (PFOA) elicits toxicities in the hepatorenal system. We investigated the effect of PFOA and N- acetylcysteine (NAC) on the hepatorenal function of rats treated thus: control, PFOA (5 mg/kg), NAC (50 mg/kg), PFOA + NAC (5 and 25 mg/kg), and PFOA + NAC (5 and 50 mg/kg). We observed that NAC significantly (p < 0.05) reduced PFOA-induced increase in hepatic and renal function biomarkers of toxicities relative to PFOA alone and alleviated (p < 0.05) decreases in antioxidant status. Increases in oxidative stress and lipid peroxidation in PFOA-treated rats were reverted to normal by NAC and abated increased pro-inflammatory mediators, and decreased anti-inflammatory cytokine both in the hepatorenal system PFOA treated rats. Histology of the kidney and liver indicated that NAC, abated the severity of PFOA-induced damage significantly. Our findings affirm further that oxido-inflammatory mediators involved in PFOA-mediated toxicity can be effectively blocked by NAC through its antioxidant activity.			D	В

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 多抽 ① ラ ② ラ
D1130	実験動物 (肝毒 性)	Weng, Zhenkun; Xu, Cheng; Zhang, Xin; Pang, Lu; Xu, Jin; Liu, Qian; Zhang, Liye; Xu, Shuqin; Gu, Aihua	Autophagy mediates perfluorooctanoic acid-induced lipid metabolism disorder and NLRP3 inflammasome activation in hepatocytes	2020	Environ Pollut. 2020 Dec;267:115655. doi: 10.1016/j.envpol.2020.115655. Epub 2020 Sep 16.	Perfluorooctanoic acid (PFOA) has applications in numerous industrial products and is an industrial waste that is persistently present in the environment. Exposure to PFOA results in nonalcoholic fatty liver disease (NAFLD). However, the underlying mechanisms remain unclear. In this study, male C57BL/6 mice were exposed to PFOA (1 mg/kg/day) for 4 weeks to evaluate the effect of PFOA, and the human liver cell line (L-02) was used to observe the direct effect of PFOA in vitro. After PFOA exposure, the expression of genes related to hepatic lipogenesis, the NLRP3 inflammasome, and autophagy were measured. We found that exposure to PFOA induced lipid accumulation and stimulated lipogenesis in both mouse livers and L-02 cells. In addition, increased NLRP3 aggregation and enhanced production of IL-1 β occurred after PFOA treatment. We also found that PFOA exposure induced autophagosome formation and p62 accumulation, indicating blockage of autophagic flux. Rapamycin alleviated PFOA-induced lipid accumulation and NLRP3 inflammasome activation by activating autophagic flux. Conversely, chloroquine, an autophagic flux inhibitor, exacerbated PFOA-induced lipid accumulation and NLRP3 inflammasome activation and NLRP3 inflammasome activation. Collectively, these results provide evidence to show that PFOA-induced blockade of autophagic flux causes an increase in lipid synthesis and inflammation in vivo and in vitro.		D B
D1131	実験動物 (肝毒 性)	Li, Rong; Guo, Chao; Lin, Xiao; Chan, Ting Fung; Su, Min; Zhang, Zhiyong; Lai, Keng Po	Integrative omics analysis reveals the protective role of vitamin C on perfluorooctanoic acid-induced hepatoxicity	2021	J Adv Res. 2021 Apr 15;35:279-294. doi: 10.1016/j.jare.2021.04.003. eCollection 2022 Jan.	INTRODUCTION: Perfluorooctanoic acid (PFOA) is a compound used as an industrial surfactant in chemical processes worldwide. Population and cross-sectional studies have demonstrated positive correlations between PFOA levels and human health problems. OBJECTIVES: Many studies have focused on the hepatotoxicity and liver problems caused by PFOA, with little attention to remediation of these problems. As an antioxidant, vitamin C is frequently utilized as a supplement for hepatic detoxification. METHODS: In this study, we use a mouse model to study the possible role of vitamin C in reducing PFOA-induced liver damage. Based on comparative transcriptomic and metabolomic analysis, we elucidate the mechanisms underlying the protective effect of vitamin C. RESULTS: Our results show that vitamin C supplementation reduces signs of PFOA-induced liver damage including total cholesterol and triglyceride levels increase, liver damage markers aspartate, transaminase, and alanine aminotransferase elevation, and liver enlargement. Further, we show that the protective role of vitamin C is associated with signaling networks control, suppressing linoleic acid metabolism, reducing thiodiglycolic acid, and elevating glutathione in the liver. CONCLUSION: The findings in this study demonstrate, for the first time, the utility of vitamin C for preventing PFOA-induced hepatotoxicity.		СВ
D1132	実験動物 (肝毒 性)	Schlezinger, J J; Puckett, H; Oliver, J; Nielsen, G; Heiger- Bernays, W; Webster, T F	Perfluorooctanoic acid activates multiple nuclear receptor pathways and skews expression of genes regulating cholesterol homeostasis in liver of humanized PPAR α mice fed an American diet	2020	Toxicol Appl Pharmacol. 2020 Oct 15;405:115204. doi: 10.1016/j.taap.2020.115204. Epub 2020 Aug 19.	Humans are exposed to per- and polyfluoroalkyl substances (PFAS) in their drinking water, food, air, dust, and by direct use of consumer products. Increased concentrations of serum total cholesterol and low density lipoprotein cholesterol are among the endpoints best supported by epidemiology. The objectives of this study were to generate a new model for examining PFAS-induced dyslipidemia and to conduct molecular studies to better define mechanism(s) of action. We tested the hypothesis that perfluoroctanoic acid (PFOA) exposure at a human-relevant level dysregulates expression of genes controlling cholesterol homeostasis in livers of mice expressing human PPAR α (hPPAR α). Female and male hPPAR α and PPAR α null mice were fed a diet based on the "What we eat in America" analysis and exposed to PFOA in drinking water (8 μ M) for 6 weeks. This resulted in a serum PFOA concentration of 48 μ g/ml. PFOA increased liver mass, which was associated with histologically-evident lipid accumulation. Pooled analyses of serum lipoprotein cholesterol suggest that PFOA increased serum cholesterol, particularly in male mice. PFOA induced PPAR α and constitutive androstane receptor target gene expression of Hmgcr in a PPAR α - dependent manner. PFOA decreased expression of LdIr and Cyp7a1 in a PPAR α -independent manner. Apob expression was not changed. Sex differences were evident. This novel study design (hPPAR α mice, American diet, long term exposure) generated new insight on the effects of PFOA on cholesterol regulation in the liver and the role of hPPAR α .		ВВ
D1133	実験動物 (肝毒 性)	Endirlik, Burcu Ü nlü; Eken, Ayşe; Canpınar, Hande; Öztürk, Figen; Gü rbay, Aylin	Perfluorooctanoic acid affects mouse brain and liver tissue through oxidative stress	2022	Arh Hig Rada Toksikol. 2022 Jul 7;73(2):148-157. doi: 10.2478/aiht-2022-73-3629.	The aim of this study was to investigate oxidative stress induced by perfluorooctanoic acid (PFOA) in the brain and liver tissues of Balb/c mice as well as protective effects of taurine and coenzyme Q(10) (CoQ(10)) in both organs. For this purpose, animals were treated with PFOA (15 and 30 mg/kg) orally and their lipid peroxidation, total glutathione levels (GSH), and antioxidant enzyme activities measured and both tissues analysed for histopathological changes. Our results showed a dose-dependent decrease in body weight and increase in relative brain and liver weights, PFOA-induced lipid peroxidation and reduced glutathione peroxidase (GPx) activity in the brain tissue, and changes in GSH levels, GPx, superoxide dismutase (Cu-Zn SOD), and catalase (CAT) activities in the liver tissue. Pre-treatment with taurine or CoQ(10) provided protection against PFOA-induced Cu-Zn SOD reduction in the liver tissue. Our findings evidence the depleting effect of PFOA on antioxidative systems and confirm that PFOA exerts its (neuro)toxicity through oxidative stress, but further research is needed to identify the exact toxicity mechanisms, especially in the brain.		B A
No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
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D1134	実験動物 (肝毒 性)	Wang, Gang; Pan, Ruili; Liang, Xi; Wu, Xiaobing; Wu, Yanmin; Zhang, Hao; Zhao, Jianxin; Chen, Wei	Perfluorooctanoic acid-induced liver injury is potentially associated with gut microbiota dysbiosis	2021	Chemosphere. 2021 Mar;266:129004. doi: 10.1016/j.chemosphere.2020.129004. Epub 2020 Nov 18.	Perfluorooctanoic acid (PFOA), an environmental pollutant, is widely engaged in industrial products and tends to accumulate in the liver. Emerging evidence has suggested that the gut microbiome is a pivotal player in maintaining animal health and can potentially altered by xenobiotic. However, few studies explored whether PFOA-induced liver injury is associated with gut microbiota dysbiosis. In the present study, the effects of subacute and subchronic PFOA exposure on liver and gut microbiota in C57BL/6J mice were investigated. Our findings showed that both subacute and subchronic exposure to PFOA induced the liver inflammation, disrupted antioxidative homeostasis and caused liver histological abnormalities with detectable hepatomegaly, ultimately triggering liver injury. Besides, 16S rRNA sequencing analysis revealed that subacute PFOA exposure caused significant changes in the abundances of intestinal flora known to contribute to liver inflammation and oxidative stress, such as the Dehalobacterium and Bacteroides genera. Exposure to subchronic toxicity mainly induced the decrease in commensal probiotics including Lactobacillus and Bifidobacterium genera, which are potentially beneficial to liver damage, compared with that in the untreated group. They also resulted in disturbed functional capabilities of the microbial communities by a Phylogenetic Investigation of Communities by Reconstruction of Unobserved States (PICRUSt) analysis. Additionally, the levels of short-chain fatty acids (SCFAs), especially butyric acid, were significantly reduced by PFOA administration. Collectively, our observations suggested that liver damage induced by both subacute and subchronic PFOA exposures probably partly related to the gut microbiota dysbiosis and provided a new insight into the role of PFOA in liver injury.		D B
D1135	実験動物 (肝毒 性)	Marques, Emily; Pfohl, Marisa; Auclair, Adam; Jamwal, Rohitash; Barlock, Benjamin J; Sammoura, Ferass M; Goedken, Michael; Akhlaghi, Fatemeh; Slitt, Angela L	Perfluorooctanesulfonic acid (PFOS) administration shifts the hepatic proteome and augments dietary outcomes related to hepatic steatosis in mice	2020	Toxicol Appl Pharmacol. 2020 Dec 1;408:115250. doi: 10.1016/j.taap.2020.115250. Epub 2020 Sep 23.	Hepatic steatosis increases risk of fatty liver and cardiovascular disease. Perfluorooctanesulfonic acid (PFOS) is a persistent, bio- accumulative pollutant that has been used in industrial and commercial applications. PFOS administration induces hepatic steatosis in rodents and increases lipogenic gene expression signatures in cultured hepatocytes. We hypothesized that PFOS treatment interferes with lipid loss when switching from a high fat diet (HFD) to a standard diet (SD), and augments HFD-induced hepatic steatosis. Male C57BL/6 N mice were fed standard chow diet or 60% kCal high-fat diet (HFD) for 4 weeks to increase body weight. Then, some HFD mice were switched to SD and mice were further divided to diet only or diet containing 0.0003% PFOS, for six treatment groups: SD, HFD to SD (H-SD), HFD, SD + PFOS, H-SD + PFOS, or HFD + PFOS. After 10 weeks on study, blood and livers were collected. HFD for 14 weeks increased body weight and hepatic steatosis, whereas H-SD mice returned to SD measures. PFOS administration reduced body weight in mice fed a SD, but not H-SD or HFD. PFOS administration increased liver weight in H-SD + PFOS and HFD + PFOS mice. PFOS increased hepatic steatosis in H-SD and HFD groups. Hepatic mRNA expression and SWATH-MS proteomic analysis revealed that PFOS treatment did interfere with lipid loss associated with switch to a SD and similarly augmented hepatic lipid accumulation in mice established on an HFD.		D B
D1136	実験動物 (肝毒 性)	Attema, Brecht; Janssen, Aafke W F; Rijkers, Deborah; van Schothorst, Evert M; Hooiveld, Guido J E J; Kersten, Sander	Exposure to low-dose perfluorooctanoic acid promotes hepatic steatosis and disrupts the hepatic transcriptome in mice	2022	Mol Metab. 2022 Sep 14;66:101602. doi: 10.1016/j.molmet.2022.101602. Online ahead of print.	OBJECTIVE: Perfluoroalkyl substances (PFAS) are man-made chemicals with demonstrated endocrine-disrupting properties. Exposure to perfluorooctanoic acid (PFOA) has been linked to disturbed metabolism via the liver, although the exact mechanism is not clear. Moreover, information on the metabolic effects of the new PFAS alternative GenX is limited. We examined whether exposure to low-dose PFOA and GenX induces metabolic disturbances in mice, including NAFLD, dyslipidemia, and glucose tolerance, and studied the involvement of PPAR α . METHODS: Male C57BL/6J wildtype and PPAR α (-/-) mice were given 0.05 or 0.3 mg/kg body weight/day PFOA, or 0.3 mg/kg body weight/day GenX while being fed a high-fat diet for 20 weeks. Glucose and insulin tolerance tests were performed after 18 and 19 weeks. Plasma metabolite levels were measured next to a detailed assessment of the liver phenotype, including lipid content and RNA sequencing. RESULTS: Exposure to high-dose PFOA decreased body weight and increased liver weight in wildtype and PPAR α (-/-) mice. High-dose but not low-dose PFOA reduced plasma triglycerides and cholesterol, which for triglycerides was dependent on PPAR α . PFOA and GenX increased hepatic triglycerides in a PPAR α , while the effects of PFOA were mostly dependent on PPAR α . In the absence of PPAR α , the involvement of PXR and CAR became more prominent. CONCLUSION: Overall, we show that long-term and low-dose exposure to PFOA and GenX disrupts hepatic lipid metabolism in mice. Whereas the effects of PFOA are mediated by multiple nuclear receptors, the effects of GenX are entirely mediated by PPAR α . Our data underscore the potential of PFAS to disrupt metabolism by altering signaling pathways in the liver.		B B

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 対 象	ン 文 ク 献 ① ラ	ン 5 ク 1 ②	文 献 ラ
D1137	実験動物 (肝毒 性)	Liu, Hui; Liu, Fangfang; Zhou, Yongbing; Cheng, Jingjing; Tang, Yuting; Wang, Li	[Rutin activates AMPK α to ameliorate liver damage caused by perfluorooctanoic acid in mice]	2021	Wei Sheng Yan Jiu. 2021 Jul;50(4):609-614. doi: 10.19813/j.cnki.weishengyanjiu.2021.04.012.	OBJECTIVE: To study the protective effect and mechanism of rutin on perfluorooctanoic acid(PFOA)-induced liver damage in mice. METHODS: A total of 24 male ICR mice were randomly divided into 3 groups, 8 in each group: control group(ctrl group: ddH_2O), perfluorooctanoic acid group(PFOA group: PFOA 20 mg/(kg·d)), rutin intervention group(rutin+PFOA group: PFOA 20 mg/(kg·d)+rutin 20 mg/(kg·d)), normal diet, oral gavage, daily observation, weighting, and recording. After 14 days of treatment, the liver was quickly stripped and weighted after blood sampling and execution. Part of the liver tissue is fixed in 4% paraformaldehyde for HE staining and PAS staining; glutamic-pyruvic transaminase(GPT) activity in the sera samples and triglyceride(TG), total cholesterol(TC), malondialhyde(MDA) content in hepatic tissue homogenate, as well as the activity of some enzymes were assayed; Using western blot to detect adenylate activated protein kinase α (AMPK α) and phosphorylated adenylate-activated protein kinase α (p-AMPK α) expression levels. RESULTS: PFOA caused a significant decrease in the weight of mice, a significant increase in liver weight and liver relative body weight coefficient(P& It; 0.05), hepatocyte cord dissociation, hepatocyte swelling, dissolution, and obvious damage, and PAS staining positive result were significantly reduced. The GPT activity of the PFOA group was 204.63 ± 11.26 U/L, which was significantly higher than that of the control group(P& It; 0.05); The activity of T-SOD was 4175.56 ± 334.96 U/mg prot, which was significantly lower than that of the control group(P& It; 0.05); however, the liver weight and the relative weight of the mice did not change significantly (P& gt; 0.05), however, the liver weight and the relative weight coefficient of the liver were significantly (P& gt; 0.05), however, the liver weight and the relative weight coefficient of the liver were significantly (P& gt; 0.05), however, the liver weight and the relative weight coefficient of the liver were significantly			С	В	
D1138	実験動物 (肝毒 性)	Xu, Ling-Ling; Chen, Yu-Kui; Zhang, Qin-Yao; Chen, Li-Jian; Zhang, Kai-Kai; Li, Jia-Hao; Liu, Jia-Li; Wang, Qi; Xie, Xiao-Li	Gestational exposure to GenX induces hepatic alterations by the gut-liver axis in maternal mice: A similar mechanism as PFOA	2022	Sci Total Environ. 2022 May 10;820:153281. doi: 10.1016/j.scitotenv.2022.153281. Epub 2022 Jan 20.	GenX is an alternative to perfluorooctanoic acid (PFOA) and was included in the accession list of Substances of Very High Concern in 2019. Gestational GenX exposure induces maternal hepatotoxicity in animals. However, the mechanisms of GenX toxicity have not been explored. In the present study, pregnant Balb/c mice were administered with PFOA (1 mg/kg BW/day), GenX (2 mg/kg BW/day), or Milli-Q water by gavage during gestation. Similar hepatic pathological changes, including enlargement of hepatocytes, cytoplasm loss, nucleus migration, inflammatory cell infiltration, and reduction of glycogen storage, were observed in PFOA and GenX groups. Increased expression levels of indicators of the TLR4 pathway indicated activation of inflammation in the liver of maternal mice after exposure to PFOA or GenX, consistent with the pathological changes. Overexpression of Cleaved PARP-1, cleaved caspase 3, Bax and decreased Bcl-2 proteins indicated activation of apoptosis, whereas overexpression of ULK- 1, p62, beclin-1, LC3-II proteins and downregulation of p-mTOR implied that PFOA and GenX exposure initiated autophagy. Decreased secretion of mucus, reduced expression levels of tight junction proteins, and higher serum levels of lipopolysaccharide inflammatory pathway in the maternal liver. In summary, gestational exposure to PFOA or GenX induced maternal hepatic alterations through the gut-liver axis.			С	С	
D1139	実験動物 (肝毒 性)	Qi, Qi; Niture, Suryakant; Gadi, Sashi; Arthur, Elena; Moore, John; Levine, Keith E; Kumar, Deepak	Per- and polyfluoroalkyl substances activate UPR pathway, induce steatosis and fibrosis in liver cells	2022	Environ Toxicol. 2022 Oct 17. doi: 10.1002/tox.23680. Online ahead of print.	Per- and polyfluoroalkyl substances (PFAS), which include perfluorooctanoic acid (PFOA), heptafluorobutyric acid (HFBA), and perfluorotetradecanoic acid (PFTA), are commonly occurring organic pollutants. Exposure to PFAS affects the immune system, thyroid and kidney function, lipid metabolism, and insulin signaling and is also involved in the development of fatty liver disease and cancer. The molecular mechanisms by which PFAS cause fatty liver disease are not understood in detail. In the current study, we investigated the effect of low physiologically relevant concentrations of PFOA, HFBA, and PFTA on cell survival, steatosis, and fibrogenic signaling in liver cell models. Exposure of PFOA and HFBA (10 to 1000 nM) specifically promoted cell survival in HepaRG and HepG2 cells. PFAS increased the expression of TNF α and IL6 inflammatory markers, increased endogenous reactive oxygen species (ROS) production, and activated unfolded protein response (UPR). Furthermore, PFAS enhanced cell steatosis and fibrosis in HepaRG and HepG2 cells which were accompanied by upregulation of steatosis (SCD1, ACC, SRBP1, and FASN), and fibrosis (TIMP2, p21, TGF β) biomarkers expression, respectively. RNA-seq data suggested that chronic exposures to PFOA modulated the expression of fatty acid/lipid metabolic genes that are involved in the development of NFALD and fatty liver disease. Collectively our data suggest that acute/chronic physiologically relevant concentrations of PFAS enhance liver cell steatosis and fibrosis by the activation of the UPR pathway and by modulation of NFALD-related gene expression.			D	В	

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	 出情ン文ン文 対報ク献ク の の の つ
D1140	実験動物 (肝毒 性)	Sun, Sujie; Wang, Jianshe; Yao, Jingzhi; Guo, Hua; Dai, Jiayin	Transcriptome analysis of 3D primary mouse liver spheroids shows that long-term exposure to hexafluoropropylene oxide trimer acid disrupts hepatic bile acid metabolism	2022	Sci Total Environ. 2022 Mar 15;812:151509. doi: 10.1016/j.scitotenv.2021.151509. Epub 2021 Nov 9.	Hexafluoropropylene oxide trimer acid (HFPO-TA), an alternative to perfluorooctanoic acid (PFOA), has been detected in various environmental and human matrices. However, information regarding its toxicity remains limited. Here, we established a three-dimensional (3D) primary mouse liver spheroid model to compare the hepatotoxicity of HFPO-TA and PFOA. The 3D spheroids were repeatedly exposed to 25-, 50-, or $100-\mu$ M HFPO-TA and PFOA for 28 d. Compared with the PFOA groups, the HFPO-TA groups showed higher bioaccumulation potential, higher lactate dehydrogenase (LDH) leakage, and lower adenosine triphosphate (ATP), albumin, and urea secretion. Transcriptome analysis identified 1603 and 772 differentially expressed genes in the $100-\mu$ M HFPO-TA- and PFOA-treated groups, respectively. Bioinformatics analysis indicated that cholesterol metabolism, bile acid metabolism, and inflammatory response were significantly altered. Exposure to $100-\mu$ M PFOA-treated group. Total bile acids in the re-polarized 3D spheroids increased significantly after $100-\mu$ M HFPO-TA and PFOA treatment, which did not affect bile acid synthesis but inhibited the expression levels of Bsep and Mrp2 related to bile acid transport. Thus, HFPO-TA exhibited more serious hepatotoxicity than PFOA in 3D primary liver spheroids and may not be a safe alternative.		сс
D1141	実験動物 (肝毒 性)	Guo, Hua; Chen, Jiamiao; Zhang, Hongxia; Yao, Jingzhi; Sheng, Nan; Li, Qi; Guo, Yong; Wu, Chengying; Xie, Weidong; Dai, Jiayin	Exposure to GenX and Its Novel Analogs Disrupts Hepatic Bile Acid Metabolism in Male Mice	2022	Environ Sci Technol. 2022 May 17;56(10):6133-6143. doi: 10.1021/acs.est.1c02471. Epub 2021 Aug 24.	Due to its wide usage and recent detection in environmental matrices, hexafluoropropylene oxide dimer acid (HFPO-DA, commercial name GenX) has attracted considerable attention. Here, we explored and compared the toxicity of GenX and its novel analogs with that of perfluorooctanoic acid (PFOA) to provide guidance on the structural design and optimization of novel alternatives to poly- and perfluoroalkyl substances (PFASs). Adult male BALB/c mice were continuously exposed to PFOA, GenX, perfluoro-2-methyl-3,6-dioxo-heptanoic acid (PFMO2HpA), and perfluoro-2-methyl-3,6,8-trioxo-nonanoic acid (PFMO3NA; 0, 0.4, 2, or 10 mg/kg/d) via oral gavage for 28 days. The PFOA, GenX, and PFMO3NA treatment groups showed an increase in relative liver weight, and bile acid metabolism was the most significantly affected pathway in all treatment groups, as shown via weighted gene coexpression network analysis. The highest total bile acid levels were observed in the 2 and 10 mg/kg/d PFMO3NA groups. The ratios of primary bile acids to all bile acids increased in the high-dose groups, while the ratios of secondary bile acids showed a downward trend. Thus, bile acid metabolism disorder may be a prominent adverse effect induced by exposure to GenX, its analogs, and PFOA. Results also showed that the hepatotoxicity of PFMO2HpA was lower than that of GenX, whereas the hepatotoxicity of PFMO3NA was stronger, suggesting that PFMO2HpA may be a potential alternative to GenX.		сс
D1142	実験動物 (肝毒 性)	Garoche, Clé mentine; Boulahtouf, Abdelhay; Grimaldi, Marina; Chiavarina, Barbara; Toporova, Lucia; den Broeder, Marjo J; Legler, Juliette; Bourguet, William; Balaguer, Patrick	Interspecies Differences in Activation of Peroxisome Proliferator-Activated Receptor γ by Pharmaceutical and Environmental Chemicals	2021	Environ Sci Technol. 2021 Dec 21;55(24):16489-16501. doi: 10.1021/acs.est.1c04318. Epub 2021 Nov 29.	Endocrine disrupting chemicals (EDCs) are able to deregulate the hormone system, notably through interactions with nuclear receptors (NRs). The mechanisms of action and biological effects of many EDCs have mainly been tested on human and mouse but other species such as zebrafish and xenopus are increasingly used as a model to study the effects of EDCs. Among NRs, peroxisome proliferator-activated receptor γ (PPAR γ) is a main target of EDCs, for which most experimental data have been obtained from human and mouse models. To assess interspecies differences, we tested known human PPAR γ ligands on reporter cell lines expressing either human, mouse, zebrafish, or xenopus PPAR γ . Using these cell lines, we were able to highlight major interspecies differences. Known hPPAR γ pharmaceutical ligands modulated hPPAR γ and mPPAR γ activities in a similar manner, while xPPAR γ was less responsive and zfPPAR γ was not modulated at all by these compounds. On the contrary, human liver X receptor (hLXR) ligands GW 3965 and WAY-252623 were only active on zfPPAR γ . Among environmental compounds, several molecules activated the PPAR γ of the four species similarly, e.g., phthalates (MEHP), perfluorinated compounds (PFOA, PFOS), and halogenated derivatives of BPA (TBBPA, TCBPA), but some of them like diclofenac and the organophosphorus compounds tri-o-tolyl phosphate and triphenyl phosphate were most active on zfPPAR γ . This study confirms or shows for the first time the h, m, x, and zfPPAR γ activities of several chemicals and demonstrates the importance of the use of species-specific models to study endocrine and metabolism disruption by environmental chemicals.		D C
D1143	実験動物 (肝毒 性)	Wang, Zhiru; Yao, Jingzhi; Guo, Hua; Sheng, Nan; Guo, Yong; Dai, Jiayin	Comparative Hepatotoxicity of a Novel Perfluoroalkyl Ether Sulfonic Acid, Nafion Byproduct 2 (H- PFMO2OSA), and Legacy Perfluorooctane Sulfonate (PFOS) in Adult Male Mice	2022	Environ Sci Technol. 2022 Jul 19;56(14):10183-10192. doi: 10.1021/acs.est.2c00957. Epub 2022 Jul 4.	Nafion byproduct 2 (H-PFM020SA) has been detected in the environment, but little is known about its toxicities. To compare the hepatotoxicity of H-PFM020SA with legacy perfluorooctane sulfonate (PFOS), male adult mice were exposed to 0.2, 1, or 5 mg/kg/d of each chemical for 28 days. Results showed that, although H-PFM020SA liver and serum concentrations were lower than those of PFOS, the relative liver weight in the H-PFM020SA groups was significantly higher than that in the corresponding PFOS groups. In addition, the increase in alanine transaminase and aspartate aminotransferase activity was greater in the H-PFM020SA groups than in the PFOS groups. Reduced glutathione (GSH) content and glutathione reductase activity in the liver increased in the 1 and 5 mg/kg/d H-PFM020SA groups and in the 5 mg/kg/d PFOS group. Liver quantitative proteome analysis demonstrated that, similar to PFOS, H-PFM020SA caused lipid metabolism disorder, and most lipid metabolism-related differentially expressed proteins (DEPs) were controlled by peroxisome proliferator-activated receptor alpha (PPAR α). Additionally, KEGG enrichment analysis highlighted changes in the GSH metabolism pathway after PFOS and H-PFM020SA exposure to H-PFM020SA but not after exposure to PFOS. In conclusion, H-PFM020SA induced higher levels of liver damage and more serious GSH metabolism dysregulation compared to PFOS.		D C

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D1144	実験動物 (肝毒 性)	Li, Dapeng; Jiang, Lilong; Hong, Yanjun; Cai, Zongwei	Multilayered glycoproteomic analysis reveals the hepatotoxic mechanism in perfluorooctane sulfonate (PFOS) exposure mice	2021	Environ Pollut. 2021 Jan 1;268(Pt A):115774. doi: 10.1016/j.envpol.2020.115774. Epub 2020 Oct 27.	Perfluorooctane sulfonate (PFOS) is one of the most widely used and distributed perfluorinated compounds proven to cause adverse health outcomes. Datasets of ecotoxico-genomics and proteomics have given greater insights for PFOS toxicological effect. However, the molecular mechanisms of hepatotoxicity of PFOS on post-translational modifications (PTMs) regulation, which is most relevant for regulating the activity of proteins, are not well elucidated. Protein glycosylation is one of the most ubiquitous PTMs associated with diverse cellular functions, which are critical towards the understanding of the multiple biological processes and toxic mechanisms exposed to PFOS. Here, we exploit the multilayered glycoproteomics to quantify the global protein expression levels, glycosylation sites, and glycoproteins in PFOS exposure and wild-type mouse livers. The identified 2439 proteins, 1292 glycosites, and 799 glycoproteins were displayed complex heterogeneity in PFOS exposure mouse livers. Quantification results reveal that 241 dysregulated proteins (fold change ≥ 2 , p < 0.05) in PFOS exposure mouse livers were involved in the lipid and xenobiotic metabolism. While, 16 overexpressed glycoproteins were exclusively related to neutrophil degranulation, cellular responses to stress, protein processing in endoplasmic reticulum (ER). Moreover, the interactome and functional network analysis identified HP and HSP90AA1 as the potential glycoprotein biomarkers. These results provide unique insights into a deep understanding of the mechanisms of PFOS induced hepatotoxicity and liver disease. Our platform of multilayered glycoproteomics can be adapted to diverse ecotoxicological research.		D B
D1145	実験動物 (肝毒 性)	Wan, Chunhua; Gu, Tianye; Ling, Junyi; Qin, Yi; Luo, Jiashan; Sun, Lingli; Hua, Lu; Zhao, Jianya; Jiang, Shengyang	Perfluorooctane sulfonate aggravates CCl4-induced hepatic fibrosis via HMGB1/TLR4/Smad signaling	2022	Environ Toxicol. 2022 May;37(5):983-994. doi: 10.1002/tox.23458. Epub 2022 Jan 6.	Perfluorooctane sulfonate (PFOS) is a widespread environmental pollutant and may cause a variety of adverse health effects. The hepatotoxicity of PFOS has attracted particular attention, given the fact that the liver has one of the highest PFOS accumulations among human tissues. In this study, we revealed that subchronic PFOS exposure may exacerbate carbon tetrachloride (CCl(4))-induced liver fibrosis in animal models. Administration with 1 mg/kg PFOS every other day for 56 days dramatically enhanced CCl(4) -mediated liver injury and hepatic stellate cell (HSC) activation. Furthermore, PFOS exposure may promote the activation of high-mobility group box 1 (HMGB1)/toll-like receptor 4 (TLR4) signaling pathway through inducing the secretion of HMGB1 from hepatocytes. PFOS exposure induced the translocation of HMGB1 from the nucleus into the cytoplasm of hepatocytes and cultured BRL-3A cells at a starting concentration of 50 μ M. This process is accompanied with concurrent flux of calcium, suggesting a link between calcium signaling and HMGB1 release following PFOS exposure. Finally, we showed that PFOS-exposed conditional medium (PFOS-CM) of hepatocytes may induce the translocation of Smad2/3 in HSCs in a TLR4-dependent manner. Taken together, subchronic PFOS exposure might play a pro-fibrotic role via a HMGB1/TLR4-dependent Smad signaling in HSCs. Our findings for the first time uncovered an involvement of PFOS exposure in liver fibrosis via HMGB1/TLR4/Smad signaling.		D B
D1146	実験動物 (肝毒 性)	Li, Xing; Li, Tuo; Wang, Zhenpeng Wei, Jinchao; Liu Jianan; Zhang, Yangyang; Zhao, Zhenwen	; , Distribution of perfluorooctane sulfonate in mice and its effect on liver lipidomic	2021	Talanta. 2021 May 1;226:122150. doi: 10.1016/j.talanta.2021.122150. Epub 2021 Jan 30.	Perfluorooctane sulfonate (PFOS) is an emerging persistent organic pollutant (POP), and the harm caused by the enrichment of PFOS in living organism has attracted more and more attention. In this work, animal exposure model to PFOS was established. Mass spectrometry (MS), mass spectrometry imaging (MSI), hematoxylin and eosin (H&E) staining and lipidomics were combined for the study of the organ targeting of PFOS, the toxicity and possible mechanism caused by PFOS. PFOS most accumulated in the liver, followed by the lungs, kidneys, spleen, heart and brain. Combined with H&E staining and matrix-assisted laser desorption ionization mass spectrometry imaging (MALDI MSI) results, it was found that the accumulation of PFOS indeed caused damage in particular areas of specific organ, like in the liver and in the marginal area of the heart. This work found that PFOS could cross the blood-brain barrier, entered the brain and caused the neurotoxicity, which was surprising and might be the reason that high dose of PFOS could cause convulsions. From the liver lipidomic analysis, we found that PFOS exposure mainly affected glycerophospholipid metabolism and sphingolipid metabolism. The up-regulated ceramide and lysophosphatidylcholine (LPC) might lead to liver cell apoptosis, and the decrease in liver triglyceride (TG) content might result in insufficient energy in mice and cause liver morphological damage. Phosphatidylcholine (PC) synthesis via phosphatidylethanolamine N-methyltransferase (PEMT) pathway might be a mechanism of self-protection in animals against PFOS induced inflammation. This study might provide new insight into underlying toxicity mechanism after exposure to PFOS.		D B
D1147	実験動物 (肝毒 性)	Qin, Yi; Gu, Tianye; Ling, Junyi; Luo, Jiashan; Zhao, Jianya; Hu, Baoying; Hua, Lu; Wan, Chunhua; Jiang, Shengyang	PFOS facilitates liver inflammation and steatosis: An involvement of NLRP3 inflammasome-mediated hepatocyte pyroptosis	2022	J Appl Toxicol. 2022 May;42(5):806-817. doi: 10.1002/jat.4258. Epub 2021 Oct 23.	Perfluorooctane sulfonate (PFOS) is a fluorinated organic pollutant with substantial accumulation in mammalian liver tissues. However, the impact of chronic PFOS exposure on liver disease progression and the underlying molecular mechanisms remain elusive. Herein, we for the first time revealed that micromolar range of PFOS exposure initiates the activation of NLR pyrin domain containing 3 (NLRP3) inflammasome to drive hepatocyte pyroptosis. We showed that 5 mg/kg/day PFOS exposure may exacerbated liver inflammation and steatosis in high-fat diet (HFD)-fed mice with concurrently elevated expression of NLRP3 and caspase-1. PFOS exposure resulted in viability impairment and LDH release in BRL-3A rat liver cells. 25-100 μ M concentrations of PFOS exposure activated the NLRP3 inflammasome, leading to consequent GSDMD cleavage, IL-1 β release and the initiation of pyroptosis in a dose-dependent manner, whereas treatment with 10 μ M NLRP3 inhibitor MCC950 abrogated this effect. Moreover, pretreatment of 5 mM ROS scavenger N-acetyl-L-cysteine (NAC) ameliorated PFOS-induced NLRP3 inflammasome activation and pyroptosis. Collectively, our data highlight a pivotal role of pyroptotic death in PFOS-mediated liver inflammation and metabolic disorder.		ВВ

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D1148	実験動物 (肝毒 性)	Huang, Tao; Zhang, Yurong; Zhang, Wenjuan; Lin, Tingting; Chen, Luoting; Yang, Bei; Wu, Lei; Yang, Jianhua; Zhang, Dalei	Attenuation of Perfluorooctane Sulfonate-Induced Steatohepatitis by Grape Seed Proanthocyanidin Extract in Mice	2020	Biomed Res Int. 2020 Dec 9;2020:8818160. doi: 10.1155/2020/8818160. eCollection 2020.	Perfluorooctane sulfonate (PFOS), an environmentally persistent pollutant, has been revealed to elicit hepatic toxicity. In the current study, we investigated the protective role of grape seed proanthocyanidin extract (GSPE) against PFOS-caused steatohepatitis in mice. Animals were exposed intragastrically to PFOS (10 mg/kg/day), GSPE (150 mg/kg/day), or their combination. After 21 days of treatment, mice exposed to PFOS exhibited steatosis, oxidative stress, and inflammation in the liver. Nevertheless, simultaneous administration of GSPE resumed the declined serum hepatic enzyme activities and histological abnormalities in PFOS-exposed mice. Furthermore, GSPE supplementation reduced the contents of triglyceride (TG) and total cholesterol (TC) and expression of lipid metabolism-associated genes CD36 and fatty acid-binding protein 4 (FABP4) in the liver of mice treated with PFOS. Moreover, GSPE suppressed the generation of lipid peroxidative product malondialdehyde and restored the activity of superoxide dismutase in the liver of PFOS-exposed mice. In addition, GSPE repressed the PFOS-induced hepatic overproduction of proinflammatory cytokines interleukin-6 (IL-6) and tumor necrosis factor- α (TNF- α). Our results demonstrate that GSPE attenuates PFOS-caused steatohepatitis in mice by regulating lipid metabolism, oxidative stress, and inflammatory response.		сс
D1149	実験動物 (肝毒 性)	Jiang, Lilong; Hong, Yanjun; Xiao, Pingting; Wang, Xiaoxiao; Zhang, Jinghui; Liu, Ehu; Li, Huijun; Cai, Zongwei	The Role of Fecal Microbiota in Liver Toxicity Induced by Perfluorooctane Sulfonate in Male and Female Mice	2022	Environ Health Perspect. 2022 Jun;130(6):67009. doi: 10.1289/EHP10281. Epub 2022 Jun 27.	BACKGROUND: Perfluorooctane sulfonate (PFOS) is a persistent organic pollutant that can cause hepatotoxicity. The underlying toxicological mechanism remains to be investigated. Given the critical role of fecal microbiota in liver function, it is possible that fecal microbiota may contribute to the liver toxicity induced by PFOS. OBJECTIVES: We aimed to investigate the role of liver-fecal microbiota axis in modulating PFOS-induced liver injury in mice. METHODS: Male and female mice were exposed to PFOS or vehicle for 14 d. In this investigation, 16S rDNA sequencing and metabolomic profiling were performed to identify the perturbed fecal microbiota and altered metabolites with PFOS exposure. In addition, antibiotic treatment, fecal microbiota transplantation, and bacterial administration were conducted to validate the causal role of fecal microbiota in mediating PFOS-induced liver injury and explore the potential underlying mechanisms. RESULTS: Both male and female mice exposed to PFOS exhibited liver inflammation and steatosis, which were accompanied by fecal microbiota dysbiosis and the disturbance of amino acid metabolism in comparison with control groups. The hepatic lesions were fecal microbiota-dependent, as supported by antibiotic treatment and fecal microbiota transplantation. Mice with altered fecal microbiota in antibiotic treatment or fecal microbiota transplantation experiments exhibited altered arginine concentrations in the liver and feces. Notably, we observed sex-specific lower levels of key microbiota, including Lactobacillus, Enterococcus, and Akkermansia. Mice treated with specific bacteria showed lower arginine levels and lower expression of the phosphorylated mTOR and P70S6K, suggesting lower activity of the related pathway and mitigation of the pathological differences observed in PFOS-exposed mice. CONCLUSIONS: Our study demonstrated the critical role of the fecal microbiota in PFOS-induced liver injury in mice. We also identified several critical bacteria that could protect against liver i		D B
D1150	実験動物 (肝毒 性)	Chen, Ling; Liu, Yafeng; Mu, Hongxin; Li, Huan; Liu, Su; Zhu, Mengyuan; Bu, Yuanqing; Wu, Bing	Effects of perfluorobutane sulfonate and perfluorooctane sulfonate on lipid homeostasis in mouse liver	2022	Environ Pollut. 2022 Dec 15;315:120403. doi: 10.1016/j.envpol.2022.120403. Epub 2022 Oct 10.	Perfluorobutane sulfonate (PFBS), an alternative to perfluorooctane sulfonate (PFOS), has been increasingly used in recent years. However, emerging evidence has raised concerns about the potential health risks of PFBS. Here, the toxicityof low-dose PFBS on livers was explored and compared with that of PFOS. Adult C57BL/6 mice were exposed to 10 μ g/L, 500 μ g/L PFBS, or 500 μ g/L PFOS for 28 days through drinking water. At the phenotypic level, no liver damage was observed in the 10 μ g/L PFBS group. The cell apoptosis and decrease of CAT activities were observed in the 500 μ g/L PFDS group, while accumulation of lipid droplets, increase of CAT activities and TAG levels were found in the 500 μ g/L PFDS group. Lipidomics analysis revealed that 138, 238, and 310 lipids were significantly changed in the 10 μ g/L, 500 μ g/L PFBS and 500 μ g/L PFOS groups, respectively. The two PFBS-treated groups induced similar global lipid changes in a dose-dependent manner, which were distinct from PFOS. Overall, PFBS exposure induced an increase in phosphatidylcholines and sphingomyelins, but a decrease in phosphatidylinositol. PFOS exposure caused an increase in triacylglycerols. This study provides more evidence on the health hazards caused by exposure to low-dose PFBS.		ВВ
D1151	実験動物 (肝毒 性)	Dong, Zhanchen; Wang, Jianyu; Qiu, Tianming; Wu, Jialu; An, Yu; Shi, Xiaoxia; Sun, Xiance; Jiang, Liping; Liu, Xiaofang; Yang, Guang; Cao, Jun; Yao, Xiaofeng	Perfluorooctane sulfonate induces mitochondrial calcium overload and early hepatic insulin resistance via autophagy/detyrosinated alpha-tubulin-regulated IP3R2-VDAC1-MICU1 interaction	2022	Sci Total Environ. 2022 Jun 15;825:153933. doi: 10.1016/j.scitotenv.2022.153933. Epub 2022 Feb 19.	Perfluorooctane sulfonate (PFOS), one kind of persistent organic pollutants, is associated with insulin resistance (IR) in general population. However, the exact mechanism is still obscure. In this study, we found that 50 μ M PFOS caused IR in L-02 hepatocytes after 1 h, and induced autophagy and mitochondrial calcium (Ca(2+)) accumulation as early as 0.5 h. Inhibiting autophagy relieved mitochondrial Ca(2+) overload and then reversed IR. Mitochondria were aggregated at cell periphery, and extracellular Ca(2+) from IP3R2 on the plasma membrane, rather than endoplasmic reticulum Ca(2+), was the priority source of mitochondrial Ca(2+) uptake at early stages of PFOS exposure. Furthermore, we discovered that the linkage connecting autophagy and mitochondrial Ca(2+) response was detyrosinated α -tubulin, which autophagy-dependently ascended, interacted with VDAC1 and enhanced the formation of IP3R2-VDAC1-MICU1 complex. Consistently, PFOS caused IR, activated autophagy, induced mitochondrial Ca(2+) overload, increased the level of detyrosinated α -tubulin, and promoted the formation of IP3R2-VDAC1-MICU1 complex in the liver of C57BL/6J mice exposed to 2.5 mg/kg/day PFOS for 6 weeks. This study clarified that autophagy and mitochondrial Ca(2+) accumulation were the early and triggering event that caused PFOS-related IR, also unveiled a novel mechanism regulating mitochondrial Ca(2+) homeostasis.		ВВ

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	 出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D1152	実験動物 (肝毒 性)	Su, Shengzhong; Billy, Laura J; Chang, Sue; Gonzalez, Frank J; Patterson, Andrew D; Peters, Jeffrey M	The role of mouse and human peroxisome proliferator- activated receptor- α in modulating the hepatic effects of perfluorooctane sulfonate in mice	2022	Toxicology. 2022 Jan 15;465:153056. doi: 10.1016/j.tox.2021.153056. Epub 2021 Nov 30.	Perfluorooctane sulfonate (PFOS) is a stable environmental contaminant that can activate peroxisome proliferator-activated receptor alpha (PPAR α). In the present work, the specific role of mouse and human PPAR α in mediating the hepatic effects of PFOS was examined in short-term studies using wild type, Ppara-null and PPARA-humanized mice. Mice fed 0.006 % PFOS for seven days (~10 mg/kg/day), or 0.003 % PFOS for twenty-eight days (~5 mg/kg/day), exhibited higher liver and serum PFOS concentrations compared to controls. Relative liver weights were also higher following exposure to dietary PFOS in all three genotypes as compared vehicle fed control groups. Histopathological examination of liver sections from mice treated for twenty-eight days with 0.003 % PFOS revealed a phenotype consistent with peroxisome proliferation, in wild-type and PPARA-humanized mice that was not observed in Ppara-null mice. With both exposures, expression of the PPAR α target genes, Acox1, Cyp4a10, was significantly increased in wild type mice but not in Ppara-null or PPARA-humanized mice. By contrast, expression of the constitutive androstane receptor (CAR) target gene, Cyp2b10, and the pregnane X receptor (PXR) target gene, Cyp3a11, were higher in response to PFOS administration in all three genotypes compared to controls for both exposure periods. These results indicate that mouse PPAR α can be activated in the liver by PFOS causing increased expression of Acox1, Cyp4a10 and histopathological changes in the liver. While histopathological analyses indicated the presence of mouse PPAR α -dependent hepatic peroxisome proliferation in wild-type in PPARA-humanized mice, the lack of increased Acox1 and Cyp4a10 mRNA by PFOS in PPARA-humanized mice indicates that the human PPAR α was not as responsive to PFOS as mouse PPAR α with this dose regime. Moreover, results indicate that hepatomegaly caused by PFOS does not require mouse or human PPAR α and could be due to effects induced by activation of CAR and/or PXR.		D B
D1153	実験動物 (肝毒 性)	Deng, Pan; Wang, Chunyan; Wahlang, Banrida; Sexton, Travis; Morris, Andrew J; Hennig, Bernhard	Co-exposure to PCB126 and PFOS increases biomarkers associated with cardiovascular disease risk and liver injury in mice	2020	Toxicol Appl Pharmacol. 2020 Dec 15;409:115301. doi: 10.1016/j.taap.2020.115301. Epub 2020 Oct 20.	Polychlorinated biphenyl (PCB)126 and perfluorooctane sulfonic acid (PFOS) are halogenated organic pollutants of high concern. Exposure to these chemicals is ubiquitous, and can lead to potential synergistic adverse effects in individuals exposed to both classes of chemicals. The present study was designed to identify interactions between PCB126 and PFOS that might promote acute changes in inflammatory pathways associated with cardiovascular disease and liver injury. Male C57BL/6 mice were exposed to vehicle, PCB126, PFOS, or a mixture of both pollutants. Plasma and liver samples were collected at 48 h after exposure. Changes in the expression of hepatic genes involved in oxidative stress, inflammation, and atherosclerosis were investigated. Plasma and liver samples was analyzed using untargeted lipidomic method. Hepatic mRNA levels for Nqo1, Icam1, and PAI1 were significantly increased in the mixture-exposed mice. Plasma levels of PAI1, a marker of fibrosis and thrombosis, were also significantly elevated in the mixture-exposed group. Liver injury was observed only in the mixture-exposed mice. Lipidomic analysis revealed that co-exposure to the mixture enhanced hepatic lipid accumulation and elevated oxidized phospholipids levels. In summary, this study shows that acute co-exposure to PCB126 and PFOS in mice results in liver injury and increased cardiovascular disease risk.		c c
D1154	実験動物 (肝毒 性)	Kirk, Andrea B; Michelsen- Correa, Stephani; Rosen, Cliff; Martin, Clyde F; Blumberg, Bruce	PFAS and Potential Adverse Effects on Bone and Adipose Tissue Through Interactions With PPAR γ	2021	Endocrinology. 2021 Dec 1;162(12):bqab194. doi: 10.1210/endocr/bqab194.	Perfluoroalkyl and polyfluoroalkyl substances (PFAS) are a widely dispersed, broad class of synthetic chemicals with diverse biological effects, including effects on adipose and bone differentiation. PFAS most commonly occur as mixtures and only rarely, if ever, as single environmental contaminants. This poses significant regulatory questions and a pronounced need for chemical risk assessments, analytical methods, and technological solutions to reduce the risk to public and environmental health. The effects of PFAS on biological systems may be complex. Each may have several molecular targets initiating multiple biochemical events leading to a number of different adverse outcomes. An exposure to mixtures or coexposures of PFAS complicates the picture further. This review illustrates how PFAS target peroxisome proliferator-activated receptors. Additionally, we describe how such activation leads to changes in cell differentiation and bone development that contributes to metabolic disorder and bone weakness. This discussion sheds light on the importance of seemingly modest outcomes observed in test animals and highlights why the most sensitive end points identified in some chemical risk assessments are significant from a public health perspective.		СВ
D1155	実験動物 (肝毒 性)	Naomi Kudo, Yoichi Kawashima	Effects of Perfluorooctanoic Acid on the Synthesis of Phospholipids in the Liver of Mice Fed a Dietary Soybean Oil, Perilla Oil or Fish Oil	2007	Journal of Health Science, 47 巻 2 号 168-174, DOI:10.1248/JHS.47.168	The effects of perfluorooctanoic acid (PFOA) on the synthesis of phospholipids were studied in combination with feeding of various dietary oils (soybean oil (SO), perilla oil (PO) or fish oil (FO)). Hepatic contents of phosphatidylcholine (PtdCho), phosphatidylethanolamine (PtdEtn) and phosphatidylinositol (PtdIns) did not differ between the three dietary groups except for a high level of PtdEtn in FO-fed mice. PFOA treatment increased the hepatic content of PtdCho and PtdEtn by 1.5 fold but did not affect that of PtdIns. Fatty acid compositions of phospholipids were different between the three groups reflecting the fatty acid composition in their diet. The rate of incorporation of [3H]glycerol into PtdEtn in the FO-fed group was significantly higher and that into TG was lower, compared to other dietary groups in PFOA-untreated mice. PFOA treatment significantly increased the incorporation of [3H]glycerol into PtdEtn synthesis de novo is responsible for a marked increase in the hepatic content of PtdCho is thought not to be due to increased synthesis de novo.		СВ

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D1156	実験動物 (肝毒 性)	Naomi Kudo, Tohru Yamazaki, Takeshi Sakamoto, Katsuyoshi Sunaga, Tadashi Tsuda, Atsushi Mitsumoto, Yoichi Kawashima	Effects of Perfluorinated Fatty Acids with Different Carbon Chain Length on Fatty Acid Profiles of Hepatic Lipids in Mice	2011 2011 doi: 10.1248/bpb.34.856	Alterations by perfluorinated fatty acids (PFCAs) with a chain length of 6—9 carbons in the fatty acid profile of hepatic lipids of mice were investigated. The characteristic changes caused by all the PFCAs examined were increases in the contents and proportions of oleic acid (18 : 1), palmitoleic acid (16 : 1) and 8,11,14-eicosatrienoic acid (20 : 3) in hepatic lipids. Hepatic contents of palmitic acid were also increased by the treatments with the PFCAs. These effects were almost dependent on the hepatic concentrations of PFCA molecules regardless of their carbon chain length. Perfluorooctanoic acid elevated the expressions of mRNA encoding acetyl-CoA carboxylase, fatty acid synthase, malic enzyme, stearoyl-CoA desaturase (SCD) (SCD1 and 2), chain elongase (ELOVL5), $\Delta 6$ desaturase (Fads2), 1-acylglycerophosphocholine acyltransferase (LPCAT) (LPCAT3). The four PFCAs examined induced microsomal SCD and LPCAT in hepatic concentration-dependent manners regardless of carbon chain length. One linear regression line was confirmed between LPCAT activity and hepatic concentration of PFCAs. These results suggest (i) that PFCAs with a chain length of 6—9 carbons change the fatty acid profile of hepatic lipids by increasing contents and proportions of 16 : 1, 18 : 1 and 20 : 3, (ii) that these alterations in fatty acid profile are caused by up-regulation of SCD, de novo fatty acid synthesis, chain elongase and $\Delta 6$ desaturase and (iii) that the mechanism underlying SCD induction is, in part, mediated through peroxisome proliferator-activated receptor α .			D	В
D1157	実験動物 (肝毒 性)	Kudo Naomi(城西 大学 薬学科), Suzuki-Nakajima Erika, Mitsumoto Atsushi, Kawashima Yoichi	雌雄マウスにおける炭素鎖長の異なるペルフルオロ脂肪 酸に対する肝臓の反応 肝肥大、ペルオキシソーム β -酸 化およびミクロソーム1-アシルグリセロホスホコリンア シルトランスフェラーゼの誘導に関して(Responses of the Liver to Perfluorinated Fatty Acids with Different Carbon Chain Length in Male and Female Mice: In Relation to Induction of Hepatomegaly, Peroxisomal β -Oxidation and Microsomal 1- Acylglycerophosphocholine Acyltransferase)(英語)	2006 Biological & Pharmaceutical Bulletin(0918-6158)29巻9号 Page1952-1957(2006.09), doi: 10.1248/bpb.29.1952	肝肥大、ペルオキシソームβ-酸化およびミクロソーム1-アシルグリセロホスホコリン(1-アシル-GPC)アシルトランスフェラーゼの誘導力について雌雄マウスの肝臓で6~9炭素鎖長のペルフルオロ脂肪酸(PFCA)間で比較した。比較したPFCAはいずれも肝肥大とペルオキシソームβ酸化を誘導し、その強度はペルフルオロノナン酸(PFNA)、ペルフルオロオクタン酸(PFOA)、ペルフルオロヘプタン酸(PFHA)、ペルフルオロヘキサン酸(PFHeA)の順であった。ミクロソーム1-アシル-GPCアシルトランスフェラーゼは、PFHA、PFOAおよびPFNAにより誘導され、ペルオキシソームβ酸化も同様であった。いずれのPFACによるペルオキシソームβ酸化の誘導においても有意な性差はなかった。PFNAとPFOAの肝臓への蓄積は雌雄共に用量依存的であった。程度は低いがPFHAは肝に蓄積し、PFHeAの肝蓄積は少量であった。PFNA、PFOAおよびPFHAの肝内濃度は雄の方が雌より高かった。雌雄ともペルオキシソームβ酸化活性とPFHeA、PFOAおよびPFNAの肝臓中濃度の間には炭素鎖長に関わらず回帰直線が認められた。以上から、雌雄マウスともペルフルオロアルキル鎖が長いほどPFCAの肝蓄積が多いこと、PFCAの蓄積が肝肥大、ペルオキシソームβ酸化およびミクロソーム1-アシル-GPCアシルトランスフェラーゼを誘導すること、さらにPFHA、PFOAおよびPFNAの肝内蓄積に見られた性差はペルオキシソームβ酸化における明確な性差を引き起こすほどではないことが示唆される。			В	В
D1158	実験動物 (肝毒 性)	Kudo Naomi(城西 大学 薬), Kawashima Yoichi	大豆油,シソ油,及び魚油給餌マウス肝臓におけるリン脂 質合成に及ぼすペルフルオロオクタン酸の効果(Effects of Perfluorooctanoic Acid on the Synthesis of Phospholipids in the Liver of Mice Fed a Dietary Soybean Oil, Perilla Oil or Fish Oil)(英語)	Journal of Health Science(1344-9702)47巻2号 Page168- 174(2001.04), DOI:10.1248/jhs.47.168	大豆油(SO),シソ油(PO),又は魚油(FO)給餌マウス肝におけるリン脂質合成に及ぼすベルフルオロオクタン酸(PFOA)の効果について検討 した.FO給餌マウスでは他マウスに比較して肝内ホスファチジルエタノールアミン(PtdEtn)含有量が高値であった.PFOA投与により,ホ スファチジルコリン(PtdCho)及びPtdEtn肝内含有量の増加が認められた.肝内脂肪酸の構成は,食餌中脂肪酸の構成を反映していた.FO給 餌マウスにおける[H3]グリセロールのPtdEtnへの取りこみ率は有意に高値であり,トリグリセリドへの取りこみ率は有意に低値であっ た.PFOA処置により,PtdEtn及びホスファチジルセリンへの[H3]グリセロール取込が有意に増加し,TGへの取り込みが有意に減少した.以 上より,PtdEtn de novo合成の増加がPFOA処置マウス肝におけるPtdEtnの著明な増加に関与しているものと考えられる			С	В
D1159	実験動物 (肝毒 性)	Uy-Yu Narcisa(富 山医科薬科大学 薬), Kawashima Yoichi, Horii Sachiko	Effects of Chronic Administration of Perfluorooctanoic Acid on Fatty Acid Metabolism in Rat Liver : Relationship among Stearoyl-Coenzyme A Desaturase, 1-Acylglycerophosphocholine Acyltransferase, and Acyl Composition of Microsomal Phosphatidylcholine	Journal of Pharmacobio-Dynamics(0386-846X)13巻9号 Page581-590(1990.09), doi: 10.1248/bpb1978.13.581	0.01%(w/w)perfluorooctanoic acid (PFOA)を含む餌を2, 22, 26週間雌雄のラットに与え,肝臓のミクロソームの1- acylglycerophosphocholine acyltransferase,ミクロソームのstearoyl-coenzyme (CoA) desaturase, peroxisomal β-oxidationの活性, またミクロソームのphosphatidylcholineのアシル成分に対するPFOAの効果を検討した.その結果,投与期間中PFOAに対する肝臓の応答 は一定であったが,コントロールのPFOAの4週間投与による肝酵素活性の上昇とミクロソームのphosphatidylcholineのアシル成分の変 化は慢性投与により低下した.雌ラットではPFOAの慢性投与後でも,化合物の投与に対してもこれらのパラメータは僅かにしか応答しな かった.このことはPFOAに対するラット肝臓の応答には明らかな性差があることを示している			В	В
D1160	実験動物 (肝毒 性)	池田 敏彦(三共), 相場 君江, 福田 邦昭	パーフルオロ脂肪酸類によるラット肝ペルオキシゾーム 増殖の誘導(英語)	The Journal of Biochemistry(0021-924X)98巻2号 Page475- 482(1985.08)	SD系雄性ラットを0.02%種々のフッ素化合物混合飼料にて2週間飼育するか,あるいは直接種々のフッ素化合物のコーン油溶液を単回腹 腔内注射(100 mg/kg)した後,肝ペルオキシゾーム増殖の誘導を調べた.その判定には,肝重量増加ならびに肝カタラーゼ活性増加の測 定,SDSポリアクリルアミドゲル電気泳動法による肝ペルオキシゾーム由来エノイルCoA水和酵素(分子量8万タンパク質)の検出および電 子顕微鏡による観察などの手法を用いた.薬物混合飼料による処理では,脂肪酸誘導体であるパーフルオロオクタン酸(PFOA, C8)および パーフルオロ酪酸(PFBA, C4)が顕著にペルオキシゾームを誘導したが,カルボキシル基を持たない1-H, 1-H,ペンタデカフルオロオクタ ノール(PFOL, C8)およびパーフルオロオクタン(PFO, C8)はまったく誘導しなかった.単回腹腔内投与では,パーフルオロデカン酸(PFDA, C10), PFOA,およびPFOLが誘導したが,PFBA,PFOおよびパーフルオロドデカン(PFD, C12)は誘導しなかった.アルコール誘導体である PFOLは,大量単回投与では一部PFOAに代謝されて効果を発揮するが短鎖脂肪酸であるPFBAは体外排泄が速い可能性が高く,このため単 回投与では効果があらわれないとみられる.官能基を持たないパラフィン誘導体はまったく誘導能を示さなかった.これらのことから,肝 ペルオキシゾーム増殖の誘導には脂肪酸構造が必須であることが示唆された			В	В

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン 文 ク 献 ① ラ	ン 文 で マ ラ
D1161	ゼブラ フィッ シュ (肝 毒性)	Wu, Dong-Lei; Cheng, Lin; Rao, Qin-Xiong; Wang, Xian-Li; Zhang, Qi-Cai; Yao, Chun-Xia; Chen, Shan-Shan; Liu, Xing; Song, Wei; Zhou, Jia-Xin; Song, Wei-Guo	Toxic effects and transcriptional responses in zebrafish liver cells following perfluorooctanoic acid exposure	2022	Aquat Toxicol. 2022 Oct 15;253:106328. doi: 10.1016/j.aquatox.2022.106328. Online ahead of print.	As a typical type of persistent organic pollutant, perfluorooctanoic acid (PFOA) is pervasive in the environment. Multiple studies have found that PFOA has hepatotoxicity, but the mechanism remains poorly understood. In this study, the toxic effects of different concentrations of PFOA on zebrafish liver cells were systematically assessed by recording cell survival, ultrastructural observations, and transcriptome analyses. The results showed that the inhibition of cell viability and the massive accumulation of autophagic vacuoles were observed at 400 µM PFOA, while transcriptomic changes occurred with treatments of 1 and 400 µM PFOA. The transcription levels of 1055 (977 up- and 78 down-regulated genes) and 520 (446 up- and 74 down-regulated genes) genes were significantly changed after treatment with 1 and 400 µM PFOA, respectively. Based on Kyoto encyclopedia of genes and genomes (KEGG) enrichment analysis, significant expression changes were observed in autophagy, tight junction, signal transduction, immune system, endocrine system, and metabolism-related pathways, indicating that such processes were greatly affected by PFOA exposure. The findings of this study will provide a scientific basis for the toxic effects and potential toxic mechanisms of PFOA on zebrafish, and provide information for ecological risk assessments.			С	С
D1162	ゼブラ フィッ シュ (肝 毒性)	Sun, Sujie; Li, Xue; Zhang, Li; Zhong, Zilin; Chen, Chao; Zuo, Yuhua; Chen, Yu; Hu, Hongmei; Liu, Fasheng; Xiong, Guanghua; Lu, Huiqiang; Chen, Jianjun; Dai, Jiayin	Hexafluoropropylene oxide trimer acid (HFPO-TA) disturbs embryonic liver and biliary system development in zebrafish	2022	Sci Total Environ. 2022 Nov 11;859(Pt 1):160087. doi: 10.1016/j.scitotenv.2022.160087. Online ahead of print.	Hexafluoropropylene oxide trimer acid (HFPO-TA), a novel alternative to perfluorooctanoic acid (PFOA), has emerged as a potential environmental pollutant. Here, to investigate the toxic effects of HFPO-TA on liver and biliary system development, zebrafish embryos were exposed to 0, 50, 100, or 200 mg/L HFPO-TA from 6 to 120 h post-fertilization (hpf). Results showed that the 50 % lethal concentration (LC(50)) of HFPO-TA was 231 mg/L at 120 hpf, lower than that of PFOA. HFPO-TA exposure decreased embryonic hatching, survival, and body length. Furthermore, HFPO-TA exerted higher toxicity at the specification stage than during the differentiation and maturation stages, leading to small-sized livers in Tg(fabp10a: DsRed) transgenic larvae and histopathological changes. Significant decreases in the mRNA expression of genes related to liver formation were observed. Alanine transaminase (ALT), aspartate aminotransferase (AST), total bilirubin (TBIL), and direct bilirubin (DBIL) levels were significantly increased. HFPO-TA decreased total cholesterol (TCHO) and triglyceride (TG) activities, disturbed lipid metabolism through the peroxisome proliferator-activated receptor (PPAR) pathway, and induced an inflammatory response. Furthermore, HFPO-TA inhibited intrahepatic biliary development in Tg(Tp1:eGFP) transgenic larvae and interfered with transcription of genes associated with biliary duct development. HFPO-TA reduced bile acid synthesis but increased bile acid transport, resulting in disruption of bile acid metabolism. Therefore, HFPO-TA influenced embryonic liver and biliary system morphogenesis, caused liver injury, and may be an unsafe alternative for PFOA.			С	С
D1163	ゼブラ フィッ シュ (肝 毒性)	Wang, Qiyu; Huang, Jing; Liu, Shuai; Wang, Caiyun; Jin, Yuanxiang; Lai, Hong; Tu, Wenqing	Aberrant hepatic lipid metabolism associated with gut microbiota dysbiosis triggers hepatotoxicity of novel PFOS alternatives in adult zebrafish	2022	Environ Int. 2022 Jun 15;166:107351. doi: 10.1016/j.envint.2022.107351. Online ahead of print.	Perfluorooctane sulfonate (PFOS) has been reported to induce hepatotoxicity in wildlife and humans. Novel PFOS alternatives have been widely used following restrictions on PFOS, but little is known about their potential toxicity. Here, the first comprehensive investigation on the chronic hepatotoxicity and underlying molecular mechanisms of PFOS, 6:2CI-PFESA (F-53B), and sodium p-perfluorous nonenoxybenzene sulfonate (OBS) was carried out on adult zebrafish through a histopathological examination, biochemical measurement, and multi-omics analysis. PFOS and its alternatives caused changes in liver histopathology and liver function indices in the order of F-53B > PFOS > OBS, which was consistent with their concentration in the liver. In silico modeling and transcriptional profiles suggested that the aberrant hepatic lipid metabolism induced by F-53B and PFOS was initiated by the action on peroxisome proliferator-activated receptor γ (PPAR γ), which triggered changes in downstream genes transcription and led to an imbalance between lipid synthesis and expenditure. Gut microbiome analysis provided another novel mechanistic perspective that changes in the abundance of Legionella, Ralstonia, Brevundimonas, Alphaproteobacteria, Plesiomonas, and Hyphomicrobium might link to alterations in the PPAR pathway based on their significant correlation. This study provides insight into the molecular mechanisms of hepatotoxicity induced by PFOS and its novel alternatives and highlights the need for concern about their environmental exposure risks.			С	С
D1164	ゼブラ フィッ シュ (肝 毒性)	Zhu, Ya; Yang, Dandong; Duan, Xinbin; Zhang, Yongkang; Chen, Daqing; Gong, Zhiyuan; Liu, Chunsheng	Perfluorooctane sulfonate promotes doxycycline- induced liver tumor progression in male Kras(v12) transgenic zebrafish	202	Environ Res. 2021 May;196:110962. doi: 10.1016/j.envres.2021.110962. Epub 2021 Mar 4.	Perfluorooctane sulfonate (PFOS) is a persistent organic pollutant that has been widely detected in the environment and has caused growing international concern. The liver is the main target organ of PFOS exposure. Animal experiments have shown that PFOS exposure can increase the risk of liver tumorigenesis. However, whether PFOS can accelerate liver tumor progression is still unclear. In this study, transgenic zebrafish Tg(fabp10:rtTA2s-M2; TRE2:EGFP-KRAS(G12V)), a hepatocellular carcinoma (HCC) model that can cause liver tumorigenesis by doxycycline (DOX) induction, was used to investigate the effect of PFOS exposure in HCC progression. The male kras(V12) transgenic zebrafish were exposed to 20 mg/L DOX, 500 μ g/L PFOS or combined 20 mg/L DOX and 500 μ g/L PFOS for 10 d. The results showed that co-treated with PFOS and DOX caused oncogenic Kras-induced liver enlargement, increased the percentages of zebrafish with HCC, and aggravated metabolic reprogramming of liver. To the best of our knowledge, this study for the first proved that PFOS could promote liver tumor progression. Decreased vitamin D level and increased fatty acid intake caused by PFOS might be responsible for the tumor-promoting effects. The results suggest that attention should be paid to the tumor-promoting effects of PFOS when assessing its environmental health risks, and these findings provide new insights into the toxicity of PFOS.			С	С

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨 (原文)	備考	出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D1165	メタボロ ミクス (肝毒 性)	Yu, Miao; Teitelbaum, Susan L; Dolios, Georgia; Dang, Lam-Ha T; Tu, Peijun; Wolff, Mary S; Petrick, Lauren M	Molecular Gatekeeper Discovery: Workflow for Linking Multiple Exposure Biomarkers to Metabolomics	2022	Environ Sci Technol. 2022 May 17;56(10):6162-6171. doi: 10.1021/acs.est.1c04039. Epub 2022 Feb 7.	The exposome reflects multiple exposures across the life-course that can affect health. Metabolomics can reveal the underlying molecular basis linking exposures to health conditions. Here, we explore the concept and general data analysis framework of "molecular gatekeepers"—key metabolites that link single or multiple exposure biomarkers with correlated clusters of endogenous metabolites—to inform health-relevant biological targets. We performed untargeted metabolomics on plasma from 152 adolescent girls participating in the Growing Up Healthy Study in New York City. We then performed network analysis to link metabolites to exposure biomarkers including five trace elements (Cd, Mn, Pb, Se, and Hg) and five perfluorinated chemicals (PFCs; n-PFOS, Sm-PFOS, n-PFOA, PFHxS, and PFNA). We found 144 molecular gatekeepers and annotated 22 of them. Lysophosphatidylcholine (16:0) and taurodeoxycholate were correlated with both n-PFOA and n-PFOS, suggesting a shared dysregulation from multiple xenobiotic exposures. Sphingomyelin (d18:2/14:0) was significantly associated with age at menarche; yet, no direct association was detected between any exposure biomarkers and age at menarche. Thus, molecular gatekeepers can also discover molecular linkages between exposure biomarkers and health outcomes that may otherwise be obscured by complex interactions in direct measurements.		D A
D1166	メタボロ ミクス (肝毒 性)	Zhang, Ruijia; Lu Wenhua; Yao, Yao; Tu, Lanyin; Yu, Tiantian; Luan, Tiangang; Chen, Baowei	, Metabolomics analysis of the 3D L-02 cell cultures revealing the key role of metabolism of amino acids in ameliorating hepatotoxicity of perfluorooctanoic acid	2022	Sci Total Environ. 2022 Feb 1;806(Pt 1):150438. doi: 10.1016/j.scitotenv.2021.150438. Epub 2021 Sep 20.	To simulate the real cell status and morphology in the living systems is substantial for using cell models to address the detrimental effects of toxic contaminants. In this study, the comparative profiles of metabolites in three-dimensional (3D) human normal liver (L-02) cell spheroids with perfluorooctanoic acid (PFOA) treatment were analyzed using a metabolomic approach. The uniform 3D cell spheroids were well formed in 3 days (e.g., sphericity index >0.9) and stably maintained over the subsequent 11 days. The cytotoxicity of PFOA to the 3D L-02 cell spheroids was highly dependent on both exposure concentration and duration. Comparative analysis of metabolomes showed that the number of differential metabolites in the 3D cell spheroids treated with 300 μ M PFOA for 10 days (n = 59) was greater than those with a 4-day exposure to 300 μ M PFOA (n = 17). Six metabolic pathways related to amino acids metabolism were only found in the 3D cell spheroids with a 10-day treatment of 300 μ M PFOA, which could not be found in the 2D monolayer cells and those 3D cell spheroids with a 4-day exposure. The suppression of PFOA on glutamine metabolism substantially decreased glutathione (GSH) production and accordingly increased the level of reactive oxygen species in the 3D cell spheroids. On the contrary, the supplementation of glutamine increased GSH production and the viability of cell spheroids, indicating that glutamine metabolism played a critical role in the chronic toxic effects of PFOA. Our study strongly suggested that comprehensive toxicological methodologies based on the 3D cell models could currently be robust and suitable for addressing the chronic adverse effects of toxic contaminants.		СВ
D1167	in silico (PPAR)	Søderstrøm, Sofie; Lille-Lang øy, Roger; Yadetie, Fekadu; Rauch, Mateusz; Milinski, Ana; Dejaegere, Annick; Stote, Roland H; Goksø yr, Anders; Karlsen, Odd André	Agonistic and potentiating effects of perfluoroalkyl substances (PFAS) on the Atlantic cod (Gadus morhua) peroxisome proliferator-activated receptors (Ppars)	2022	Environ Int. 2022 May;163:107203. doi: 10.1016/j.envint.2022.107203. Epub 2022 Mar 29.	Toxicity mediated by per- and polyfluoroalkyl substances (PFAS), and especially perfluoroalkyl acids (PFAAs), has been linked to activation of peroxisome proliferator-activated receptors (Ppar) in many vertebrates. Here, we present the primary structures, phylogeny, and tissue-specific distributions of the Atlantic cod (Gadus morhua) gmPpara1, gmPpara2, gmPparb, and gmPparg, and demonstrate that the carboxylic acids PFHxA, PFOA, PFNA, as well as the sulfonic acid PFHxS, activate gmPpara1 in vitro, which was also supported by in silico analyses. Intriguingly, a binary mixture of PFOA and the non-activating PFOS produced a higher activation of gmPpara1 compared to PFOA alone, suggesting that PFOS has a potentiating effect on receptor activation. Supporting the experimental data, docking and molecular dynamics simulations of single and double-ligand complexes led to the identification of a putative allosteric binding site, which upon binding of PFOS stabilizes an active conformation of gmPpara1. Notably, binary exposures of gmPpara1, gmPpara2, and gmPparb to model-agonists and PFAAs produced similar potentiating effects. This study provides novel mechanistic insights into how PFAAs may modulate the Ppar signaling pathway by either binding the canonical ligand-binding pocket or by interacting with an allosteric binding site. Thus, individual PFAAs, or mixtures, could potentially modulate the Ppar-signaling pathway in Atlantic cod by interfering with at least one gmPpar subtype.		СВ
D1168	in virto (PPAR)	Evans, Nicola; Conley, Justin M; Cardon, Mary; Hartig, Phillip; Medlock- Kakaley, Elizabeth; Gray, L Earl Jr	In vitro activity of a panel of per- and polyfluoroalkyl substances (PFAS), fatty acids, and pharmaceuticals in peroxisome proliferator-activated receptor (PPAR) alpha, PPAR gamma, and estrogen receptor assays	2022	, Toxicol Appl Pharmacol. 2022 Aug 15;449:116136. doi: 10.1016/j.taap.2022.116136. Epub 2022 Jun 22.	(PPAR α), however, additional work is needed to characterize PFAS activity on PPAR gamma (PPAR γ) and other nuclear receptors. We utilized in vitro assays with either human or rat PPAR α or PPAR γ ligand binding domains to evaluate 16 PFAS (HFPO-DA, HFPO-DA-AS, NBP2, PFMOAA, PFHxA, PFOA, PFNA, PFDA, PFOS, PFBS, PFHxS, PFOSA, EtPFOSA, and 4:2, 6:2 and 8:2 FTOH), 3 endogenous fatty acids (oleic, linoleic, and octanoic), and 3 pharmaceuticals (WY14643, clofibrate, and the metabolite clofibric acid). We also tested chemicals for human estrogen receptor (hER) transcriptional activation. Nearly all compounds activated both PPAR α and PPAR γ in both human and rat ligand binding domain assays, except for the FTOH compounds and PFOSA. Receptor activation and relative potencies were evaluated based on effect concentration 20% (EC(20)), top percent of max fold induction (pmax(top)), and area under the curve (AUC). HFPO-DA and HFPO-DA-AS were the most potent (lowest EC(20), highest pmax(top) and AUC) of all PFAS in rat and human PPAR α assays, being slightly less potent than oleic and linoleic acid, while NBP2 was the most potent in rat and human PPAR γ activity did not correlate with oral doses or serum concentrations of PFAS that induced increases in male rat liver weight from the National Toxicology Program 28-d toxicity studies. Data indicate that both PPAR α and PPAR γ activation may be molecular initiating events that contribute to the in vivo effects observed for many PFAS.		D B

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 象抽 ① ラ ② ラ
D1169	in vitro (PPAR)	Sakai, Genki; Hirao-Suzuki, Masayo; Koga, Takayuki; Kobayashi, Takananobu; Kamishikiryo, Jun; Tanaka, Michitaka; Fujii, Kiyonaga; Takiguchi, Masufumi; Sugihara, Narumi; Toda, Akihisa; Takeda, Shuso	Perfluorooctanoic acid (PFOA) as a stimulator of estrogen receptor-negative breast cancer MDA-MB- 231 cell aggressiveness: Evidence for involvement of fatty acid 2-hydroxylase (FA2H) in the stimulated cell migration	2022	J Toxicol Sci. 2022;47(4):159-168. doi: 10.2131/jts.47.159.	Detailed in vitro studies on the effects of perfluorooctanoic acid (PFOA) have demonstrated that activation of peroxisome proliferator-activated receptor α (PPAR α) is a key process by which PFOA affects the malignancy of estrogen receptor α (ER α)-positive breast cancer cells. However, there is very little information on the PPAR α -regulated genes responsible for the effects of PFOA in ER α -negative breast cancer cell malignancy. We recently demonstrated that fatty acid 2-hydroxylase (FA2H) stimulates the migration of ER α -negative human MDA-MB-231 cells, and PPAR α is a key factor for the induction of FA2H in these cells. However, evidence for the relationship between PFOA exposure and PPAR α -FA2H axis-driven migration has not been obtained. Here we analyzed the effects of PFOA on PPAR α transcription and FA2H expression in relation to MDA-MB-231 cell migration. We found that simultaneously with stimulated migration, PFOA upregulated FA2H and activated the transcription of PPAR α . FA2H-selective siRNA, but not siRNA control, clearly dampened PFOA-mediated cell migration. There is an inhibitory interaction between PPAR α and PPAR β / δ (i.e., PPAR β / δ can suppress PPAR α to upregulate FA2H. Collectively, our findings show that i) PFOA activates PPAR α -mediated transcription, ii) PFOA stimulates migration dependent on FA2H expression, and iii) mechanistically, PFOA relieves PPAR β / δ suppression of PPAR α activity to upregulate FA2H in MDA-MB-231 cells.		D B
D1170	in vitro (PPAR)	Nielsen, Greylin; Heiger-Bernays, Wendy J; Schlezinger, Jennifer J; Webster, Thomas F	Predicting the effects of per- and polyfluoroalkyl substance mixtures on peroxisome proliferator- activated receptor alpha activity in vitro	2022	Toxicology. 2022 Jan 15;465:153024. doi: 10.1016/j.tox.2021.153024. Epub 2021 Nov 4.	Human exposure to per- and polyfluoroalkyl substances (PFAS) is ubiquitous, with mixtures of PFAS detected in drinking water, food, household dust, and other exposure sources. Animal toxicity studies and human epidemiology indicate that PFAS may act through shared mechanisms including activation of peroxisome proliferator activated receptor α (PPAR α). However, the effect of PFAS mixtures on human relevant molecular initiating events remains an important data gap in the PFAS literature. Here, we tested the ability of modeling approaches to predict the effect of diverse PPAR α ligands on receptor activity using Cos7 cells transiently transfected with a full length human PPAR α (hPPAR α) expression construct and a peroxisome proliferator response element-driven luciferase reporter. Cells were treated for 24 h with two full hPPAR α agonists (pemafibrate and GW7647), a full and a partial hPPAR α agonist (pemafibrate and mono(2-ethylhexyl) phthalate), or a full hPPAR α agonist and a competitive antagonist (pemafibrate and GW6471). Receptor activity was modeled with three additive approaches: effect summation, relative potency factors (RPF), and generalized concentration addition (GCA). While RPF and GCA accurately predicted activity for mixtures of full hPPAR α agonists, only GCA predicted activity for full and partial hPPAR α agonists and a full agonist and antagonist. We then generated concentration response curves for seven PFAS, which were well-fit with three-parameter Hill functions. The four perfluorinated carboxylic acids (PFCA) tended to act as full hPPAR α agonists while the three perfluorinated sulfonic acids (PFSA) tended to act as partial agonists that varied in efficacy between 28-67 % of the full agonist, positive control level. GCA and RPF performed equally well at predicting the effects of mixtures with three PFCAs, but only GCA predicted experimental activity with mixtures of PFSAs and a mixture of PFCAs and PFSAs at ratios found in the general population. We conclude that of		СВ
D1171	in vitro (心血管 系)	Davidsen, Nichlas; Ramhøj, Louise; Kugathas, Indusha; Evrard, Bertrand; Darde, Thomas A; Chalmel, Frédé ric; Svingen, Terje; Rosenmai, Anna Kjerstine	PFOS disrupts key developmental pathways during hiPSC-derived cardiomyocyte differentiation in vitro	2022	Toxicol In Vitro. 2022 Dec;85:105475. doi: 10.1016/j.tiv.2022.105475. Epub 2022 Sep 16.	Exposure to perfluorooctanesulfonic acid (PFOS) has been associated with congenital heart disease (CHD) and decreased birth weight. PFOS exposure can disrupt signaling pathways relevant for cardiac development in stem cell-derived cardiomyocyte assays, such as the PluriBeat assay, where spheroids of human induced pluripotent stem cells (hiPSCs) differentiate into contracting cardiomyocytes. Notably, cell line origin can also affect how the assay responds to chemical exposure. Herein, we examined the effect of PFOS on cardiomyocyte differentiation by transcriptomics profiling of two different hiPSC lines to see if they exhibit a common pattern of disruption. Two stages of differentiation were investigated: the cardiac progenitor stage and the cardiomyocyte stage. Many differentially expressed genes (DEGs) were observed between cell lines independent of exposure. However, 135 DEGs were identified as common between the two cell lines. Of these, 10 DEGs were associated with GO-terms related to the heart. PFOS exposure disrupted multiple signaling pathways relevant to cardiac development, including WNT, TGF, HH, and EGF. Of these pathways, genes related to the non-canonical WNTCa(2+) signaling was particularly affected. PFOS thus has the capacity to disrupt pathways important for cardiac development and function.		D B

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D1172	in vitro (心血管 系)	Liu, Dan; Liu, Nuo-Ya; Chen, Li-Ting; Shao, Ying; Shi, Xiao- Meng; Zhu, Dan- Yan	Perfluorooctane sulfonate induced toxicity in embryonic stem cell-derived cardiomyocytes via inhibiting autophagy-lysosome pathway	2020	Toxicol In Vitro. 2020 Dec;69:104988. doi: 10.1016/j.tiv.2020.104988. Epub 2020 Aug 28.	Perfluorooctane sulfonate (PFOS), a classic environmental pollutant, is reported to cause cardiotoxicity in animals and humans. It has been demonstrated that PFOS exposure down-regulates expression of cardiac-development related genes and proteins. However, the related mechanism of PFOS has not been fully elucidated. In the present study, the embryonic stem (ES) cells-derived cardiomyocytes (ESC-CMs) was employed to investigate PFOS-mediated mechanism in developmental toxicity of cardiomyocytes. Our previous study shows that PFOS induces cardiomyocyte toxicity via causing mitochondrial damage. Nevertheless, the underlying mechanism by which PFOS affects the autophagy-related mitochondrial toxicity in ESC-CMs remains unclear. Here, we found that PFOS induced the swelling of mitochondria and the autophagosome accumulation in ESC-CMs at 40 μ M concentration. PFOS increased the levels of LC3-II, p62, and ubiquitinated proteins. PFOS also induced an increase of LC3 and p62 localization into mitochondria, indicating that mitophagy degradation was impaired. The results of autophagic flux using chloroquine and RFP-GFP-LC3 analysis showed that the accumulation of autophagosome and lysosome. PFOS caused dysfunction of lysosomes because it down-regulated Lamp2a and cathepsin D, but it did not induced lysosome membrane permeabilization. Meanwhile, PFOS-mediated lysosomal function and the inhibitory effect of autophagic flux could be reversed by PP242 at 40 nM concentration, an mTOR inhibitor. Furthermore, PP242 restored PFOS-induced ATP depletion and mitochondrial membrane potential. In conclusion, PFOS induced mitochondrial dysfunction via blocking autophagy-lysosome degradation, leading to cardiomycyte toxicity from ES cells.			D	E	3
D1173	in vitro (心血管 系)	原田 浩二, 小泉 昭夫	P1069 ペルフルオロオクタンスルホン酸(PFOS)とペル フルオロオクタン酸(PFOA)のguinea pig心室筋細胞にお けるL型Ca^2+電流への影響	2005	産業衛生学雑誌, 47 巻 Special 号 684-, doi: 10.1539/sangyoeisei.KJ00003804316	ペルフルオロオクタンスルホン酸 (PFOS) とペルフルオロオクタン酸 (PFOA) は野生生物やヒトを含む環境中に広範に検出されるようになった界面活性剤である。PFOS・PFOA は横紋筋融解、神経内分泌攪乱、発達毒性、生殖毒性、発癌性などを指摘されてきたが、分子レベルでのメカニズムは明らかではなかった。 直鎖アルキル 界面活性剤 が電位依存性イオンチャネルの機能に影響することが報告されており、細胞内カルシウムの 恒常性維持は筋機能、内分泌、細胞間連絡などの点から重要であり、PFOA・PFOSの及ぼす影響を検討する。【方法】本研究では PFOS・PFOA が単離 guineapig心 室筋細胞の L型 Ca2+ 電流に及ぼす影響について 調査 した。単離心室筋細胞 を Tytodeあるいは Na + -K+ -free - Tytede液下で whole ceU patch clamprecording を行った。【結果】 whole cen nt dampでは、PFOS は活動電位の立ち上がり速度、活動電位持続時間、最大電位を 10 μ M 以上で減少させた。 100 μ M では活動電位 は抑制された。 whole cellvoltage clampでは ca2+ 電流の半活性化、不活性化電位を過分極側に移した。半活性化電位についての ECs。は52 μ M、半不活性化電位についての ECm は 119 μ M であった。また Ca2+ 電流の最大電流を用量依存性に増加させた(ECm = 6・3ptM)。PFOA も PFOS と同様の作用を示したが作用強度は有意に低かった。【考察】これらの結果は直鎖アルキル界面活性剤と一致した。 膜に界面活性剤が結合し、活性化、不活性化を変化させると考えられており、有機フッ素系界面活性剤も膜電位に作用し、他の電位依存性イオンチャネル全般への作用しうると考えられる。最大電流の増強作用は長鎖飽和脂肪酸で見られ、炭素鎖 8 の 中鎖脂肪酸では効果がないとされてきたが、炭素鎖のフッ素化により界面活性能が増加することが要因であると思われた。PFOA・PFOSによる細胞内カルシウム調節機構への影響はこれまでの PFOA・PFOS の毒性のメカニズムの理解に役立っと考えられる。特に μ M オーダーで作用が見られ、フッ素化学工場労働者での PFOA・PFOS 面清中濃度がおよそ1-30 μ M と報告されており、これらに基づく毒性についてより、こ			С	E	3
D1174	in vitro (代謝)	Modaresi, Seyed Mohamad Sadegh; Wei, Wei; Emily, Marques; DaSilva, Nicholas A; Slitt, Angela L	Per- and polyfluoroalkyl substances (PFAS) augment adipogenesis and shift the proteome in murine 3T3-L1 adipocytes	2022	Toxicology. 2022 Jan 15;465:153044. doi: 10.1016/j.tox.2021.153044. Epub 2021 Nov 17.	The Per- and polyfluoroalkyl substances (PFAS) are a wide group of fluorinated compounds, which the health effects of many of them have not been investigated. Perfluorinated sulfonates, such as perfluoroctane sulfonate (PFOS) and perfluorinated carboxylates, such as perfluoroctanoic acid (PFOA) are members of this broad group of PFAS, and previous studies have shown a correlation between the body accumulation of PFOS and PFOA and increased adipogenesis. PFOA and PFOS have been withdrawn from the market and use is limited because of their persistence, toxicity, and bioaccumulative properties. Instead, short chain PFAS have been created to replace PFOA and PFOS, but the health effects of other short chain PFAS are largely unknown. Therefore, herein we aimed to comprehensively determined the potential adipogenesis of ten different PFAS (PFBS, PFHxS, PFOS, PFBA, PFHxA, PFHA, PFOA, PFDA, and HFPO-DA) and investigated the differences in protein expression of 3T3-L1 cells upon exposure to each PFAS. 3T3-L1 cells were differentiated with or without each PFAS for 4-days, and cellular lipid was quantified using Nile Red staining. Analysis of the adipocyte proteome was performed to identify the pathways related to adipogenesis and quantify proteins significantly affected by each PFAS. The results showed that in general, every PFAS investigated in our study has the potential to induce the 3T3-L1 differentiation to adipocytes in the presence of rosiglitazone, with the concentrations that range between 0.25 and 25 μ M. Proteomics analysis revealed specific markers regarding to adipogenesis upregulated upon exposure to each of the ten PFAS.			D	E	3

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D1175	in vitro (代謝)	Zhang, Ruijia; Yao, Yao; Tu, Lanyin; Luan, Tiangang; Chen, Baowei	Non-targeted metabolomics of multiple human cells revealing differential toxic effects of perfluorooctanoic acid	2021	J Hazard Mater. 2021 May 5;409:125017. doi: 10.1016/j.jhazmat.2020.125017. Epub 2020 Dec 31.	Differences in toxic effects of contaminants among human cells are essential for evaluating their health risks to humans. In this study, non-targeted metabolomics of multiple human cell lines (A549 (lung), DLD-1 (intestine) and L-02 (liver) cells) was used to address the differential toxicity of perfluorooctanoic acid (PFOA). The number of differential metabolites (DMs) identified in the PFOA-treated A549 cells (67) was highest, followed by DLD-1 (12) and L-02 cells (10). The categorization of DMs was almost uniquely specific to each of cell lines. PFOA significantly promoted linoleic acid metabolism in L-02 cells whereas this metabolism was inhibited in the PFOA-treated A549 cells. The levels of interleukin (IL)-1 β , IL-6, IL-8 and IL-13 were about 1.5 times higher in the PFOA-treated A549 and L-02 cells than in the controls. PFOA stimulated the biosynthesis of arginine and the metabolism of vitamin B6 in A549 cells. Arginine and vitamin B6 supplemented into cell culture effectively decreased the levels of IL-6 and IL-8. The inhibition of purine metabolism by PFOA resulted in the arrestation of DLD-1 cells at the G(0)/G(1)-phase. Our results suggest that the differential toxicity of PFOA related to exposure pathways could be elucidated by metabolic profiles specific to various human cells.			D	В
D1176	in vitro (代謝)	He, Xiaowei; Wu, Dan; Xu, Yanan; Zhang, Yaqin; Sun, Yue; Chang, Xiaoai; Zhu, Yunxia; Tang, Wei	Perfluorooctanoic acid promotes pancreatic β cell dysfunction and apoptosis through ER stress and the ATF4/CHOP/TRIB3 pathway	2022	Environ Sci Pollut Res Int. 2022 Dec;29(56):84532-84545. doi: 10.1007/s11356-022-21188-9. Epub 2022 Jul 4.	Perfluorooctanoic acid (PFOA), a widely used chemical substance, causes an increased risk of human type 2 diabetes (T2D), but its underlying mechanism is not well elucidated. The aim of the present study was to investigate whether PFOA regulates the functions of pancreatic β cells, which are specialized for the biosynthesis and secretion of insulin. The treatment of the mouse pancreatic β cell line (MIN6 cells) with PFOA caused a time- and dose-dependent inhibition of cell viability in CCK-8 assays. Annexin V/PI and TUNEL staining results confirmed that exposure to a high PFOA dose (500 μ M) promoted apoptosis of β cells, while a low dose (300 μ M) had no effects on β cell survival. PFOA treatment, even at a low dose, diminished glucose-stimulated insulin secretion (GSIS) in both primary islet perfusion and MIN6 cell experiments. RNA-sequencing data showed significantly increased expression of endoplasmic reticulum (ER) stress-associated genes, with tribbles homolog 3 (Trib3) ranking first among the altered genes. The activation of ER stress pathways was verified by qRT-PCR assays, and the ATF4/CHOP/TRIB3 pathway contributed to PFOA-induced β cell damage. The inhibition of TRIB3 expression significantly protected MIN6 cells from PFOA- induced GSIS defects and apoptosis by ameliorating ER stress. These findings reveal a link between ER stress and PFOA-induced β cell defects, opening up a new set of questions about the pathogenesis of T2D due to environmental chemicals.			D	В
D1177	in vitro (代謝)	Duan, Xiaoyu; Sun, Weijie; Sun, Hongwen; Zhang, Lianying	Perfluorooctane sulfonate continual exposure impairs glucose-stimulated insulin secretion via SIRT1- induced upregulation of UCP2 expression	2021	Environ Pollut. 2021 Jun 1;278:116840. doi: 10.1016/j.envpol.2021.116840. Epub 2021 Mar 1.	Per- and polyfluoroalkyl substances (PFASs) are environmentally and biologically persistent anthropogenic chemicals linked to adverse health outcomes. Epidemiological data have revealed association between exposure to specific PFAS and disruption of insulin level in bodies. However, the effect of PFASs on insulin secretion and the responsible molecular mechanism are poorly understood. In the present study, we used perfluorooctane sulfonate (PFOS) as a representative PFAS family member to investigate its effect on the insulin secretion in mouse pancreatic β cells (β -TC-6). Our results showed that exposure to PFOS inhibited silent information regulator 1 (SIRT1) activity, and molecular simulation showed PFOS could fit into the pocket overlapped with the nicotinamide adenine dinucleotide (NAD(+)) binding cavity in SIRT1. PFOS exposure upregulated uncoupling protein 2 (UCP2) expression, and this upregulation was blunted in the presence of Ex-527, a SIRT1 specific inhibitor. The mitochondria membrane potential ($\Delta \Psi$ m), as well as the glucose-induced ATP production and Ca(2+) influx decreased under PFOS treatment. PFOS continual exposure (48 h) impaired glucose stimulated insulin secretion (GSIS), while the gene expression of insulin was not significantly altered. Importantly, the SIRT1 activator and UCP2 inhibitor could partly reverse the PFOS-induced impairment of GSIS. Taken together, the results suggested that PFOS continual exposure could inhibit SIRT1 activity, and the SIRT1-UCP2 pathway mediated, at least partially, the PFOS induced GSIS impairment.			D	В
D1178	in vitro (代謝)	Al-Abdulla, Ruba; Ferrero, Hilda; Soriano, Sergi; Boronat-Belda, Talía; Alonso- Magdalena, Paloma	Screening of Relevant Metabolism-Disrupting Chemicals on Pancreatic β -Cells: Evaluation of Murine and Human In Vitro Models	2022	Int J Mol Sci. 2022 Apr 10;23(8):4182. doi: 10.3390/ijms23084182.	Endocrine-disrupting chemicals (EDCs) are chemical substances that can interfere with the normal function of the endocrine system. EDCs are ubiquitous and can be found in a variety of consumer products such as food packaging materials, personal care and household products, plastic additives, and flame retardants. Over the last decade, the impact of EDCs on human health has been widely acknowledged as they have been associated with different endocrine diseases. Among them, a subset called metabolism-disrupting chemicals (MDCs) is able to promote metabolic changes that can lead to the development of metabolic disorders such as diabetes, obesity, hepatic steatosis, and metabolic syndrome, among others. Despite this, today, there are still no definitive and standardized in vitro tools to support the metabolic risk assessment of existing and emerging MDCs for regulatory purposes. Here, we evaluated the following two different pancreatic cell-based in vitro systems: the murine pancreatic β -cell line MIN6 as well as the human pancreatic β -cell line EndoC- β H1. Both were challenged with the following range of relevant concentrations of seven well-known EDCs: (bisphenol-A (BPA), bisphenol-S (BPS), bisphenol-F (BPF), perfluorooctanesulfonic acid (PFOS), di(2-ethylhexyl) phthalate (DEHP), cadmium chloride (CdCl(2)), and dichlorodiphenyldichloroethylene (DDE)). The screening revealed that most of the tested chemicals have detectable, deleterious effects on glucose-stimulated insulin release, insulin content, electrical activity, gene expression, and/or viability. Our data provide new molecular information on the direct effects of the selected chemicals on key aspects of pancreatic β -cell function, such as the stimulus-secretion coupling and ion channel activity. In addition, we found that, in general, the sensitivity and responses were comparable to those from other in vivo studies reported in the literature. Overall, our results suggest that both systems can serve as effective tools for the rapid screening of pot			D	С

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D1179	MOA (PPAR)	Qin, Hui; Niu, Yuxin; Luan, Haiyang; Li, Minghan; Zheng, Lu; Pan, Yifan; Liu, Wei	Effects of legacy and emerging per- and polyfluoroalkyl substances on PPAR $\alpha / \beta / \gamma$ regulation and osteogenic/adipogenic differentiation	2022	Environ Int. 2022 Oct 13;170:107584. doi: 10.1016/j.envint.2022.107584. Online ahead of print.	As the primary molecular target, there is still a gap between the peroxisome proliferator-activated receptors (PPARs) regulation and the adverse health effects caused by per- and polyfluoroalkyl substances (PFASs). The effects of PFASs on cellular differentiation regulated by PPARs is likely significant given the association of PFASs exposure with obesity and decreased bone density. Human mesenchymal stem cells (hMSCs) were used as an in vitro model to assess the roles of PPAR subtypes in the multipotent differentiation of hMSCs affected by perfluorooctanesulfonate (PFOS), perfluorooctanoic acid (PFOA) and their replacement compounds. PFASs increased the expression of three PPAR subtypes in proliferating and differentiating hMSCs. Meanwhile, PFOS and PFOA decreased osteogenesis, enhanced adipogenesis, and increased bone turnover in hMSCs. Similarly, PFOA alternatives, hexafluoropropylene oxide dimer acid (HFPO-DA) and hexafluoropropylene oxide trimer acid (HFPO-TA), exhibited similar or even higher potency in affecting stem cell differentiation compared with PFOA. Perfluorohexanesulfonate (PFHxS) inhibited osteogenesis. PPAR β expression is significantly positively correlated with osteogenesis and osteoprotegerin (OPG) secretion in 6:2CI-PFESA treated cells. shRNA knockdown of PPAR β remarkably reversed the osteogenic effects of 6:2CI-PFESA and enhanced the adipogenic effects of the six chemicals. The results suggested that the adverse effects and relative potency of PFASs on the multipotent differentiation of hMSCs were dependent on the integrated action of the three PPAR subtypes, which facilitates a better understanding of the molecular initiating events of PFASs. The present study may well explain the mechanism of the decreased bone density and increased obesity incidence among those exposed to legacy PFASs,		D	В
D1180	MOA (PPAR)	Almeida, Nuno M S; Eken, Yiğitcan; Wilson, Angela K	Binding of Per- and Polyfluoro-alkyl Substances to Peroxisome Proliferator-Activated Receptor Gamma	2021	ACS Omega. 2021 Jun 4;6(23):15103-15114. doi: 10.1021/acsomega.1c01304. eCollection 2021 Jun 15.	and indicates the necessity of further health risk assessment for the alternatives. Peroxisome proliferator receptor gamma (PPAR γ), a type II nuclear receptor, fundamental in the regulation of genes, glucose metabolism, and insulin sensitization has been shown to be impacted by per- and poly-fluoroalkyl substances (PFASs). To consider the influence of PFASs upon PPAR γ , the molecular interactions of 27 PFASs have been investigated. Two binding sites have been identified on the PPAR γ homodimer structure: the dimer pocket and the ligand binding pocket, the former has never been studied prior. Molecular dynamics calculations were performed to gain insights about PFASs-PPAR γ binding and the role of acidic and basic residues. The electrostatic interactions for acidic and basic residues far from the binding site were probed, together with their effect on PPAR γ recognition. Short-range electrostatic and van der Waals interactions with nearby residues and their influence on binding energies were investigated. As the negative effects of perfluorooctane sulfonate acid were previously shown to be alleviated by one of its natural ligands, I-carnitine, here, the utility of I-carnitine as a possible inhibitor for other PFASs has been considered. A comparison of the binding patterns of I-carnitine and PFASs provides insights toward mitigation strategies for PFASs.		D	В
D1181	MOA(受 容体結合 能)	Li, Xin; Chen, Lei; Zhou, Haitao; Wang, Jie; Zhao, Chunyan; Pang, Xinyue	PFOA regulate adenosine receptors and downstream concentration-response cAMP-PKA pathway revealed by integrated omics and molecular dynamics analyses	2022	Sci Total Environ. 2022 Jan 10;803:149910. doi: 10.1016/j.scitotenv.2021.149910. Epub 2021 Aug 26.	As an important pollutant, perfluorooctane acid (PFOA) has been widely concerned and reported by thousands of times, while less is known about the concentration-response pathway of PFOA. The aim of the present work was to reveal the concentration-response mechanism of PFOA in human cells. Omics results showed that calcium-related pathways play key roles in PFOA injury mechanisms. The results of GO and KEGG analyses showed that the cAMP signaling pathway was presented as the top one in all of the regulatory patterns and concentrations groups of PFOA. In the cAMP signaling pathway, the adenosine A(1) receptor (ADORA1) recognized the low concentration of PFOA and induced pathway "G(i)-cAMP-PKA" to decrease the concentration of cAMP. This indicated that the low concentration of PFOA may promote breast hyperplasia and inhibit lactation. While adenosine A(2A) receptor (ADORA2A) recognized the high concentration of PFOA and induced pathway "G(S)-AC-cAMP-RKA" to increase the concentration of cAMP, induce cell damage and may lead to the deterioration of breast cancer. The results of molecular dynamics simulation showed that PFOA could bind to ADORA1 and ADORA2A, thus cause subsequent signal transduction. Furthermore, considering the strong binding ability of PFOA with ADORA1, PFOA tends to bind to ADORA1 at a low concentration. On the other side, PFOA at high concentration will continue to bind to another receptor protein, ADORA2A, and activate subsequent signaling pathways. Combined analyses of transcriptomic and proteomic revealed that different concentrations of PFOA, ADORA1 and ADORA2A were activated respectively, showing opposite cellular effects, leading to kinds of breast lesions. In the nervous system, PFOA might induce a variety of nervous system diseases. The present work was an exploration on the toxicological mechanism of PFOA, providing important information on the health impacts of PFOA in humans.		C	В
D1182	MOA(受 容体結合 能)	Yu, Shuling; Ren, Jing; Lv, Zhenxia; Li, Rui; Zhong, Yuyan; Yao, Wu; Yuan, Jintao	Prediction of the endocrine-disrupting ability of 49 per- and polyfluoroalkyl substances: In silico and epidemiological evidence	2022	Chemosphere. 2022 Mar;290:133366. doi: 10.1016/j.chemosphere.2021.133366. Epub 2021 Dec 18.	The toxic effects of per- and polyfluoroalkyl substances (PFASs) on humans are mediated by nuclear hormone receptors (NHRs). However, data on the interaction of PFASs and NHRs is limited. Endocrine Disruptome, an inverse docking tool, was used in this study to simulate the docking of 49 common PFASs with 14 different types of human NHRs. According to the findings, 25 PFASs have a high or moderately high probability of binding to more than five NHRs, with androgen receptor (AR) and mineralocorticoid receptor (MR) being the most likely target NHRs. Molecular docking analyses revealed that the binding modes of PFASs with the two NHRs were similar to those of their corresponding co-crystallized ligands. PFASs, in particular, may disrupt the endocrine system by binding to MR. This finding is consistent with epidemiological research that has linked PFASs to MR-related diseases. Our findings may contribute to a better understanding of the health risks posed by PFASs.		D	С

No.	(参考)	著者	タイトル	発行年	書誌情報	要旨(原文)
D1183	MOA(受 容体結合 能)	Lai, Thanh T; Eken, Yiğitcan; Wilson, Angela K	Binding of Per- and Polyfluoroalkyl Substances to the Human Pregnane X Receptor	2020	Environ Sci Technol. 2020 Dec 15;54(24):15986-15995. doi: 10.1021/acs.est.0c04651. Epub 2020 Nov 23.	Per- and polyfluoroalkyl substances (PFASs) are a class of environmentally persistent indust metabolic pathways. Among the protein receptors to which PFASs bind, the human pregnane host for a variety of long- and short-chain PFASs that lead to its overactivation. Overactivation endocrine disruption, oxidative stress, hepatic steatosis, and adverse drug interactions. In thi used to study the binding between hPXR and a number of PFAS compounds, including altern not been experimentally tested. This is the first-time MD is used to study the interactions be how relative binding free energies of PFASs relate to hPXR agonism. Binding free energy calc per-residue decomposition calculations, and alanine scanning studies are done to provide fur several short-chain and alternative PFAS compounds to long-chain PFASs that have yet to be These short-chain and alternative species include perfluorobutane sulfonic acid (PFBS), Gen tetrafluoro-2-heptafluoropropoxy propanoic acid), ADONA (trade name for 4,8-dioxa-3H-perf fluorotelomer carboxylic acid (6:2 FTCA). The study shows key aspects of PFAS recognition of binding to hPXR and the hPXR activity change observed upon the PFAS exposure, and the pc on hPXR activity.
D1184	MOA(受 容体結合 能)	Tachachartvanic h, Phum; Singam, Ettayapuram Ramaprasad Azhagiya; Durkin, Kathleen A; Furlow, J David; Smith, Martyn T; La Merrill, Michele A	In Vitro characterization of the endocrine disrupting effects of per- and poly-fluoroalkyl substances (PFASs) on the human androgen receptor	2022	J Hazard Mater. 2022 May 5;429:128243. doi: 10.1016/j.jhazmat.2022.128243. Epub 2022 Jan 10.	Per- and poly-fluoroalkyl substances (PFASs) are used extensively in a broad range of indust products. While a few legacy PFASs have been voluntarily phased out, over 5000 PFASs have their predecessors. The potential endocrine disrupting hazards of most emerging PFASs have investigated. In silico molecular docking to the human androgen receptor (hAR) combined wit previously applied to 5206 PFASs and predicted 23 PFASs bind the hAR. Herein, the in silico five candidate AR ligands that were commercially available. Three manufactured PFASs nam- tetrahydro-1 H,5 H,11 H-pyrano[2,3-f]pyrido[3,2,1-ij]quinolin-11-one (NON), 2-(heptafluorop and 2,2,3,3,4,4,5,5,5-nonafluoro-N-(4-nitrophenyl)pentanamide (NNN) elicited significant ant concentrations. We further investigated the mechanism of AR inhibition and found that all the transactivation induced by testosterone through a competitive binding mechanism. We then o of these PFASs on AR expression and its responsive genes. Consistently, these PFASs signifi PSA and FKBP5 and increased the expression of AR, similar to the effects elicited by a know hydroxyflutamide. This suggests they are competitive human prostate cancer cells. Hence corroborate our published in silico approach and indicate these emerging PFASs may adverse system.
D1185	MOA(心 血管系)	Cui, Jiajing; Wang, Pingwei; Yan, Shuqi; Liang, Yujun; Liu, Dongge: Ren.	Perfluorooctane Sulfonate Induces Dysfunction of Human Umbilical Vein Endothelial Cells via Ferroptosis Pathway	2022	Toxics. 2022 Aug 28;10(9):503. doi: 10.3390/toxics10090503.	(1) Background: Perfluorooctane sulfonate (PFOS) is a persistent organic pollutant, and it is regarding its human health risks due to its extensive use. Endothelial dysfunction is a mark o basic mechanism of PFOS-induced endothelial dysfunction is still not fully understood. Ferro cell death driven by cellular metabolism and iron-dependent lipid peroxidation. Although ferro involved in the pathogenesis of cardiovascular diseases, the involvement of ferroptosis in the dysfunction caused by PFOS remains unclear. (2) Purpose: To explore the role of ferroptosis and underlying mechanisms. (3) Methods: Human umbilical vein endothelial cells (HUVECs) Fer-1. The viability, morphology change under electronic microscope, lipid-reactive oxygen sp nitric oxide (NO) were determined. The expression of glutathione peroxidase 4(GPX4). ferritin

別添-2 文献データベース文献リスト

Dongge; Ren,

Shuping

分野

要旨(原文)	備考	出 情 対 報 象 抽	ン 文 ク 献 ① ラ	ン 文 ク 献 ② ラ
Per- and polyfluoroalkyl substances (PFASs) are a class of environmentally persistent industrial compounds that disrupt various metabolic pathways. Among the protein receptors to which PFASs bind, the human pregnane X receptor (hPXR) is found to be a host for a variety of long- and short-chain PFASs that lead to its overactivation. Overactivation of hPXR is linked to potential endocrine disruption, oxidative stress, hepatic steatosis, and adverse drug interactions. In this study, molecular dynamics (MD) is used to study the binding between hPXR and a number of PFAS compounds, including alternatives whose activity on hPXR has not been experimentally tested. This is the first-time MD is used to study the interactions between PFASs and hPXR, showing how relative binding free energies of PFASs relate to hPXR agonism. Binding free energy calculations, hydrogen bond analysis, per-residue decomposition calculations, and alanine scanning studies are done to provide further insight. Activities on hPXR for several short-chain and alternative species include perfluorobutane sulfonic acid (PFBS), Gen-X (trade name for 2,3,3-tetrafluoro-2-heptafluoropropoxy propanoic acid), ADONA (trade name for 4,8-dioxa-3H-perfluorononanoic acid), and 6:2 fluorotelomer carboxylic acid (6:2 FTCA). The study shows key aspects of PFAS recognition on the hPXR, the link between PFAS binding to hPXR activity.			D	С
Per- and poly-fluoroalkyl substances (PFASs) are used extensively in a broad range of industrial applications and consumer products. While a few legacy PFASs have been voluntarily phased out, over 5000 PFASs have been produced as replacements for their predecessors. The potential endocrine disrupting hazards of most emerging PFASs have not been comprehensively investigated. In silico molecular docking to the human androgen receptor (hAR) combined with machine learning techniques were previously applied to 5206 PFASs and predicted 23 PFASs bind the hAR. Herein, the in silico results were validated in vitro for the five candidate AR ligands that were commercially available. Three manufactured PFASs namely (9-(nonafluorobutyl)- 2,3,6,7-tetrahydro-1 H,5 H,11 H-pyrano[2,3-f]pyrido[3,2,1-ij]quinolin-11-one (NON), 2-(heptafluoropropyl)- 3-phenylquinoxaline (HEP), and 2,2,3,3,4,4,5,5,5-nonafluoro-N-(4-nitrophenyl)pentanamide (NNN) elicited significant antiandrogenic effects at relatively low concentrations. We further investigated the mechanism of AR inhibition and found that all three PFASs inhibited AR transactivation induced by testosterone through a competitive binding mechanism. We then examined the antiandrogenic effects of these PFASs on AR expression and its responsive genes. Consistently, these PFASs significantly decreased the expression of PSA and FKBP5 and increased the expression of AR, similar to the effects elicited by a known competitive AR inhibitor, hydroxyflutamide. This suggests they are competitive antagonists of AR activity and western blot analysis revealed these PFASs decreased intracellular AR protein in androgen sensitive human prostate cancer cells. Hence, the findings presented here corroborate our published in silico approach and indicate these emerging PFASs may adversely affect the human endocrine system.			D	С
(1) Background: Perfluorooctane sulfonate (PFOS) is a persistent organic pollutant, and it is receiving increasing attention regarding its human health risks due to its extensive use. Endothelial dysfunction is a mark of cardiovascular disease, but the basic mechanism of PFOS-induced endothelial dysfunction is still not fully understood. Ferroptosis is a newly defined regulatory cell death driven by cellular metabolism and iron-dependent lipid peroxidation. Although ferroptosis has been shown to be involved in the pathogenesis of cardiovascular diseases, the involvement of ferroptosis in the pathogenesis of endothelial dysfunction caused by PFOS remains unclear. (2) Purpose: To explore the role of ferroptosis in the dysfunction of endothelial cells and underlying mechanisms. (3) Methods: Human umbilical vein endothelial cells (HUVECs) were exposed to PFOS or PFOS and Fer-1. The viability, morphology change under electronic microscope, lipid-reactive oxygen species (lipid-ROS), and production of nitric oxide (NO) were determined. The expression of glutathione peroxidase 4(GPX4), ferritin heavy chain protein 1 (FTH1), heme oxygenase 1 (HO-1) and Acyl-CoA synthetase long-chain family member 4 (ACSL4) were analyzed via Western blot analysis. (4) Results: PFOS was shown to cause a decrease in viability and morphological changes of mitochondria, and well as an increase in lipid droplets. The expression of GPX4, FTH1 and HO-1 was decreased, and that of ACSL4 was increased after exposure to PFOS. In addition to the above-mentioned ferroptosis-related manifestations, there was also a reduction in NO content. (5) Conclusions: PFOS induces ferroptosis by regulating the GPX4 and ACSL4 pathways, which leads to HUVEC dysfunction.			D	В

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D1186	MOA(心 血管系)	Papadopoulou, Eleni; Nicolescu, Alina; Haug, Line S; Husøy, Trine; Deleanu, Calin; Dirven, Hubert; Lindeman, Birgitte	Lipoprotein profiles associated with exposure to poly- and perfluoroalkyl substances (PFASs) in the EuroMix human biomonitoring study	2022	Environ Pollut. 2022 Sep 1;308:119664. doi: 10.1016/j.envpol.2022.119664. Epub 2022 Jun 20.	Exposure to per- and polyfluoroalkyl substances (PFASs) is associated with increased blood cholesterol. Although elevated cholesterol is a well-established risk factor for cardiovascular diseases (CVD), it is not clear whether PFASs affect this risk. Lipoprotein subclasses are emerging biomarkers for disease risk and lipoprotein profiling may provide an insight to physiological implications of PFAS exposure. We explored the association between serum PFAS concentrations and lipoprotein subclasses in a cross-sectional study. We determined the concentrations and lipid composition of the major subclasses of lipoproteins in plasma samples from 127 adult participants of the EuroMix human biomonitoring study by nuclear magnetic resonance (NMR). Serum concentrations of 17 PFASs showed a detection frequency between 30 and 100% and were included in further analyses. We examined the associations between PFAS concentrations and lipoprotein subclasses by linear mixed-effect regression models, adjusted for confounders. In the adjusted models, positive associations were found between several PFASs and cholesterol per interquartile range (IQR) increase for several PFASs. In women the associations with PFNA, PFUnDA, PFDoDA and PFOS were significant after adjustment for multiple comparisons. Similar magnitude of change was observed between longer chained PFASs and LDL cholesterol, and a few of these associations reached significance for cholesterol in large to medium LDL particle sizes in women. No significant associations with plasma triglycerides were observed. However, most PFASs tended to be associated with reduction in VLDL (very low-density lipoproteins) particle number and VLDL triglyceride. Findings from this exploratory study, suggest that background PFAS exposures influence particle size distributions and lipid composition of plasma lipoprotein subclasses, and that these effects may be more prominent in women. A two-points lipoprofiling for all subjects indicated both low intra-individual variability and good analytica		D A
D1187	MOA(代 謝)	Li, Zhuo; Yu, Zhenyang; Yin, Daqiang	Multi- and trans-generational disturbances of perfluorobutane sulfonate and perfluorohexane sulfonate on lipid metabolism in Caenorhabditis elegans	2021	Chemosphere. 2021 Oct;280:130666. doi: 10.1016/j.chemosphere.2021.130666. Epub 2021 Apr 27.	Short-chained perfluorobutane sulfonate (PFBS, four-carbon) and perfluorohexane sulfonate (PFHxS, six-carbon) are widely employed to substitute long-chained per- and poly-fluoroalkyl substances (PFASs). Recent studies showed the potential persistence of PFBS and PFHxS, and also reported their correlation with obesity. However, the long-term outcome and underlying mechanisms remained poorly understood. Presently, the effects of PFBS and PFHxS were studied on C. elegans with multi- and trans-generational experiments. The multi-generational effects were measured in continuous four generational exposure (i.e., F1 to F4). Results showed that PFBS did not stimulate the fat content in F1 but in F4 with continuous but different disturbances on the lipid metabolism and the insulin and insulin-like (IIS) pathway. PFHxS stimulated the fat content in F1 and F4 with similar disturbances on the lipid metabolism and IIS pathway. The trans-generational results showed that the effects of PFBS and PFHxS on the lipid metabolism and IIS pathway were not totally recovered in the offspring of F1 (i.e., T1-T3) and F4 (i.e., T1'-T3') which were not continuously exposed. PFHxS showed a common pattern to up-regulate daf-7 in both multi- and trans-generational effects. The long-term consequences of the short-chained PFASs substitutes should be concerned and epigenetic regulations should be considered in future mechanism studies.		СС
D1188	MOA(代 谢)	Ling, Junyi; Hua, Lu; Qin, Yi; Gu, Tianye; Jiang, Shengyang; Zhao, Jianya	Perfluorooctane sulfonate promotes hepatic lipid accumulation and steatosis in high-fat diet mice through AMP-activated protein kinase/acetyl-CoA carboxylase (AMPK/ACC) pathway	2022	J Appl Toxicol. 2022 Aug 23. doi: 10.1002/jat.4383. Online ahead of print.	Perfluorooctane sulfonate (PFOS) is a hepatotoxic environmental organic pollutant that can cause aberrant lipid accumulation in the liver. However, the molecular mechanism underlying PFOS-induced hepatic steatosis remains unclear. Our research showed that subchronic PFOS exposure inhibited AMP-activated protein kinase (AMPK) phosphorylation, leading to increased acetyl-CoA carboxylase (ACC) activity, attenuated fatty acid β -oxidation, and consequent liver lipid accumulation. We found that 1 mg/kg/day PFOS exposure significantly aggravated steatosis in high-fat diet (HFD)-fed mice, along with reduced AMPK activity. Oil Red O results showed that PFOS exposure caused fat accumulation in HepG2 cells. As predicted, PFOS treatment reduced the level of phosphorylated AMPK in a concentration-dependent manner, leading to subsequent increase in ACC activity and lipid droplet accumulation in HepG2 cells. Treatment with 200- μ M AMPK agonist AICAR alleviated PFOS-induced ACC activation and lipid accumulation. In summary, our data highlight a crucial role of AMPK/ACC pathway in PFOS-mediated liver lipid metabolic disorders.		ВВ

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 象抽 ① ラ ② ラ
D1189	MOA(代 謝)	Deng, Pan; Durham, Jerika; Liu, Jinpeng; Zhang, Xiaofei; Wang, Chi; Li, Dong; Gwag, Taesik; Ma, Murong; Hennig, Bernhard	Metabolomic, Lipidomic, Transcriptomic, and Metagenomic Analyses in Mice Exposed to PFOS and Fed Soluble and Insoluble Dietary Fibers	2022	Environ Health Perspect. 2022 Nov;130(11):117003. doi: 10.1289/EHP11360. Epub 2022 Nov 4.	BACKGROUND: Perfluorooctane sulfonate (PFOS) is a persistent environmental pollutant that has become a significant concern around the world. Exposure to PFOS may alter gut microbiota and liver metabolic homeostasis in mammals, thereby increasing the risk of cardiometabolic diseases. Diets high in soluble fibers can ameliorate metabolic disease risks. OBJECTIVES: We aimed to test the hypothesis that soluble fibers (inulin or pectin) could modulate the adverse metabolic effects of PFOS by affecting microbe-liver metabolism and interactions. METHODS: Male C57BL/6J mice were fed an isocaloric diet containing different fibers: a) inulin (soluble), b) pectin (soluble), or c) cellulose (control, insoluble). The mice were exposed to PFOS in drinking water (3 μ g/g per day) for 7 wk. Multi-omics was used to analyze mouse liver and cecum contents. RESULTS: In PFOS-exposed mice, the number of differentially expressed genes associated with atherogenesis and hepatic hyperlipidemia were lower in those that were fed soluble fiber than those fed insoluble fiber. Shotgun metagenomics showed that inulin and pectin protected against differences in microbiome community in PFOS-exposed vs. control mice. It was found that the plasma PFOS levels were lower in inulin-fed mice, and there was a trend of lower liver accumulation of PFOS in soluble fiber-fed mice compared with the control group. Soluble fiber intake ameliorated the effects of PFOS on host hepatic metabolism gene expression and cecal content microbiome structure. DISCUSSIONS: Results from metabolomic, lipidomic, and transcriptomic studies suggest that inulin- and pectin-fed mice were less susceptible to PFOS-induced liver metabolic disturbance, hepatic lipid accumulation, and transcriptional changes compared with control diet-fed mice. Our study advances the understanding of interaction between microbes and host under the influences of environmental pollutants and nutrients. The results provide new insights into the microbe-liver metabolic network and the protection agai		D C
D1190	MOA(代 謝)	Wei, Cuiyun; Zhou, Zhen; Wang, Ling; Huang, Zichun; Liang, Yong; Zhang, Jie	Perfluorooctane sulfonate (PFOS) disturbs fatty acid metabolism in Caenorhabditis elegans: Evidence from chemical analysis and molecular mechanism exploration	2021	Chemosphere. 2021 Aug;277:130359. doi: 10.1016/j.chemosphere.2021.130359. Epub 2021 Mar 24.	Perfluorooctane sulfonate (PFOS) is a persistent organic pollutant that might induce disorders in fatty acid (FA) metabolism, but the underlying mechanisms remain unresolved. Caenorhabditis elegans (C. elegans) as a model organism can synthesize polyunsaturated FAs de novo via the polyunsaturated FA synthesis pathway. In this study, synchronized L1 C. elegans were exposed to 0, 0.01, 0.1, 0.5 and 1 μ M PFOS for 72 h. Gas chromatography-mass spectrometry (GC-MS) was used to establish a sensitive and reliable analysis method for PFASs in exposed nematode, the instrument detection limits of nine fatty acid methyl esters examined ranged between 1.11 and 27.6 ng/mL, with satisfactory reproducibility (RSD < 10%) observed. Methyl pentadecanoate (C15:0) was used as an internal standard, the linearity of the calibration (0.1-10 μ g/mL) nine FAs from the nematode were quantitatively analyzed. Comparing with the control group, PFOS exposure caused significantly decreased levels of C18:0 while significantly increased levels of C18:3n6. A decrease in the C18:3n6: C18:2n6 ratio was observed. Consistently, expression of the FA desaturation gene fat-3 was significantly down-regulated. These findings suggest that the FA disorder is associated with decrease in mRNA expression of Δ 6-desaturase genes in C. elegans. Simultaneously, the disorders in FA metabolism were found to disrupt mitochondrial function with a reduction in ATP synthesis, as determined by the luciferase method. In summary, the results of the study provide insights into the adverse effects of PFOS on FA metabolism in living organisms.		C C
D1191	海洋哺乳 類(代 謝)	Sun, Jiachen; Zhang, Long; Zhou, Fengli; Shaw, Susan; Roos, Anna; Berger, Michelle; Bäcklin, Britt- Marie; Huang, Yichao; Zheng, Xiaoshi; Wang, Xiaodong; Chen, Da	Hepatic Fatty Acid Profiles Associated with Exposure to Emerging and Legacy Halogenated Contaminants in Two Harbor Seal Populations across the North Atlantic	2022	Environ Sci Technol. 2022 Feb 1;56(3):1830-1840. doi: 10.1021/acs.est.1c06512. Epub 2022 Jan 24.	Fatty acids (FAs) have been extensively used as indicators of foraging ecology in marine mammals, yet their association with exposure to contaminants has rarely been investigated. The present study provided the first characterization of the relationship between hepatic FA profiles and exposure to a suite of contaminants in a sentinel species—the harbor seal (Phoca vitulina)—from the Gulf of Maine and the south coast of Sweden. FA profiles differed in the two seal populations, and the levels of legacy and alternative brominated flame retardants and polyhalogenated carbazoles were significantly elevated in Maine seals. Correlations between individual FAs and multiple flame retardants (FRs) and poly- and perfluoroalkyl substances (PFASs) were found in seals from both populations. Moreover, several FR and PFAS chemicals were significantly associated with the estimated desaturating enzyme activity inferred from the FA profiles. The ratios of poly to monounsaturated FAs (Σ PUFAs/ Σ MUFAs) and those of unsaturated to saturated FAs (Σ UFAs/ Σ SFAs) were significantly associated with HBBZ, PFHxS, or BDE 47 in seals from Maine and Sweden, whereas $\Sigma n - 6/\Sigma n - 3$ PUFAs was significantly associated with BDE 154 and 36-CCZ in Swedish and Maine seals, respectively. Our results suggest the lipid metabolism-disrupting potential of these contaminants in marine mammals and warrant continuous biomonitoring and risk assessment, considering the critical role of PUFAs in vital biological processes.		D C

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D1192	実験動物 (PPAR)	Schlezinger, J J; Hyötyläinen, T; Sinioja, T; Boston, C; Puckett, H; Oliver, J; Heiger- Bernays, W; Webster, T F	Perfluorooctanoic acid induces liver and serum dyslipidemia in humanized PPAR α mice fed an American diet	2021 2021 Toxicol Appl Pharmacol. 2021 Sep 1;426:115644. doi: 10.1016/j.taap.2021.115644. Epub 2021 Jul 10.	Per- and polyfluoroalkyl substances (PFAS) are pervasive in the environment resulting in nearly universal detection in people. Human serum PFAS concentrations are strongly associated with increased serum low-density lipoprotein cholesterol (LDL-C), and growing evidence suggests an association with serum triacylglycerides (TG). Here, we tested the hypothesis that perfluorooctanoic acid (PFOA) dysregulates liver and serum triacylglycerides in human peroxisome proliferator activated receptor α (hPPAR α)-expressing mice fed an American diet. Mice were exposed to PFOA (3.5 mg/L) in drinking water for 6 weeks resulting in a serum concentration of 48 ± 9 μ g/ml. In male and female hPPAR α mice, PFOA increased total liver TG and TG substituted with saturated and monounsaturated fatty acids. Lack of expression of PPAR α alone also increased total liver TG, and PFOA treatment had little effect on liver TG in PPAR α null mice. In hPPAR α mice, PFOA neither significantly increased nor decreased serum TG; however, there was a modest increase in TG associated with very low-density cholesterol particles in both sexes. Intriguingly, in female PPAR α null mice, PFOA significantly increased serum TG, with a similar trend in males. PFOA also modified fatty acid and TG homeostasis-related gene expression in liver, in a hPPAR α -dependent manner, but not in adipose. The results of our study and others reveal the importance of context (serum concentration and genotype) in determining the effect of PFOA on lipid homeostasis.			В	В
D1193	実験動物 (PPAR)	Li, Jing; Quan, Xiaojie; Lei, Saifei; Huang, Zhenyao; Wang, Qi; Xu, Pengfei	PFOS Inhibited Normal Functional Development of Placenta Cells via PPAR γ Signaling	Biomedicines. 2021 Jun 15;9(6):677. doi: 10.3390/biomedicines9060677.	Perfluorooctane sulfonic acid (PFOS), a persistent environmental pollutant, has adverse effects on gestation pregnancy. Peroxisome proliferator-activated receptor γ (PPAR γ) is involved in angiogenesis, metabolic processes, anti-inflammatory, and reproductive development. However, the function of PPAR γ in PFOS evoked disadvantageous effects on the placenta remain uncertain. Here, we explored the role of PPAR γ in PFOS-induced placental toxicity. Cell viability, cell migration, angiogenesis, and mRNA expression were monitored by CCK-8 assay, wound healing assay, tube formation assay, and real-time PCR, respectively. Activation and overexpression of PPAR γ were conducted by rosiglitazone or pcDNA-PPAR γ , and inhibition and knockdown of PPAR γ were performed by GW9662 or si-PPAR γ . Results revealed that PFOS decreased cell growth, migration, angiogenesis, and increased inflammation in human HTR-8/SVneo and JEG-3 cells. Placenta diameter and fetal weight decreased in mice treated with PFOS (12.5 mg/kg). In addition, rosiglitazone or pcDNA-PPAR γ rescued cell proliferation, migration, angiogenesis, and decreased inflammation induced by PFOS in HTR8/SVneo and JEG-3 cells. Furthermore, GW9662 or si-PPAR γ exacerbated the inhibition of cell viability, migration, angiogenesis, and aggravated inflammation induced by PFOS in HTR-8/SVneo and JEG-3 cells. Meanwhile, the results of mRNA expression level were consistent with the cell representation. In conclusion, our findings revealed that PFOS induced placenta cell toxicity and functional damage through PPAR γ pathway.			В	A
D1194	実験動物 (心血管 系)	Xu, Dongmin; Li, Li; Tang, Leilei; Guo, Ming; Yang, Jie	Perfluorooctane sulfonate induces heart toxicity involving cardiac apoptosis and inflammation in rats	2022 Exp Ther Med. 2022 Jan;23(1):14. doi: 10.3892/etm.2021.10936. Epub 2021 Oct 28.	Perfluorooctane sulfonate (PFOS) is a persistent pollutant that exerts toxicity and induces cardiogenesis in humans and animals. Yet, the effect of PFOS exposure on cardiac toxicity in adult rats has, to our knowledge, not been reported and the mechanism still remains unknown. The present study aimed to investigate the toxicity of PFOS on rat hearts and any associated mechanisms. Rats were exposed to 0 (control), 1 and 10 mg/kg PFOS every other day for 14 days. Body weight and heart weight were recorded. The serum levels of lactic dehydrogenase (LDH), creatine kinase (CK), creatine kinase-isoenzyme-MB (CK-MB) and cardiac troponin-T (cTn-T) in heart tissues were measured using biochemical assays. TUNEL staining and western blotting were applied to analyze levels of apoptosis in rat hearts. Pathological assessment and immunohistochemistry analysis of heart tissues were used to evaluate the levels of PFOS-induced cardiotoxicity and inflammatory infiltration. PFOS exposure at the dosage of 10 mg/kg significantly increased the percentage of heart to body weight; however, it did not alter the body weight. At 10 mg/kg, PFOS significantly increased expression levels of myocardial injury markers, such as cTn-T, LDH, CK and CK-MB, while 1 mg/kg PFOS upregulated the expression level of cTn-T in rats. Notably, cardiac fibrosis and myocardiac hypertrophy appeared in the 10 mg/kg PFOS group. In addition, TUNEL-positive cells were significantly increased by exposure to 10 mg/kg PFOS group. Inflammatory infiltration, detected by analyzing expression levels of IL-1 β and TNF- α , was significantly raised by 10 mg/kg PFOS exposure. In conclusion, these results demonstrated that 10 mg/kg PFOS-induced cardiac toxicity in rats, which was associated with an increase in apoptosis and the expression of proinflammatory cytokines.			В	В
D1195	実験動物 (代謝)	Pfohl, Marisa; Ingram, Lishann; Marques, Emily; Auclair, Adam; Barlock, Benjamin; Jamwal, Rohitash; Anderson, Dwight; Cummings, Brian S; Slitt, Angela L	Perfluorooctanesulfonic Acid and Perfluorohexanesulfonic Acid Alter the Blood Lipidome and the Hepatic Proteome in a Murine Model of Diet- Induced Obesity	2020 Toxicol Sci. 2020 Dec 1;178(2):311-324. doi: 10.1093/toxsci/kfaa148.	Perfluoroalkyl substances (PFAS) represent a family of environmental toxicants that have infiltrated the living world. This study explores diet-PFAS interactions and the impact of perfluorooctanesulfonic acid (PFOS) and perfluorohexanesulfonic (PFHxS) on the hepatic proteome and blood lipidomic profiles. Male C57BL/6J mice were fed with either a low-fat diet (10.5% kcal from fat) or a high fat (58% kcal from fat) high carbohydrate (42 g/l) diet with or without PFOS or PFHxS in feed (0.0003% wt/wt) for 29 weeks. Lipidomic, proteomic, and gene expression profiles were determined to explore lipid outcomes and hepatic mechanistic pathways. With administration of a high-fat high-carbohydrate diet, PFOS and PFHxS increased hepatic expression of targets involved in lipid metabolism and oxidative stress. In the blood, PFOS and PFHxS altered serum phosphatidylcholines, phosphatidylethanolamines, plasmogens, sphingomyelins, and triglycerides. Furthermore, oxidized lipid species were enriched in the blood lipidome of PFOS and PFHxS treated mice. These data support the hypothesis that PFOS and PFHxS increase the risk of metabolic and inflammatory disease induced by diet, possibly by inducing dysregulated lipid metabolism and oxidative stress.			В	В

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 対 象 抽	ン文ン文 ク献ク献 ① ラ ② ラ
D1196	実験動物 (代謝)	Liu, Hui; Sun, Weiqiang; Zhou, Yongbing; Griffin, Nathan; Faulkner, Sam; Wang, Li	iTRAQ-based quantitative proteomics analysis of Sprague-Dawley rats liver reveals perfluorooctanoic acid-induced lipid metabolism and urea cycle dysfunction	2022	Toxicol Lett. 2022 Mar 1;357:20-32. doi: 10.1016/j.toxlet.2021.12.016. Epub 2021 Dec 24.	Perfluorooctanoic acid (PFOA) is a typical C8 representative compound of perfluoroalkyl and polyfluoroalkyl substances (PFAS) widely used in industrial and domestic products. It is a persistent organic pollutant found in the environment as well as in the tissues of humans and wildlife. Despite emerging scientific and public interest, the precise mechanisms of PFOA toxicity remain unclear. In this study, male rats were exposed to 1.25, 5, and 20 mg PFOA/kg body weight/day for 14 days by gavage; food intake and bodyweight changes were recorded every day. After 14 days, blood was collected for sera biochemistry, livers were quickly stripped and weighed after execution. Part of the liver tissue was frozen by liquid nitrogen for iTRAQ-Based Quantitative Proteomics Analysis; and some was fixed in 4% paraformaldehyde (PFA) for histological section and hematoxylin-eosin (HE) staining. Urine samples were also collected and monitored by raising rats in metabolic cages. Real-time quantitative PCR and western blot was used to validate the proteomics assay after bioinformatics analysis. The results demonstrate that 20 mg/kg/d PFOA exposure cause body weight loss and significant liver swelling and reduced urea metabolism. The sera biochemistry assay shows that ALT, GGT, BILD and UREA levels have significant changes compared with normal control group and reference range of rat sera. The subsequent iTRAQ-based quantitative proteomics analysis of rat livers identified 3,327 non-redundant proteins of which 112 proteins were significantly upregulated and 80 proteins were downregulated. Gene ontology analysis revealed proteins are primarily involved in cellular, metabolic and single-organism processes. Among them, eight proteins (ACOX1, ACOX2, ACOX3, ACSL1, EHHADH, GOT2, MTOR and ACAA1) were related to oxidation of fatty acids and two proteins (ASS1 and CPS1) were found to be associated with urea cycle disorder. The downregulation of urea synthesis proteins ASS1 and CPS1 after exposure to PFOA was then confirmed through qPCR and w			D B
D1197	実験動物 (代謝)	Salter, Deanna M; Wei, Wei; Nahar, Pragati P; Marques, Emily; Slitt, Angela L	Perfluorooctanesulfonic Acid (PFOS) Thwarts the Beneficial Effects of Calorie Restriction and Metformin	2021	Toxicol Sci. 2021 Jul 16;182(1):82-95. doi: 10.1093/toxsci/kfab043.	A combination of calorie restriction (CR), dietary modification, and exercise is the recommended therapy to reverse obesity and nonalcoholic fatty liver disease. In the liver, CR shifts hepatic metabolism from lipid storage to lipid utilization pathways, such as AMP-activated protein kinase (AMPK). Perfluorooctanesulfonic acid (PFOS), a fluorosurfactant previously used in stain repellents and anti-stick materials, can increase hepatic lipids in mice following relatively low-dose exposures. To test the hypothesis that PFOS administration interferes with CR, adult male C57BL/6N mice were fed ad libitum or a 25% reduced calorie diet concomitant with either vehicle (water) or 100 μ g PFOS/kg/day via oral gavage for 6 weeks. CR alone improved hepatic lipids and glucose tolerance. PFOS did not significantly alter CR-induced weight loss, white adipose tissue mass, or liver weight over 6 weeks. However, PFOS increased hepatic triglyceride accumulation, in both mice fed ad libitum and subjected to CR. This was associated with decreased phosphorylated AMPK expression in liver. Glucagon (100 nM) treatment induced glucose production in hepatocytes, which was further upregulated with PFOS (2.5 μ M) co-treatment. Next, to explore whether the observed changes were related to AMPK signaling, HepG2 cells were treated with metformin or AICAR alone or in combination with PFOS (25 μ M). PFOS interfered with glucose-lowering effects of metformin, and AICAR treatment partially impaired PFOS-induced increase in glucose production. In 3T3-L1 adipocytes, metformin was less effective with PFOS co-treatment. Overall, PFOS administration disrupted hepatic lipid and glucose homeostasis and interfered with beneficial glucose-lowering effects of CR and metformin.			ВВ
D1198	実験動物 (代謝)	Roth, Katherine; Yang, Zhao; Agarwal, Manisha; Liu, Wendy; Peng, Zheyun; Long, Ze; Birbeck, Johnna; Westrick, Judy; Liu, Wanqing; Petriello, Michael C	Exposure to a mixture of legacy, alternative, and replacement per- and polyfluoroalkyl substances (PFAS) results in sex-dependent modulation of cholesterol metabolism and liver injury	2021	Environ Int. 2021 Dec;157:106843. doi: 10.1016/j.envint.2021.106843. Epub 2021 Aug 31.	BACKGROUND: Epidemiological studies have shown Per- and polyfluoroalkyl substances (PFAS) to be associated with diseases of dysregulated lipid and sterol homeostasis such as steatosis and cardiometabolic disorders. However, the majority of mechanistic studies rely on single chemical exposures instead of identifying mechanisms related to the toxicity of PFAS mixtures. OBJECTIVES: The goal of the current study is to investigate mechanisms linking exposure to a PFAS mixture with alterations in lipid metabolism, including increased circulating cholesterol and bile acids. METHODS: Male and female wild-type C57BL/6J mice were fed an atherogenic diet used in previous studies of pollutant-accelerated atherosclerosis and exposed to water containing a mixture of 5 PFAS representing legacy, replacement, and alternative subtypes (i.e., PFOA, PFOS, PFNA, PFHxS, and GenX), each at a concentration of 2 mg/L, for 12 weeks. Changes at the transcriptome and metabolome level were determined by RNA-seq and high-resolution mass spectrometry, respectively. RESULTS: We observed increased circulating cholesterol, sterol metabolites, and bile acids due to PFAS exposure, with some sexual dimorphic effects. PFAS exposure increased hepatic injury, demonstrated by increased liver weight, hepatic inflammation, and plasma alanine aminotransferase levels. Females displayed increased lobular and portal inflammation compared to the male PFAS-exposed mice. Hepatic transcriptomics analysis revealed PFAS exposure modulated multiple metabolic pathways, including those related to sterols, bile acids, and acyl carnitines, with multiple sexspecific differences observed. Finally, we show that hepatic and circulating levels of PFOA were increased in exposed females compared to males, but this sexual dimorphism was not the same for other PFAS examined. DISCUSSION: Exposure of mice to a mixture of PFAS results in PFAS-mediated modulation of cholesterol levels, possibly through disruption of enterohepatic circulation.			СВ

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン文ン ク献ク 1 ラ ② 1	文献ラ
D1199	実験動物 (代謝)	Guo, Hua; Sheng, Nan; Guo, Yong; Wu, Chengying; Xie, Weidong; Dai, Jiayin	Exposure to GenX and its novel analogs disrupts fatty acid metabolism in male mice	2021	Environ Pollut. 2021 Dec 15;291:118202. doi: 10.1016/j.envpol.2021.118202. Epub 2021 Sep 20.	Perfluoroalkyl ether carboxylic acids (PFECAs), including hexafluoropropylene oxide dimer acid (HFPO-DA, GenX), have been widely used as alternatives to perfluorooctanoic acid (PFOA) and subsequently detected in various environmental matrices. Despite this, public information regarding their hepatotoxicity remains limited. Here, to compare the hepatotoxicity of PFECAs and identify better alternatives for GenX, adult male mice were exposed to different concentrations (0.4, 2, and 10 mg/kg/d) of PFOA, GenX, and its analogs (PFMO2HpA and PFMO3NA) for 28 d. Results demonstrated increased hepatomegaly and disturbed fatty acid metabolism with increasing treatment doses. After dimensionality reduction analysis, significant differences were observed in the relative liver weights and liver and serum biochemical parameters among the four clusters. Furthermore, when chemical concentrations in the liver were similar, no differences in the indicators of liver injury associated with fatty acid metabolism were observed among groups in the same clusters. Our results suggest that dimensionality reduction analysis is a useful strategy for analyzing samples exposed to multiple compounds at different doses. Furthermore, PFECAs exhibit similar hepatotoxicities at the same cumulative hepatic concentration in mice with constant body weight, while PFMO2HpA exhibits lower hepatotoxicity compared to GenX at the same dose.			СВ	
D1200	実験動物 (代謝)	Wang, Li; Zhou, Yongbing; Ma, Xinzhuang; Sun, Weiqiang; Liu, Hui	Perfluorooctanoic acid-induced lipid metabolism disorder in SD rat liver and its effect on the expression of fatty acid metabolism-related proteins	2022	Zhong Nan Da Xue Xue Bao Yi Xue Ban. 2022 Jan 28;47(1):18-25. doi: 10.11817/j.issn.1672-7347.2022.210320	OBJECTIVES: Perfluorooctanoic acid (PFOA) can cause lipid metabolism disorders in animal body and affect the lipolysis and synthesis of fatty acids. Peroxisome proliferators-activated receptor (PPAR) plays an extremely important role in this process. This study aims to explore the effects of PFOA on liver lipid metabolism disorders in Sprague Dewley (SD) rats and the expression of PPAR. METHODS: A total of 40 male SD rats were randomly divided into 4 groups (n=10 in each group): a control group (ddH(2)O), a low-dose PFOA group [PFOA 1.25 mg/(kg-d)], a middle-dose PFOA group [PFOA 5.00 mg/(kg-d)], and a high-dose PFOA group [PFOA 20.00 mg/(kg-d)]. The rats were fed with normal diet, and PFOA exposure were performed by oral gavage for 14 days, and the rats were observed, weighted and recorded every day during the exposure. After the exposure, the blood was collected, and the livers were quickly stripped after the rats were killed. Part of the liver tissues were fixed in 4% paraformaldehyde for periodic acid-schiff (PAS) staining; the contents of HDLC, LDLC, TG, TC in serum and liver tissues, as well as the activities of their related enzymes were assayed; The expression levels of cyclic adenosine monophosphate-response element binding protein (Cbp), general control of amino acid synthesis 5-like 2 (Gcn5L2), peroxidation peroxisome proliferation 0. factor activated receptor γ (PPAR), silent information regulator 1 (Sirt1) and human retinoid X receptor alpha 2 (Rxr α 2) were detected by Western blotting. RESULTS: After 14 days of PFOA exposure, without significant difference (P>0.05), there was no significant difference in HDLC and TG (both P>0.05). The activities of alkaline phosphatase (AKP) and alanine aminotransferase (ALT) were increased significantly (P<0.05), on the thigh-dose group showed an increasing tendency, without significant difference in LDH and TG (both P>0.05); the HDLC content in the liver tissues in the high-dose group was significantly reduced, compared with the control group (P<0.05); the			A B	
D1201	実験動物 (代謝)	Qin, Weiping; Ren, Xiaomin; Zhao, Lixia; Guo, Lianghong	Exposure to perfluorooctane sulfonate reduced cell viability and insulin release capacity of eta cells	2022	J Environ Sci (China). 2022 May;115:162-172. doi: 10.1016/j.jes.2021.07.004. Epub 2021 Aug 2.	Per- and polyfuloroalkyl substances (PFAS) are found to have multiple adverse outcomes on human health. Recently, epidemiological and toxicological studies showed that exposure to PFAS had adverse impacts on pancreas and showed association with insulin abnormalities. To explore how PFAS may contribute to diabetes, we studied impacts of perfluorooctane sulfonate (PFOS) on cell viability and insulin release capacity of pancreatic β cells by using in vivo and in vitro methods. We found that 28-day administration with PFOS (10 mg/(kg body weight•day)) caused reductions of pancreas weight and islet size in male mice. PFOS administration also led to lower serum insulin level both in fasting state and after glucose infusion among male mice. For cell-based in vitro bioassay, we used mouse β -TC-6 cancer cells and found 48-hr exposure to PFOS decreased the cell viability at 50 μ mol/L. By measuring insulin content in supernatant, 48-hr pretreatment of PFOS (100 μ mol/L) decreased the insulin release capacity of β -TC-6 cells after glucose stimulation. Although these concentrations were higher than the environmental concentration of PFOS, it might be reasonable for high concentration of PFOS to exert observable toxic effects in mice considering mice had a faster removal efficiency of PFOS than human. PFOS exposure (50 μ mol/L) to β -TC-6 cells induced intracellular accumulation of reactive oxidative specie (ROS). Excessive ROS induced the reactive toxicity of cells, which eventually invoke apoptosis and necrosis. Results in this study provide evidence for the possible causal link of exposure to PFOS and diabetes risk.			ВВ	

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 村 報 銀	ン 文 ク 献 ① ラ ② ラ
D1202	実験動物 (代謝)	Hamilton, Matthew C; Heintz, Melissa M; Pfohl, Marisa; Marques, Emily; Ford, Lucie; Slitt, Angela L; Baldwin, William S	Increased toxicity and retention of perflourooctane sulfonate (PFOS) in humanized CYP2B6-Transgenic mice compared to Cyp2b-null mice is relieved by a high-fat diet (HFD)	2021	Food Chem Toxicol. 2021 Jun;152:112175. doi: 10.1016/j.fct.2021.112175. Epub 2021 Apr 8.	PFOS is a persistent, fluorosurfactant used in multiple products. Murine Cyp2b's are induced by PFOS and high-fat diets (HFD) and therefore we hypothesized that human CYP2B6 may alleviate PFOS-induced steatosis. Cyp2b-null and hCYP2B6-Tg mice were treated with 0, 1, or 10 mg/kg/day PFOS by oral gavage for 21-days while provided a chow diet (ND) or HFD. Similar to murine Cyp2b10, CYP2B6 is inducible by PFOS. Furthermore, three ND-fed hCYP2B6-Tg females treated with 10 mg/kg/day PFOS died during the exposure period; neither Cyp2b-null nor HFD-fed mice died. hCYP2B6-Tg mice retained more PFOS in serum and liver than Cyp2b-null mice presumably causing the observed toxicity. In contrast, serum PFOS retention was reduced in the HFD-fed hCYP2B6-Tg mice; the opposite trend observed in HFD-fed Cyp2b-null mice. Hepatotoxicity biomarkers, ALT and ALP, were higher in PFOS-treated mice and repressed by a HFD. However, PFOS combined with a HFD exacerbated steatosis in all mice, especially in the hCYP2B6-Tg mice with significant disruption of key lipid metabolism genes such as Srebp1, Pparg, and Hmgcr. In conclusion, CYP2B6 is induced by PFOS but does not alleviate PFOS toxicity presumably due to increased retention. CYP2B6 protects from PFOS-mediated steatosis in ND-fed mice, but increases steatosis when co-treated with a HFD.			D B
D1203	実験動物 (代謝)	Wan, Hin Ting; Cheung, Lok Yi; Chan, Ting Fung; Li, Marco; Lai, Keng Po; Wong, Chris Kong Chu	Characterization of PFOS toxicity on in-vivo and ex- vivo mouse pancreatic islets	2021	Environ Pollut. 2021 Nov 15;289:117857. doi: 10.1016/j.envpol.2021.117857. Epub 2021 Jul 26.	Considerable human data have shown that the exposure to per fluorooctane sulfonate (PFOS) correlates to the risk of metabolic diseases, however the underlying effects are not clearly elucidated. In this study, we investigated the impacts of PFOS treatment, using in-vivo, ex-vivo and in-vitro approaches, on pancreatic β -cell functions. Mice were oral-gavage with 1 and 5 μ g PFOS/g body weight/day for 21 days. The animals showed a significant increase in liver triglycerides, accompanied by a reduction of triglycerides in blood sera and glycogen in livers and muscles. Histological examination of pancreases showed no noticeable changes in the size and number of islets from the control and treatment groups. Immunohistochemistry showed a reduction of staining intensities of insulin and the transcriptional factors (Pdx-1, islet-1) in islets of pancreatic sections from PFOS-treated groups, but no changes in the intensity of Glut2 and glucagon were noted. Transcriptomic study of isolated pancreatic islets treated ex vivo with 1 μ M and 10 μ M PFOS for 24 h, underlined perturbations of the insulin signaling pathways. Western blot analysis of ex-vivo PFOS-treated islets revealed a significant reduction in the expression levels of the insulin receptor, the IGF1 receptor- β , Pdk1-Akt-mTOR pathways, and Pdx-1. Using the mouse β -cells (Min-6) treated with 1 μ M and 10 μ M PFOS for 24 h, Western blot analysis consistently showed the PFOS-treatment inhibited Akt-pathway and reduced cellular insulin contents. Moreover, functional studies revealed the inhibitory effects of PFOS on glucose-stimulated insulin-secretion (GSIS) and the rate of ATP production. Our data support the perturbing effects of PFOS on animal metabolism and demonstrate the underlying molecular targets to impair β -cell functions.			вв
D1204	実験動物 (代謝)	Chen, Yanyan; Jiang, Lilong; Zhang, Rong; Shi, Zhangsheng; Xie, Chengyi; Hong, Yanjun; Wang, Jianing; Cai, Zongwei	Spatially revealed perfluorooctane sulfonate-induced nephrotoxicity in mouse kidney using atmospheric pressure MALDI mass spectrometry imaging	2022	Sci Total Environ. 2022 Sep 10;838(Pt 3):156380. doi: 10.1016/j.scitotenv.2022.156380. Epub 2022 May 31.	Perfluorooctane sulfonate (PFOS), an emerging environmental persistent pollutant, has attracted extensive attention due to its potential nephrotoxicity. However, little is known about the spatial variations of lipid metabolism associated with PFOS exposure. In this study, atmospheric pressure matrix-assisted laser desorption/ionization mass spectrometry imaging (AP-MALDI MSI) was used to reveal the spatial distributions of PFOS and its adverse effect on lipid metabolism directly in mouse kidney sections. We have observed that PFOS accumulated in the renal pelvis and outer cortex regions, with some found in the medulla and inner cortex regions. Hematoxylin and eosin (H&E) staining results also demonstrated that the accumulation of PFOS caused damage to the mouse kidney, which was consistent with AP-MALDI MSI results. Furthermore, a total of 42 lipids were shown to be significantly different in the spatial distribution patterns and variations between control and PFOS exposure mice groups, including the significant down-regulation of lyso-glycerophospholipids (Lyso-GPs), phosphatidic acids (PA), phosphatidylcholines (PC), phosphatidylethanolamines (PE), phosphatidylserines (PS) sphingomyelins (SM) and sulfatides (ST) in renal medulla or cortex region of mouse kidney sections, and remarkable up-regulation of cholesterol and phosphatidylinositols (PI) in the cortex regions of mouse kidney sections. The AP-MALDI MSI provides a new tool to explore spatial distributions and variations of the endogenous metabolites for the risk assessment of environmental pollutants.			D B

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン 文 ク 献 ① ラ	ン 文 ク 献 ② ラ
D1205	実験動物 (代謝)	Han, Jiajun; Gu, Wen; Barrett, Holly; Yang, Diwen; Tang, Song; Sun, Jianxian; Liu, Jiabao; Krause, Henry M; Houck, Keith A; Peng, Hui	A Roadmap to the Structure-Related Metabolism Pathways of Per- and Polyfluoroalkyl Substances in the Early Life Stages of Zebrafish (Danio rerio)	2021	Environ Health Perspect. 2021 Jul;129(7):77004. doi: 10.1289/EHP7169. Epub 2021 Jul 21.	Background: Thousands of per- and polyfluoroalkyl substances (PFAS) with diverse structures have been detected in the ambient environment. Apart from a few well-studied PFAS, the structure-related toxicokinetics of a broader set of PFAS remain unclear. Objectives: To understand the toxicokinetics of PFAS, we attempted to characterize the metabolism pathways of 74 structurally diverse PFAS samples from the U.S. Environmental Protection Agency's PFAS screening library. Methods: Using the early life stages of zebrafish (Danio rerio) as a model, we determined the bioconcentration factors and phenotypic toxicities of 74 PFAS. Then, we applied high-resolution mass spectrometry-based nontargeted analysis to identify metabolites of PFAS in zebrafish larvae after 5 d of exposure by incorporating retention time and mass spectra. In vitro enzymatic activity experiments with human recombinant liver carboxylesterase (hCES1) were employed to validate the structure-related hydrolysis of 11 selected PFAS. Results: Our findings identified five structural categories of PFAS prone to metabolism. The metabolism pathways of PFAS were highly related to their structures as exemplified by fluorotelomer alcohols that the predominance of β -oxidation or taurine conjugation pathways were primarily determined by the number of hydrocarbons. Hydrolysis was identified as a major metabolism pathway for diverse PFAS, and perfluoroalkyl carboxamides showed the highest in vivo hydrolysis rates, followed by carboxyesters and sulfonamides. The hydrolysis of PFAS was verified with recombinant hCES1, with strong substrate preferences toward perfluoroalkyl carboxamides. Conclusions: We suggest that the roadmap of the structure-related metabolism pathways of PFAS established in this study would provide a starting point to inform the potential health risks of other PFAS.			С	В
D1206	実験動物 (代謝)	Sinioja, Tim; Bodin, Johanna; Duberg, Daniel; Dirven, Hubert; Berntsen, Hanne Friis; Zimmer, Karin; Nygaard, Unni C; Orešič, Matej; Hyötylä inen, Tuulia	Exposure to persistent organic pollutants alters the serum metabolome in non-obese diabetic mice	2022	Metabolomics. 2022 Nov 3;18(11):87. doi: 10.1007/s11306- 022-01945-0.	INTRODUCTION: Autoimmune disorders such as type 1 diabetes (T1D) are believed to be caused by the interplay between several genetic and environmental factors. Elucidation of the role of environmental factors in metabolic and immune dysfunction leading to autoimmune disease is not yet well characterized. OBJECTIVES: Here we investigated the impact of exposure to a mixture of persistent organic pollutants (POPs) on the metabolome in non-obese diabetic (NOD) mice, an experimental model of T1D. The mixture contained organochlorides, organobromides, and per- and polyfluoroalkyl substances (PFAS). METHODS: Analysis of molecular lipids (lipidomics) and bile acids in serum samples was performed by UPLC-Q-TOF/MS, while polar metabolic changes, which were similar to those previously reported as associated with PFAS exposure, as well as risk of T1D in human studies. This included an increase in the levels of sugar derivatives, triacylglycerols and lithocholic acid, and a decrease in long chain fatty acids and several lipid classes, including phosphatidylcholines, lysophosphatidylcholines and sphingomyelins. CONCLUSION: Taken together, our study demonstrates that exposure to POPs results in an altered metabolic signature previously associated with autoimmunity.			С	С
D1207	メタボロ ミクス (代謝)	Wolter, Nicole L; LeClair, Madison J; Chin, Michael T	Plasma metabolomic profiling of hypertrophic cardiomyopathy patients before and after surgical myectomy suggests postoperative improvement in metabolic function	2021	BMC Cardiovasc Disord. 2021 Dec 28;21(1):617. doi: 10.1186/s12872-021-02437-0.	BACKGROUND: Hypertrophic cardiomyopathy (HCM) is a common inherited heart disorder complicated by left ventricle outflow tract (LVOT) obstruction, which can be treated with surgical myectomy. To date, no reliable biomarkers for LVOT obstruction exist. We hypothesized that metabolomic biomarkers for LVOT obstruction may be detectable in plasma from HCM patients. METHODS: We conducted metabolomic profiling on plasma samples of 18 HCM patients before and after surgical myectomy, using a commercially available metabolomics platform. RESULTS: We found that 215 metabolites were altered in the postoperative state (p-value < 0.05). 12 of these metabolites were notably significant after adjusting for multiple comparisons (q-value < 0.05), including bilirubin, PFOS, PFOA, 3,5-dichloro-2,6-dihydroxybenzoic acid, 2-hydroxylaurate, trigonelline and 6 unidentified compounds, which support improved organ metabolic function and increased lean soft tissue mass. CONCLUSIONS: These findings suggest improved organ metabolic function after surgical relief of LVOT obstruction in HCM and further underscore the beneficial systemic effects of surgical myectomy.			С	A
D1208	ex vivo (血液毒 性)	Liu, Qian S; Zhang, Yuzhu; Sun, Zhendong; Gao, Yurou; Zhou, Qunfang; Jiang, Guibin	A high-throughput assay for screening the abilities of per- and polyfluoroalkyl substances in inducing plasma kallikrein-like activity	2022	Ecotoxicol Environ Saf. 2022 Mar 4;234:113381. doi: 10.1016/j.ecoenv.2022.113381. Online ahead of print.	The plasma consists of multiple functional serine zymogens, such as plasma kallikrein-kinin system (KKS), which are vulnerable to exogenous chemical exposure, and may closely relate to the deleterious effects. Testing whether the anthropogenic chemicals could increase the kallikrein-like activity in plasma or not would be of great help to understand their potentials in triggering the cascade activation of the plasma zymogens and explain the corresponding hematotoxicity. In this study, a novel high-throughput ex vivo assay was established to screen the abilities of emerging chemicals like per- and polyfluoroalkyl substances (PFASs) in inducing kallikrein-like activities on basis of using rat plasma as the protease zymogen source. Upon the optimization of the conditions in the test system, the assay gave sensitive fluorescent response to the stimulation of the positive control, dextran sulfate, and the dose-response showed a typical S-shaped curve with EC(50) of 0.24 mg/L. The intra-plate and inter-plate relative standard deviations (RSDs) were less than 10% in the quantitative range of dextran sulfate, indicating a good reliability and repeatability of this newly-established assay. Using this method, several alternatives or congeners of perfluoroctanesulfonic acid (PFOS) and perfluoroctanoic acid (PFOA), including 6:2 chlorinated polyfluoroalkyl ether sulfonate (6:2 CI-PFESA), Ag-PFOA, K-PFOA, Na-PFOA and ammonium pentadecafluoroctanoate (APFO), were further screened, and their capabilities in inducing kallikrein-like activities were identified. The ex vivo assay newly-developed in the present study would be promising in high-throughput screening of the hematological effects of emerging chemicals of concern.			В	с

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D1209	in silico (免疫毒 性)	Pappalardo, Francesco; Russo, Giulia; Corsini, Emanuela; Paini, Alicia; Worth, Andrew	Translatability and transferability of in silico models: Context of use switching to predict the effects of environmental chemicals on the immune system	2022	Comput Struct Biotechnol J. 2022 Mar 26;20:1764-1777. doi: 10.1016/j.csbj.2022.03.024. eCollection 2022.	Immunotoxicity hazard identification of chemicals aims to evaluate the potential for unintended effects of chemical exposure on the immune system. Perfluorinated alkylate substances (PFAS), such as perfluoroctane sulfonate (PFOS) and perfluoroctanoic acid (PFOA), are persistent, globally disseminated environmental contaminants known to be immunotoxic. Elevated PFAS exposure is associated with lower antibody responses to vaccinations in children and in adults. In addition, some studies have reported a correlation between PFAS levels in the body and lower resistance to disease, in other words an increased risk of infections or cancers. In this context, modelling and simulation platforms could be used to simulate the human immune system with the aim to evaluate the adverse effects that immunotoxicants may have. Here, we show the conditions under which a mathematical model developed for one purpose and application (e.g., in the pharmaceutical domain) can be successfully translated and transferred to another (e.g., in the chemicals domain) without undergoing significant adaptation. In particular, we demonstrate that the Universal Immune System Simulator was able to simulate the effects of PFAS on the immune system, introducing entities and new interactions that are biologically involved in the phenomenon. This also revealed a potentially exploitable pathway for assessing immunotoxicity through a computational model.		D B
D1210	in silico (免疫毒 性)	Azhagiya Singam, Ettayapuram Ramaprasad; Durkin, Kathleen A; La Merrill, Michele A; Furlow, J David; Wang, Jen- Chywan; Smith, Martyn T	The vitamin D receptor as a potential target for the toxic effects of per- and polyfluoroalkyl substances (PFASs): An in-silico study	2022	Environ Res. 2022 Nov 17:114832. doi: 10.1016/j.envres.2022.114832. Online ahead of print.	Due to their persistence and toxicity, perfluoroalkyl and polyfluoroalkyl substances (PFASs) constitute significant hazards to human health and the environment. Their effects include immune suppression, altered hormone levels, and osteoporosis. Recently, the most studied PFAS, perfluorooctanoic acid (PFOA), was shown to competitively binding to the Vitamin D receptor (VDR). VDR plays a crucial role in regulating genes involved in maintaining immune, endocrine, and calcium homeostasis, suggesting it may be a target for at least some of the health effects of PFAS. Hence, this study examined the potential binding of 5206 PFASs to VDR using molecular docking, molecular dynamics, and free energy binding calculations. We identified 14 PFAS that are predicted to interact strongly with VDR, similar to the natural ligands. We further investigated the interactions of VDR with 256 PFASs of established commercial importance. Eighty-three (32%) of these 256 commercially important PFAS were predicted to be stronger binders to VDR than PFOA. At least 16 PFASs of regulatory importance, because they have been identified in water supplies and human blood samples, were also more potent binders to VDR than PFOA. Further, PFASs are usually found together in contaminated drinking water and human blood samples, which raises the concern that multiple PFASs may act together as a mixture on VDR function, potentially producing harmful effects on the immune, endocrine, and bone homeostasis.		D B
D1211	in vitro (甲状 腺)	Zhang, Shouhua; Chen, Kuai; Li, Weiming; Chai, Yong; Zhu, Jian; Chu, Bingfeng; Li, Nuoya; Yan, Jinlong; Zhang, Shenglai; Yang, Yipeng	Varied thyroid disrupting effects of perfluorooctanoic acid (PFOA) and its novel alternatives hexafluoropropylene-oxide-dimer-acid (GenX) and ammonium 4,8-dioxa-3H-perfluorononanoate (ADONA) in vitro	2021	Environ Int. 2021 Nov;156:106745. doi: 10.1016/j.envint.2021.106745. Epub 2021 Jul 7.	Due to its potential adverse effects on human health, perfluorooctanoic acid (PFOA), one of the once widely used legacy per- and polyfluoroalkyl substances (PFASs), has been recently replaced by its novel alternatives including hexafluoropropylene-oxide- dimer-acid (GenX) and ammonium 4,8-dioxa-3H-perfluorononanoate (ADONA). These alternative PFASs are detected in water and exposed workers. PFASs can enter organs like thyroids, however, it is yet unknown whether the new alternatives are safer than PFOA. In the current study, we compared the thyroid disrupting effects of PFOA and its alternatives GenX and ADONA in vitro with both rat thyroid cell line FRTL5 and primary normal human thyroid (NHT) cells. Cells were exposed to ascendant doses of PFOA, GenX or ADONA for various incubation time and cell viability was assessed by WST-1 assay and LDH assay. The proliferation rate of survived cells was determined by crystal violet-based cell proliferation assay and MTT assay. The gene expression of thyroid hormone regulation-related genes in thyroid cell viability in both dose and time dependent manner, with GenX being more toxic than PFOA at the same condition. Similarly, the proliferation rate of cells survived exposure to PFOA and GenX was considerably impaired, with GenX showing more profound adverse effect than PFOA. Unlike PFOA and GenX, ADONA showed no apparent adverse effects on the viability and proliferation of both thyroid cell types. Gene expression data revealed that all three PFASs altered gene expression in both thyroid cells and the altered gene expression seemed to be PFAS and cell type dependent. Taken together, our data reveal that the thyroid disrupting effects is increased in the order of GenX > PFOA > ADONA. Our findings will be beneficial for the guidance of the future usage of PFASs and development of better alternatives.		B C

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン 文 ① ラ	ン 文 ク 献 ② ラ	
D1212	in vitro (甲状 腺)	Coperchini, F; Croce, L; Pignatti, P; Ricci, G; Gangemi, D; Magri, F; Imbriani, M; Rotondi, M; Chiovato, L	The new generation PFAS C6O4 does not produce adverse effects on thyroid cells in vitro	2021	J Endocrinol Invest. 2021 Aug;44(8):1625-1635. doi: 10.1007/s40618-020-01466-4. Epub 2020 Dec 14.	PURPOSE: Per- and poly-fluoroalkyl-substances (PFASs) are synthetic compounds that raised concern due to their potential adverse effects on human health. Long-chain PFAS were banned by government rules in many states, and thus, new emerging PFAS were recently introduced as substitutes. Among these, Perfluoro{acetic acid, 2-[(5-methoxy-1,3-dioxolan-4-yl)oxy]}, ammonium salt (C6O4) was recently introduced to produce a range of food contact articles and literature data about this compound are scanty. The aim of this study was to evaluate the in vitro effects of exposure to C6O4, compared with PFOA and PFOS on thyroid cells. METHODS: FRTL5 rat-thyroid cell lines and normal human thyroid cells (NHT) were incubated with increasing concentrations of C6O4 for 24, 48, 72, and 144 h to assess cell viability by WST-1. Cell viability was confirmed by AnnexinV/PI staining. Long-chain PFAS (PFOA and PFOS) were used at same concentrations as positive controls. The proliferation of cells exposed to C6O4, PFOA, and PFOS was measured by staining with crystal violet and evaluation of optical density after incubation with SDS. Changes in ROS production by FRTL5 and NHT after exposure to C6O4 at short (10, 20, and 30 min) and long-time points (24 h) were evaluated by cytofluorimetry. RESULTS: C6O4 exposure did not modify FRTL5 and NHT cell viability of FRTL5 while and NHT, while PFOA only in FRTL5. FRTL5 and NHT cell proliferation was reduced by incubation with by PFOA and PFOS, but not with C6O4. ROS production by NHT and FRTL5 cells was not modified after C6O4 exposure, at any time/concentration tested. CONCLUSIONS: The present in vitro study constitutes the first evaluation of the potential adverse effects of the new emerging PFAS C6O4 in cultured rat and human thyroid cells, suggesting its safety for thyroid cells in vitro.			В	с	
D1213	in vitro (甲状 腺)	Conti, Amalia; Strazzeri, Chiara; Rhoden, Kerry J	Perfluorooctane sulfonic acid, a persistent organic pollutant, inhibits iodide accumulation by thyroid follicular cells in vitro	2020	Mol Cell Endocrinol. 2020 Sep 15;515:110922. doi: 10.1016/j.mce.2020.110922. Epub 2020 Jul 1.	Poly- and perfluoroalkyl substances (PFAS) are a class of endocrine disrupting chemicals (EDCs) reported to alter thyroid function. Iodide uptake by thyroid follicular cells, an early step in the synthesis of thyroid hormones, is a potential target for thyroid disruption by EDCs. The aim of the present study was to evaluate the acute effects of perfluorooctane sulfonic acid (PFOS) and perfluorooctane carboxylic acid (PFOA), two of the most abundant PFAS in the environment, on iodide transport by thyroid follicular cells in vitro. Dynamic changes in intracellular iodide concentration were monitored by live cell imaging using YFP-H148Q/I152, a genetically encoded fluorescent iodide biosensor. PFOS, but not PFOA, acutely and reversibly inhibited iodide accumulation by FRTL-5 thyrocytes, as well as by HEK-293 cells transiently expressing the Sodium Iodide Symporter (NIS). PFOS prevented NIS-mediated iodide uptake and reduced intracellular iodide concentration in iodide-containing cells, mimicking the effect of the NIS inhibitor perchlorate. PFOS did not affect iodide efflux from thyroid cells. The results of this study suggest that disruption of iodide homeostasis in thyroid cells may be a potential mechanism for anti-thyroid health effects of PFOS. The study also confirms the utility of the YFP-H148Q/I152 cell-based assay to screen environmental PFAS, and other EDCs, for anti-thyroid activity.			В	с	
D1214	in vitro (甲状 腺)	De Toni, Luca; Di Nisio, Andrea; Rocca, Maria Santa; Pedrucci, Federica; Garolla, Andrea; Dall'Acqua, Stefano; Guidolin, Diego; Ferlin, Alberto; Foresta, Carlo	Comparative Evaluation of the Effects of Legacy and New Generation Perfluoralkyl Substances (PFAS) on Thyroid Cells In Vitro	2022	Front Endocrinol (Lausanne). 2022 Jun 23;13:915096. doi: 10.3389/fendo.2022.915096. eCollection 2022.	BACKGROUND: Per- and poly-fluorinated alkyl substances (PFAS) are environment-persitent emerging endocrine disrupting chemicals raising health concerns worldwide. Exposure to PFAS has been associated with the imbalance of thyroid hormones. However, available studies addressing the cell mechanism underlying thyroid disrupting feature of legacy PFAS, such as perfluoro-octanoic acid (PFOA), perfluoro-octane-sulfonic acid (PFOS), and the new generation substitutes, such as C6O4, are still lacking. In this study the potential disrupting effect of PFOA, PFOS, and C6O4 on a murine thyroid cell model was assessed. METHODS: A rat FRTL-5 cell line was used as the normal thyroid follicular cell model. Cell iodide-uptake, induced by thyroid stimulating hormone (TSH), was used to assess the functional impact of PFAS exposure on cell function. Tetrazolium salt-based cell viability assay and merocyanine 540-based cell staining were used to address the possible involvement of cell toxicity and membrane biophysical properties on altered cell function. The possible direct interaction of PFAS with TSH-receptor (TSH-R) was investigated by computer-based molecular docking and analysis of molecular dynamics. Evaluation of intracellular cAMP levels and gene expression analysis were used to validate the direct impairment of TSH-R-mediated downstream events upon PFAS exposure. RESULTS: Different from PFOS or C6O4, exposure to PFOA at a concentration $\geq 10 \text{ ng/mL}$ was associated with significant impairment of the iodide uptake upon TSH stimulation (respectively: basal 100.0 \pm 19.0%, CTRL + TSH 188.9 \pm 7.8%, PFOA 10 ng/mL + TSH 120.4 \pm 20.9%, p= 0.030 vs CTRL + TSH; PFOA 100 ng/mL + TSH 115.6 \pm 12.3% p= 0.017 vs CTRL + TSH). No impairment of cell viability or membrane stability was observed. Computational analysis showed a possible direct differential interaction of C6O4, PFOA, and PFOS on a same binding site of the extracellular domain of TSH-R. Finally, exposure to PFOA was associated with a significant reduction of downstr			В	A	

引添-2	文献データベース文献リスト	

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 象抽 ① ラ ② ラ
D1215	in vitro (呼吸 器)	Ahmad, Saeed; Wen, Yi; Irudayaraj, Joseph Maria Kumar	PFOA induces alteration in DNA methylation regulators and SARS-CoV-2 targets Ace2 and Tmprss2 in mouse lung tissues	2021	Toxicol Rep. 2021;8:1892-1898. doi: 10.1016/j.toxrep.2021.11.014. Epub 2021 Nov 26.	Perfluorooctanoic acid (PFOA), a ubiquitous environmental toxicant from the Per- and polyfluoroalkyl substances (PFAS) family has been implicated in toxicity of various organs. Several epidemiological studies have linked PFOA to different lung injuries and diseased conditions. However, the implication of PFOA in affecting epigenetic regulators and SARS-CoV-2 infection pathways in the lung are unknown. The present work explores the accumulation of PFOA in lungs and changes in mRNA expression of DNA methylation regulator genes DNA methyltransferases (Dnmts) and ten-eleven translocation (Tets) along with the membrane proteins angiotensin converting enzyme 2 (Ace2) and transmembrane Serine Protease 2 (Tmprss2) genes involved in the SARS-CoV-2 virus infection. CD1 mice were orally exposed to 5 and 20 mg/kg/day PFOA for 10 days and the lung tissues were analyzed using LCMS, qPCR, and pyrosequencing techniques. PFOA was shown to accumulate in the lung tissues and increase in a dose-dependent manner. Dnmts and Tets were significantly downregulated upon at least one of the PFOA dosing concentration, whereas Ace2 and Tmprss2 show significant increase in their expression level. Further, CpG islands in the promotor region of Tmprss2 exhibited significant hypomethylation in PFOA treated groups, which supports its increased gene expression level. Current study reveals the implication of PFOA induced DNA methylation changes in lungs and their possible role in upregulation of Ace2 and Tmprss2. It is possible that increased expression of these membrane receptors due to PFOA exposure can lead to higher susceptibility of SARS-CoV-2 infections.		B A
D1216	in vitro	Lucas, Joseph H; Wang, Qixin; Rahman, Irfan	Perfluorooctane sulfonic acid disrupts protective tight junction proteins via protein kinase D in airway epithelial cells	2022	Toxicol Sci. 2022 Sep 15:kfac096. doi: 10.1093/toxsci/kfac096. Online ahead of print.	Perfluorooctane sulfonic acid (PFOS) is a long chain per- and polyfluoroalklyl substance (PFAS) that has been used in aqueous film-forming foams. Emerging epidemiological evidence indicates that PFOS may be associated with chronic lung diseases such as asthma and analysis of human tissues demonstrates that the lungs carry a significant body burden of PFOS. Deficits in barrier function are a major risk factor for asthma. Thus, we hypothesized that PFOS exposure will lead to impaired epithelial barrier function through dysregulated tight junctions. Hence, we assessed the impact of PFOS on epithelial barrier integrity. Bronchial epithelial cells (16HBE) were grown on collagen-coated transwells and treated to 5-25 μ M PFOS, and assessed for changes in barrier function and tight junction proteins. Rescue experiments were performed using the protein kinase D (PKD) inhibitor, CID755673. PFOS treatment reduced transepithelial electrical resistance (TEER) and increased 4 kDa FITC-dextran flux. Additionally, PFOS significantly decreased protein levels and the tight junction organization rate of occludin and zonula occludens 1. Increased phosphorylation (Ser744/Ser748) of PKD was observed 3 h following PFOS treatment. Pretreatment with the PKD inhibitor attenuated PFOS-mediated changes in TEER and FITC-dextran flux and restored occludin protein levels. In conclusion, PFOS causes loss of airway barrier integrity and the disruption of tight junctions in bronchial epithelial cells, which was partly attenuated through the inhibition of PKD. These findings demonstrate that PFOS is capable of disrupting airway barrier function, a potentially driving factor underlying associations between PFOS and respiratory diseases such as asthma.		1 A A
D1217	in vitro (呼吸 器)	Tien, Peng-Tai; Lin, Hui-Ju; Tsai, Yi-Yu; Lim, Yun- Ping; Chen, Chih Sheng; Chang, Ching-Yao; Lin, Chao-Jen; Chen, Jamie Jiin-Yi; Wu, Shan-Mei; Huang, Yuh- Jeen; Wan, Lei	Perfluorooctanoic acid in indoor particulate matter triggers oxidative stress and inflammation in corneal and retinal cells	2020	Sci Rep. 2020 Sep 24;10(1):15702. doi: 10.1038/s41598-020- 72600-8.	To investigate the particle size distribution of particulate matter and the concentration of specific perfluorinated compounds in indoor dust samples from several locations. Then, we used cell-based assays to investigate the effect of perfluorinated compounds on human corneal epithelial (HCEpiC), endothelial cells (HCEC) and retinal pigment epithelial cells (RPE). Indoor dust samples were collected at five different locations and PM(50-10), PM(10-2.5), and PM(2.5-1) were fractionized. The presence and levels of 8:2 fluorotelomer alcohol, 10:2 fluorotelomer alcohol, and perfluoroctanoic acid were detected by gas chromatography-mass spectrometry. The effect of perfluoroctanoic acid on the activation of reactive oxygen species, transepithelial resistance as well as the expression of interleukin (IL)-6 and IL-8 were determined. The basolateral media of human corneal epithelial or human corneal endothelial or retinal pigment epithelial cells, respectively to indicate the potential of ocular surface inflammation may result in retinal inflammation. Among perfluorinated compounds, only perfluoroctanoic acid was detected in all indoor dust samples. Perfluorooctanoic acid had the highest concentration among all perfluorinated compounds in the samples. Exposure to perfluorooctanoic acid impaired tight junction sealing and increased the levels of reactive oxygen species in human corneal epithelial cells. In human corneal epithelial cells, secretion of IL-6 and IL-8 in both apical and basolateral media was promoted significantly by perfluoroctanoic acid treatment. Stimulation with the basolateral media from perfluorooctanoic acid-treated human corneal epithelial cells induced inflammation in human corneal endothelial cells also elicited the secretion of proinflammatory cytokines. The results indicate that perfluoroctanoic acid exposure impaired the tight junction of corneal cells and caused inflammatory reactions in the retina. Exposure of the cornea to perfluorooctanoic acid contained in particulate matter might induce oxi		B A
D1218	in vitro (細胞毒 性)	Goines, Sondrica; Dick, Jeffrey E	Investigating the cytotoxic redox mechanism of PFOS within Hep G2 by hyperspectral-assisted scanning electrochemical microscopy	2022	Analyst. 2022 Sep 26;147(19):4356-4364. doi: 10.1039/d2an00904h.	Perfluorooctane sulfonate (PFOS) is one of the most lethal per- and poly-fluoroalkyl substances (PFAS). Generally, exposure effects are studied through case-controlled studies, cohort studies, or cell assays. Unfortunately, most studies involving two-dimensional cell cultures require cell lysis or fixation. For in vitro studies, fluorescence microscopy has been useful, but methods to simultaneously discern phototoxic effects during an experiment are limited. Here, we use hepatocarcinoma (Hep G2) cells to examine the redox mechanism of PFOS cytotoxicity in vitro, while using hyperspectral-assisted scanning electrochemical microscopy (SECM) to differentiate between PFOS and redox mediator induced stress. Specifically, we correlate an increase in the electrochemical response of ferrocenemethanol oxidation with an increase in intracellular reactive oxygen species. Corresponding hyperspectral images of redox indicative-fluorophores implicate superoxide in the cytotoxic redox mechanism.		C A

パーフルオロ化合物に係る国際機関等の評価及び科学的知見の情報収集並びに整理

別添-2 文献データベース文献リスト

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D1219	in vitro (神経毒 性)	Alharthy, Saif A; Hardej, Diane	The role of transcription factor Nrf2 in the toxicity of perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA) in C57BL/6 mouse astrocytes	2021	Environ Toxicol Pharmacol. 2021 Aug;86:103652. doi: 10.1016/j.etap.2021.103652. Epub 2021 Apr 1.	Perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA) are members of perfluoroalkyl substances (PFAS). This study aimed to determine the protective role of Nrf2 against the toxicity of these agents. Nrf2-/- and wild-type astrocytes were exposed to PFOS (75-600 μ M) and PFOA (400-1000 μ M) for 24 h. Lactate dehydrogenase (LDH) release was significantly higher in nrf2-/- than in the wild-type astrocytes. Exposure to 600 μ M PFOS and 800 μ M PFOA showed significant increases in reactive oxygen species, lipid peroxidation, and apoptosis in nrf2-/- astrocytes as compared to wild-type astrocytes. The GSH/GSSG ratio was significantly decreased in nrf2-/- astrocytes when compared to wild-type astrocytes. Additionally, PFOS and PFOS caused dramatic ultrastructural alterations to the mitochondria. BHT pretreatment in wild-type cells decreased ROS production with exposure to both agents. Results of the present study conclude that PFOS and PFOA are cytotoxic to astrocytes and that nrf2 -/- cells are more sensitive to toxicity by these agents.		в в
D1220	in vitro (神経毒 性)	Berntsen, Hanne Friis; Moldes- Anaya, Angel; Bj ørklund, Cesilie Granum; Ragazzi, Lorenzo; Haug, Trude Marie; Strandabø, Rø nnaug A U; Verhaegen, Steven; Paulsen, Ragnhild Elisabeth; Ropstad, Erik; Tasker, R Andrew	Perfluoroalkyl acids potentiate glutamate excitotoxicity in rat cerebellar granule neurons	2020	Toxicology. 2020 Dec 1;445:152610. doi: 10.1016/j.tox.2020.152610. Epub 2020 Oct 4.	Perfluoroalkyl acids (PFAAs) are persistent man-made chemicals, ubiquitous in nature and present in human samples. Although restrictions are being introduced, they are still used in industrial processes as well as in consumer products. PFAAs cross the blood-brain-barrier and have been observed to induce adverse neurobehavioural effects in humans and animals as well as adverse effects in neuronal in vitro studies. The sulfonated PFAA perfluorooctane sulfonic acid (PFOS), has been shown to induce excitotoxicity via the N-methyl-D-aspartate receptor (NMDA-R) in cultures of rat cerebellar granule neurons (CGNs). In the present study the aim was to further characterise PFOS-induced toxicity (1-60 μ M) in rat CGNs, by examining interactions between PFOS and elements of glutamatergic signalling and excitotoxicity. Effects of the carboxylated PFAA, perfluoroctanoic acid (PFOA, 300-500 μ M) on the same endpoints were also examined. During experiments in immature cultures at days in vitro (DIV) 8, PFOS increased both the potency and efficacy of glutamate, whereas in mature cultures at DIV 14 only increased potency was observed. PFOA also increased potency at DIV 14. PFOS-enhanced glutamate toxicity was further antagonised by the competitive NMDA-R antagonist 3-((R)-2-Carboxypiperazin-4-yl)-propyl-1-phosphonic acid (CPP) at DIV 8. At DIV 8, PFOS also induced glutamate release (9-13 fold increase vs DMSO control) after 1-3 and 24 h exposure, whereas for PFOA a large (80 fold) increase was observed, but only after 24 h. PFOS and PFOA both also increased alanine and decreased serine levels after 24 h exposure. In conclusion, our results indicate that PFOS at concentrations relevant in an occupational setting, may be inducing excitotoxicity, and potentiation of glutamate signalling, via an allosteric action on the NMDA-R or by actions on other elements regulating glutamate release or NMDA-R function. Our results further support our previous findings that PFOS and PFOA at equipotent concentrations induce toxicity via diffe		ВВ
D1221	in vitro (神経毒 性)	Osemwegie, Odia; Butler, Landon; Subbiah, Seenivasan; Smith, Ernest	Effects of in vitro exposure of perfluorooctanoic acid and monocrotophos on astroglia SVG p12 cells	2021	J Appl Toxicol. 2021 Sep;41(9):1380-1389. doi: 10.1002/jat.4129. Epub 2021 Feb 10.	Glia cells provide supportive functions to the central nervous system and can be compromised by environmental contaminants. The primary objective of this study was to characterize the effects of in vitro exposure to perfluorooctanoic acid, a persistent environmental contaminant and/or monocrotophos (MCP), a neurotoxic organophosphate that is rapidly metabolized, to astroglia SVG p12 cells. The endpoints evaluated include cell viability, intracellular glutamate levels as a marker of astrocyte homeostasis function, differential gene expression for selected proteins, which include inflammatory markers (tachykinin), astrocytosis (nestin), S100B, and metabolism enzymes (CYP1A1). The results from cell viability revealed significant differences from the controls at some of the concentrations tested. Also, intracellular glutamate levels were elevated at the 10- μ M concentration for perfluorooctanoic acid (PFOA) as well as the 10- μ M PFOA/5- μ M MCP concentration. Gene expression results at 80- μ M PFOA/20- μ M MCP caused a significant decrease in the expression of S100B, tachykinin. Gene expression for MCP exposures produced a decrease at the 20- μ M MCP concentration. Immunofluorescence results indicated an increase in nestin protein expression for the 20- μ M concentration of MCP, which contradicted the gene expression at the same concentration tested. The results indicate that toxicity to glia cells can compromise critical glia functions and could be implicated in neurodegenerative diseases.		B A

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 象抽 ① ラ ② ラ
D1222	in vitro (神経毒 性)	Yadav, Ajay; Verhaegen, Steven; Verbruggen, Evelien; Kerhoas, Marie; Willemijn Huiberts, Eva Henriëtte; Hadera, Mussie Ghezu; Berntsen, Hanne Friis; Zimmer, Karin Elisabeth; Ropstad, Erik; Paulsen, Ragnhild Elisabeth	A human relevant mixture of persistent organic pollutants (POPs) and perfluorooctane sulfonic acid (PFOS) differentially affect glutamate induced excitotoxic responses in chicken cerebellum granule neurons (CGNs) in vitro	2021	Reprod Toxicol. 2021 Mar;100:109-119. doi: 10.1016/j.reprotox.2021.01.008. Epub 2021 Jan 23.	Primary cultures of cerebellar granule neurons (CGNs) derived from chicken embryos were used to explore the effects on developmental neurotoxicity by a complex defined mixture of persistent organic pollutants (POPs). Its chemical composition and concentrations were based on blood levels in the Norwegian/Scandinavian population. Perfluorooctane sulfonic acid (PFOS) alone, its most abundant compound was also evaluated. Different stages of CGNs maturation, between day in vitro (DIV) 1, 3, and 5 were exposed to the POP mixture, or PFOS alone. Their combination with glutamate, an excitatory endogenous neurotransmitter important in neurodevelopment, also known to cause excitotoxicity was evaluated. Outcomes with the mixture at 500x blood levels were compared to PFOS at its corresponding concentration of 20 μ M. The POP mixture reduced tetrazolium salt (MTT) conversion at earlier stages of maturation, compared to PFOS alone. Glutamate-induced excitotoxicity was enhanced above the level of that induced by glutamate alone, especially in mature CGNs at DIV5. Glutathione (GSH) concentrations seemed to set the level of sensitivity for the toxic insults from exposures to the pollutants. The role of N-methyl-D-aspartate receptor (NMDA-R) mediated calcium influx in pollutant exposures was investigated using the non-competitive and competitive receptor antagonists MK-801 and CGP 39551. Observations indicate a calcium-independent, but still NMDA-R dependent mechanism in the absence of glutamate, and a calcium- and NMDA-R dependent one in the presence of glutamate. The outcomes for the POP mixture cannot be explained by PFOS alone, indicating that other chemicals in the mixture contribute its overall effect.		ВВ
D1223	in vitro (神経毒 性)	Black, Carlie A; Bucher, Meghan L; Bradner, Joshua M; Jonas, Lauren; Igarza, Kenny; Miller, Gary W	Assessing Vesicular Monoamine Transport and Toxicity Using Fluorescent False Neurotransmitters	2021	Chem Res Toxicol. 2021 May 17;34(5):1256-1264. doi: 10.1021/acs.chemrestox.0c00380. Epub 2020 Dec 30.	Impairments in the vesicular packaging of dopamine result in an accumulation of dopamine in the cytosol. Cytosolic dopamine is vulnerable to two metabolic processes-enzymatic catabolism and enzymatic- or auto-oxidation-that form toxic metabolites and generate reactive oxygen species. Alterations in the expression or activity of the vesicular monoamine transporter 2 (VMAT2), which transports monoamines such as dopamine from the cytosol into the synaptic vesicle, result in dysregulated dopamine packaging. Here, we developed a series of assays using the fluorescent false neurotransmitter 206 (FFN206) to visualize VMAT2-mediated vesicular packaging at baseline and following pharmacological and toxicological manipulations. As a proof of principle, we observed a significant reduction in vesicular FFN206 packaging after treatment with the VMAT2 inhibitors reserption (IC(50): 73.1 nM), tetrabenazine (IC(50): 30.4 nM), methamphetamine (IC(50): 2.4 μ M), and methylphenidate (IC(50): 94.3 μ M). We then applied the assay to investigate the consequences on vesicular packaging by environmental toxicants including the pesticides paraquat, rotenone, and chlorpyrifos, as well as the halogenated compounds unichlor, perfluorooctanesulfonic acid, Paroil, Aroclor 1260, and hexabromocyclododecane. Several of the environmental toxicants showed minor impairment of the vesicular FFN206 loading, suggesting that the toxicants are weak VMAT2 inhibitors at the concentrations tested. The assay presented here can be applied to investigate the effect of additional pharmacological compounds and environmental toxicants on vesicular function, which will provide insight into how exposures to such factors are involved in the pathogenesis of monoaminergic diseases such as Parkinson's disease, and the assay can be used to identify pharmacological agents that influence VMAT2 activity.		D C
D1224	in vitro (神経毒 性)	Pei Wu, Chuanjin Ding, Meijuan Yan, Biying Qian, Wei Wang, Pingping Sun, Jianmei Zhao	Perfluorooctane sulfonate induces apoptosis via activation of FoxO3a and upregulation of proapoptotic Bcl-2 proteins in PC12 cells	2019	J Toxicol Sci. 2019;44(10):657-666. doi: 10.2131/jts.44.657.	Perfluorooctane sulfonate (PFOS), a kind of organic pollutant widely found in the environment and biota, could alter normal brain development and produce cognitive dysfunction. For the past years, the neurotoxic effects of PFOS have been shown. Recent studies have proven that PFOS can induce neuronal apoptosis and cause neurotoxicity, but the regulatory proteins referred to the process have not been clarified. In this study, PC12 cells were used to investigate the changes of the expression of apoptosis-related proteins, forkhead box O3 (FoxO3a) and pro-apoptotic Bcl-2 proteins. We detected that the levels of cleaved caspase-3 and cleaved PARP were up-regulated obviously in PFOS-treated PC12 cells by using Western blotting, and that the apoptotic rate of PC12 cells was increased significantly by using flow cytometry, verifying that PFOS could induce neuronal apoptosis. Western blot analysis and immunofluorescence revealed obvious up-regulation of the expression of FoxO3a and proapoptotic Bcl-2 proteins. In addition, knockdown of FoxO3a gene inhibited Bim expression and apoptosis. According to the data, we believe that FoxO3a may play a crucial role in PFOS-induced neurotoxicity.		вС
D1225	in vitro (神経毒 性)	古武 弥一郎	環境化学物質の神経毒性メカニズム解明およびその評価 系構築に関する研究	2018	YAKUGAKU ZASSHI, 138 巻 10 号 1227-1233, doi: 10.1248/yakushi.18-00014	It is pivotal to assess the toxicity and safety of chemicals, including medicines, in the research field of environmental health science. Here we introduce neurotoxic mechanisms in mammals of environmental organotin and Parkinson's disease-related chemicals. We clarified that low concentrations of tributyltin decrease α -amino-3-hydroxy-5-methyl-4-isoxazolepropionic acid (AMPA)-type glutamate receptor subunit GluA2 (GluR2) expression, leading to the vulnerability of cultured neurons. That is, tributyltin reduces GluA2 prior to neuronal death. This GluA2 decrease can be used as a sensitive evaluation index of neurotoxicity, since low levels of certain chemicals, for example some agrochemicals, decrease GluA2 expression. We also elucidated the mechanisms of abnormal protein metabolism induced by low levels of two Parkinson's disease-related chemicals: 1-methyl-4-phenylpyridinium ion (MPP+) and 1,2,3,4-tetrahydroisoquinoline derivatives. It is expected that these findings will become clues in accurately evaluating the toxicity of chemicals and/or in investigating the causes of disease.		D B

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D1226	in vitro (神経毒 性)	Wu Pei(Department of Pediatrics, School of Medicine, Nantong University), Ding Chuanjin, Yan Meijuan, Qian Biying, Wang Wei, Sun Pingping, Zhao Jianmei	ペルフルオロオクタンスルホン酸はFoxO3a活性化およ びアポトーシス性蛋白質Bcl-2のアップレギュレーション を介してPC12細胞のアポトーシスを誘導する (Perfluorooctane sulfonate induces apoptosis via activation of FoxO3a and upregulation of proapoptotic Bcl-2 proteins in PC12 cells)(英語)	2015	J Toxicol Sci. 2019;44(10):657-666. doi: 10.2131/jts.44.657.	ペルフルオロオクタンスルホン酸(PFOS)で処理したPC12細胞におけるアポトーシス関連蛋白質FoxO3aおよびBcl-2の変化を調べた。 PFOS処理PC12細胞におけるカスパーゼおよびPARPの切断産物のアップレギュレーションがウェスタンブロット法で検出され、アポ トーシス細胞の増加がフローサイトメトリーで認められ、PFOSによる神経細胞アポトーシスの誘導が示唆された。ウェスタンブロット 法および免疫蛍光分析によりPFOS処理PC12細胞におけるFoxO3aおよびBcl-2の発現のアップレギュレーションが確認された。FoxO3a 遺伝子ノックダウンによりBim発現およびアポトーシスが阻害された。以上の結果から、FoxO3aはPFOSの神経毒性において重要な役 割をもつと考えられた。	JST-47と 重複	ВС
D1227	in vitro (腎毒 性)	Wang, Pingwei; Liu, Dongge; Yan, Shuqi; Liang, Yujun; Cui, Jiajing; Guo, Li; Ren, Shuping; Chen, Peng	The Role of Ferroptosis in the Damage of Human Proximal Tubule Epithelial Cells Caused by Perfluorooctane Sulfonate	2022	? Toxics. 2022 Jul 29;10(8):436. doi: 10.3390/toxics10080436.	Perfluorooctane sulfonate (PFOS) is a typical persistent organic pollutant and environmental endocrine disruptor that has been shown to be associated with the development of many diseases; it poses a considerable threat to the ecological environment and to human health. PFOS is known to cause damage to renal cells; however, studies of PFOS-induced ferroptosis in cells have not been reported. We used the CCK-8 method to detect cell viability, flow cytometry and immunofluorescence methods to detect ROS levels and Western blot to detect ferroptosis, endoplasmic reticulum stress, antioxidant and apoptosis-related proteins. In our study, we found that PFOS could induce the onset of ferroptosis in HK-2 cells with decreased GPx4 expression and elevated ACSL4 and FTH1 expression, which are hallmarks for the development of ferroptosis. In addition, PFOS-induced ferroptosis in HK-2 cells could be reversed by Fer-1. We also found that endoplasmic reticulum stress and its mediated apoptotic mechanism and P53-mediated antioxidant mechanism are involved in the toxic damage of cells by PFOS. In this paper, we demonstrated for the first time that PFOS can induce ferroptosis in HK-2 cells. In addition, we preliminarily explored other mechanisms of cytotoxic damage by PFOS, which provides a new idea to study the toxicity of PFOS as well as the damage to the kidney and its mechanism.		D B
D1228	in vitro (腎毒 性)	Wen, Li-Li; Chen, Yen-Ting; Lee, Yuan-Chii Gladys; Ko, Tsui- Ling; Chou, Hsiu- Chu; Juan, Shu- Hui	Perfluorooctane sulfonate induces autophagy- associated apoptosis through oxidative stress and the activation of extracellular signal-regulated kinases in renal tubular cells	2021	PLoS One. 2021 Jan 20;16(1):e0245442. doi: 10.1371/journal.pone.0245442. eCollection 2021.	Perfluorooctane sulfonate (PFOS) is among the most abundant organic pollutants and is widely distributed in the environment, wildlife, and humans. Its toxic effects and biological hazards are associated with its long elimination half-life in humans. However, how it affects renal tubular cells (RTCs) remains unclear. In this study, PFOS was observed to mediate the increase in reactive oxygen species (ROS) generation, followed by the activation of the extracellular-signal-regulated kinase 1/2 (ERK1/2) pathway, which induced autophagy in RTCs. Although PFOS treatment induced autophagy after 6 h, prolonged treatment (24 h) reduced the autophagic flux by increasing lysosomal membrane permeability (LMP), leading to increased p62 protein accumulation and subsequent apoptosis. The increase in LMP was visualized through increased green fluorescence with acridine orange staining, and this was attenuated by 3-methyladenine, an autophagy inhibitor. N-acetyl cysteine and an inhibitor of the mitogen-activated protein kinase kinases (U0126) attenuated autophagy and apoptosis. Taken together, these results indicate that ROS activation and ROS-mediated phosphorylated ERK1/2 activation are essential to activate autophagy, resulting in the apoptosis of PFOS-treated RTCs. Our findings provide insight into the mechanism of PFOS-mediated renal toxicity.		ВВ
D1229	in vitro (膵臓)	Hocevar, Sarah E; Kamendulis, Lisa M; Hocevar, Barbara A	Perfluorooctanoic acid activates the unfolded protein response in pancreatic acinar cells	2020) J Biochem Mol Toxicol. 2020 Nov;34(11):e22561. doi: 10.1002/jbt.22561. Epub 2020 Jun 24.	Perfluoroalkyl substances, such as perfluorooctanoic acid (PFOA), are widely used in consumer and industrial applications. Human epidemiologic and animal studies suggest that PFOA exposure elicits adverse effects on the pancreas; however, little is known about the biological effects of PFOA in this organ. In this study, we show that PFOA treatment of mouse pancreatic acinar cells results in endoplasmic reticulum (ER) stress and activation of the protein kinase-like endoplasmic reticulum kinase (PERK), inositol-requiring kinase/endonuclease 1 α (IRE1 α), and activating transcription factor 6 arms of the unfolded protein response (UPR) pathway. PFOA-stimulated activation of the UPR was blocked by pretreatment with specific PERK and IRE1 α inhibitors and the chemical chaperone 4-phenyl butyrate, but not the antioxidants N-acetyl- I-cysteine and Tiron. PFOA treatment led to increased cytosolic Ca(+2) levels and induction of the UPR was blocked by an inhibitor of the inositol 1,4,5-trisphosphate receptor. These findings indicate that PFOA-induced ER stress may be the mechanistic trigger leading to oxidative stress in the pancreas.		ВВ

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン 文 ク 献 ① ラ	ン ク ②	文 献 ラ
D1230	in vitro (膵臓)	Abudayyak, Mahmoud; Özta ş, Ezgi; Özhan, G ül	Assessment of perfluorooctanoic acid toxicity in pancreatic cells	2021	Toxicol In Vitro. 2021 Apr;72:105077. doi: 10.1016/j.tiv.2021.105077. Epub 2021 Jan 8.	Perfluorooctanoic acid (PFOA) was classified as a possible carcinogen for humans (Group 2B). The in vivo studies have reported that PFOA might lead to hepatic, testicular and pancreatic toxicities and cancers. However, its mechanisms in pancreatic tissue are still unclear and insufficiently discussed. Since inflammation is the most important mechanism leading to pancreatitis and ultimately cancer, we aimed to investigate the role of inflammation in PFOA-induced pancreatic toxicity. To this end, the effect of PFOA on cell viability, apoptosis, oxidative stress and inflammatory pathways, as well as levels of trypsin and chymotrypsin were assessed in the human pancreatic cell line (PANC-1). PFOA caused cell death in concentration dependent manner (IC(50) 195.6 μ M), apoptosis appears to be the major cell death pathway. A significant increase in trypsin and chymotrypsin levels was detected in PANC-1 cells. Oxidative stress parameters and gene expression level-related inflammation were significantly altered with PFOA exposure. These results indicate oxidative stress plays a role in PFOA-induced pancreatic toxicity and highlight the incidence of inflammation with PFOA exposure. However, this data is preliminary. Advanced in vivo and in vitro mechanistic studies should be conducted in order to better understand the inflammation-induced oxidative stress role in the toxicity of PFOA.			В	В	
D1231	in vitro (腸細 胞)	Liu, Yaxuan; Shi, Qingying; Liu, Xiaomei; Wang, Lan; He, Yuhe; Tang, Jingchun	Perfluorooctane sulfonate (PFOS) enhanced polystyrene particles uptake by human colon adenocarcinoma Caco-2 cells	2022	Sci Total Environ. 2022 Nov 20;848:157640. doi: 10.1016/j.scitotenv.2022.157640. Epub 2022 Jul 27.	As microplastics and nanoplastics (MNPs) are widely distributed in the environment and can be transferred to human body through food chain, their potential impact on human health is of great concern. Perfluorooctane sulfonate (PFOS) is persistent, bioaccumulative and can be adsorbed by MNPs. However, there are few studies on the combined human health effects of MNPs with PFOS. In this study, the effects of polystyrene (PS) particles and PFOS on human colon adenocarcinoma cell Caco-2 were investigated in vitro to explore the combined toxicity from cellular level, and the toxic mechanism was further illustrated. Results showed that the presence of PFOS significantly increased the cell uptake of PS nanoparticles by >30 %, which is related to variations of the surface properties of PS particles, including the decrease of hydration kinetic diameter, the rise of surface potential and the adsorption of hydrophobic PFOS molecules. The toxic effect of PFOS was weakened in the presence of PS particles under low PFOS concentration (10 μ g/mL), which is because the bioavailability of PFOS was reduced after adsorption. PS particles with small particle size (20 nm) showed higher cell uptake and ROS production, while PS particles with large particle size (1 μ m) led to higher lipid oxidation degree and related membrane damage as well as mitochondrial stress. This study provides the first evaluation of combined toxicity of MNPs and PFOS on human intestinal cells, in order to support the risk assessment of combined pollution of MNPs and PFOS on human health.			В	A	
D1232	in vitro (内分泌 系)	Behnisch, Peter A; Besselink, Harrie; Weber, Roland; Willand, Wolfram; Huang, Jun; Brouwer, Abraham	Developing potency factors for thyroid hormone disruption by PFASs using TTR-TRβ CALUX® bioassay and assessment of PFASs mixtures in technical products	2021	Environ Int. 2021 Dec;157:106791. doi: 10.1016/j.envint.2021.106791. Epub 2021 Aug 4.	BACKGROUND: Over the last decade, per- and polyfluoroalkyl substances (PFASs) have become one of the most heavily investigated persistent organohalogen compound class of environmental concern. However, knowledge about their toxicology is still scarce, although PFASs as individual compounds and their industrial mixtures were shown to exert effects on the thyroid hormone system. METHODS: In vitro toxicity potency factors were established for thyroid hormone transport disruption potential using the novel TTR-TR β CALUX® bioassay for major PFASs. We assessed technical PFASs mixtures, including aqueous film- forming foam (AFFF) surfactants and chromium mist suppressants (CMS) applications with and without total oxidizable precursor (TOP) by TTR-TR β CALUX® assay for their thyroid hormone transport disrupting potential. RESULTS: All PFASs listed in the German guideline for drinking water (German Environment Agency, 2017) affected the T4 binding to TTR, an important plasma thyroid hormone transport protein. For all tested PFASs, potency factors based on PC(80) values relative to PFOA could be obtained and ranged between PFBA (0.0018) and PFOS (2.0). Applying in vitro potency factors obtained from the present in vitro TTR-TR β CALUX® assay study and recently reported in vivo potency factors (Zeilmaker et al., 2018; Bil et al., 2021) on the above- mentioned German guideline for PFAS in drinking water, showed that the cumulative effect-based trigger values (in vivo and in vitro) are comparable (3.0 vs. 2.9 to 4.6 μ g PFOA-EQ/I). Additionally, AFFF surfactants and CMS with and without TOP assay were tested. Highest activities were found in the older AFFF surfactants (2013/2014) due to higher PFOS/PFOA levels, which were already substituted with 6:2 FTS in 2019, resulting in much lower PFOA-EQ levels. As expected also the PFOA-EQ levels increased in the samples with TOP treatment compared to the original AFFF surfactants and CMS as confirmed here by biological and chemical PFOA-equivalents (PFOA-EQ) analysis. Addition			С	c	

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 対 象	ン 文 ク 献 ① ラ	ン 文 ク 献 ② ラ
D1233	in vitro (内分泌 系)	Samardzija Nenadov, Dragana; Tesic, Biljana; Fa, Svetlana; Pogrmic-Majkic, Kristina; Kokai, Dunja; Stanic, Bojana; Andric, Nebojsa	Long-term in vitro exposure of human granulosa cells to the mixture of endocrine disrupting chemicals found in human follicular fluid disrupts steroidogenesis	2022	Toxicol In Vitro. 2022 Mar;79:105302. doi: 10.1016/j.tiv.2021.105302. Epub 2021 Dec 18.	Most in vitro studies examine the effects of a single ED or a mixture of EDs on granulosa cells using short-term exposure; however, this approach is unlikely to reflect long-term, real-life exposures that are common in humans. We established an in vitro model that mimics long-term exposure of granulosa cells to real-life ED mixture. Human granulosa cells, HGrC1, were exposed to the mixture consisting of bisphenol A, polychlorinated biphenyl 153, benzo[a]pyrene, and perfluorooctanesulfonate in concentrations found in human follicular fluid (MIX) for 48 h and 4 weeks. Only long-term exposure to MIX decreased estradiol production after 2 and 3 weeks, and CYP19A1 protein after 2 weeks of exposure. By week 4, the cells restored estradiol production and CYP19A1 protein level. MIX increased basal progesterone production after 3 and 4 weeks of exposure but did not affect STAR and CYP11A1 mRNA. Cells that had been exposed to MIX for 4 weeks showed augmentation of forskolin-stimulated progesterone production. These results demonstrate that only long-term exposure to MIX alters steroidogenesis in HGrC1. This study also revealed that adverse effects of MIX on steroidogenesis in HGrC1 occurred a few weeks into MIX exposure and that this effect can be transient.			С	С
D1234	in vitro (ヒト細 胞毒性)	Solan, Megan E; Senthilkumar, Sanjanaa; Aquino, Grace V; Bruce, Erica D; Lavado, Ramon	Comparative cytotoxicity of seven per- and polyfluoroalkyl substances (PFAS) in six human cell lines	2022	Toxicology. 2022 Jul;477:153281. doi: 10.1016/j.tox.2022.153281. Epub 2022 Aug 4.	Human exposures to perfluoroalkyl and polyfluoroalkyl substances (PFAS) have been linked to several diseases associated with adverse health outcomes. Animal studies have been conducted, though these may not be sufficient due to the inherent differences in metabolic processes between humans and rodents. Acquiring relevant data on the health effects of short-chain PFAS can be achieved through methods supported by in vitro human cell-based models. Specifically, cytotoxicity assays are the crucial first step to providing meaningful information used for determining safety and providing baseline information for further testing. To this end, we exposed human cell lines representative of six different tissue types, including colon (CaCo-2), liver (HepaRG), kidney (HEK293), brain (HMC-3), lung (MRC-5), and muscle (RMS-13) to five short-chain PFAS and two legacy PFAS. The exposure of the individual PFAS was assessed using a range of concentrations starting from a low concentration (10-11 M) to a high concentration of (10-4 M). Our results indicated that CaCo-2 and HEK293 cells were the least sensitive to PFAS exposure, while HMC-3, HepaRG, MRC-5, and RMS-13 demonstrated significant decreases in viability in a relatively narrow range (EC50 ranging from 1 to 70 μM). The most sensitive cell line was the neural HMC-3 for all short- and long-chain PFAS (with EC50 ranging from 1.34 to 2.73 μM). Our data suggest that PFAS do not exert toxicity on all cell types equally, and the cytotoxicity estimates we obtained varied from previously reported values. Overall, this study is novel because it uses human cell lines that have not been widely used to understand human health outcomes associated with PFAS exposure.			[D
D1235	in vitro (免疫毒 性)	Kasten-Jolly, Jane; Lawrence, David A	Perfluorooctanesulfonate (PFOS) and perfluorooctanoic acid (PFOA) modify in vitro mitogen- and antigen-induced human peripheral blood mononuclear cell (PBMC) responses	2022	J Toxicol Environ Health A. 2022 Sep 2;85(17):715-737. doi: 10.1080/15287394.2022.2075816. Epub 2022 May 24.	Environmental contaminants perfluorooctanoate (PFOA) and perfluorooctanesulfonate (PFOS) are present in human serum at the highest concentration among all per- and polyfluoroalkyl substances (PFAS). Serum concentrations as high as 500 ng and 3000 ng PFOA/ml have been detected in individuals living near contamination sites and those occupationally exposed, respectively. Animal and human studies indicated that PFOA and PFOS at these serum concentrations perturb the immune system. The aim of this study was to examine the effects of in vitro exposure of human peripheral blood mononuclear cells (PBMC) to 1, 10, or 100 μ M PFOA or PFOS in a medium with serum (RPMI-1640 + 5% human AB serum) on the measurement of proliferation, T cell activation, generation of memory T cells, and cytokine production/secretion. In addition, these immune system parameters were assessed for PBMC in a serum-free medium (OpSFM), which was stimulated with phytohemagglutinin (PHA) (2.5 μ g/ml) or influenza vaccine antigen (0.625 μ g/ml Flu Ag). PFOS decreased proliferation stimulated by PHA or Flu Ag. With Flu Ag stimulation, PFOA and PFOS inhibited the generation of memory T cells in a concentration-dependent manner. In OpSFM, PFOA and PFOS produced no marked change in proliferation and no inhibition of T cell activation. Cytokines measured in the media with Luminex methodology indicated decreased PBMC secretion of IFN- γ by PFOA and PFOS in medium with serum, but no alteration in OpSFM. The results indicated that changes in immune parameters due to PFOA or PFOS following Flu Ag stimulation are medium (\pm serum) dependent.			С	В
D1236	in vitro (免疫毒 性)	Park, Sung-Joon; Sim, Kyeong Hwa; Shrestha, Prafulla; Yang, Jae-Ho; Lee, Youn Ju	Perfluorooctane sulfonate and bisphenol A induce a similar level of mast cell activation via a common signaling pathway, Fyn-Lyn-Syk activation	2021	Food Chem Toxicol. 2021 Oct;156:112478. doi: 10.1016/j.fct.2021.112478. Epub 2021 Aug 4.	Perfluoroalkyl compounds (PFCs) as food contaminants are widely distributed persistent organic pollutants (POPs) and have been suggested to induce immune dysfunction. However, their effects on immune function are not conclusive. Mast cells play a central role in allergic and non-allergic inflammatory responses. Therefore, we have examined the effects of PFCs (PFHxS, PFOA, PFOS) on mast cell-mediated inflammatory responses using in vitro mouse bone marrow-derived mast cells (BMMCs) and human mast cells (HMC-1) and in vivo mice model. The effects of PFCs were compared with those of bisphenol A (BPA), a well-studied environmental pollutant. Among PFCs tested, PFOS had the highest effects. Both PFOS and BPA increased degranulation and production of inflammatory eicosanoids in mast cells at a similar level, which subsequently led to increased skin edema and serum LTC(4) and PGD(2) in mice. Both PFOS and BPA increased not only downstream signaling (PLC γ 1, AKT, ERK), but also upstream signaling (Fyn, Lyn, Syk/LAT) in mast cells. Taken together, PFOS and BPA induce mast cell-mediated inflammatory responses and improve the immune dysfunction risk assessment for emerging POPs such as PFCs.			В	В

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D1237	in vitro (免疫毒 性)	Tian, Jinglin; Hong, Yanjun; Li, Zhenchi; Yang, Zhiyi; Lei, Bo; Liu, Jianjun; Cai, Zongwei	Immunometabolism-modulation and immunotoxicity evaluation of perfluorooctanoic acid in macrophage	2021	Ecotoxicol Environ Saf. 2021 Jun 1;215:112128. doi: 10.1016/j.ecoenv.2021.112128. Epub 2021 Mar 24.	Perfluorooctanoic acid (PFOA) is one of the most commonly used perfluorinated chemicals in industry. Wide concerns of PFOA toxicity are increased in recent years. However, report on immunotoxicity of PFOA was quite limited. This study aimed to investigate the immunotoxicity of PFOA exposure on macrophage RAW264.7. We assessed the effects of PFOA exposure on macrophage cell viability, cell apoptosis and cellular ROS level, and detected prominent cytokines release by RAW264.7. The results indicated that the cell viability of macrophage RAW264.7 was decreased by PFOA in dose- and time-dependent manners. Specifically, the exposure of 200 μ M PFOA significantly increased apoptosis and ROS generation in macrophage, and thus caused cell damage. The ELISA results displayed that 100 μ M PFOA exposure induced macrophage activation and enhanced cytokines secretion, including TNF- α , IL-1, IL-6, and IL-12. We also conducted nontargeted metabolomics based on LC-MS/MS and unveiled the perturbed metabolic pathways in macrophages induced by sublethal doses of PFOA (10 μ M and 100 μ M). Remarkably, global metabolomics results displayed that 10 μ M PFOA exposure affected glutamine related pathways and the exposure at 100 μ M conspicuously changed glutathione and fatty acid oxidation metabolism. These findings showed that 10 μ M PFOA exposure could impel metabolic reprogramming of macrophage to trigger inflammatory response, although such dose displayed no obvious effect on cell viability, cellular ROS or apoptosis events of macrophage RAW264.7.		СВ
D1238	in vitro (免疫毒 性)	Mangu, Jagadish Chandra Kumar; Stylianou, Marios; Olsson, Per-Erik; Jass, Jana	Per- and polyfluoroalkyl substances enhance Staphylococcus aureus pathogenicity and impair host immune response	2022	Environ Pollut. 2022 Dec 1;314:120294. doi: 10.1016/j.envpol.2022.120294. Epub 2022 Sep 28.	Per- and Poly-fluoroalkyl substances (PFAS) are major persistent environmental contaminants. Epidemiological studies have linked PFAS exposures to altered immunity and increased occurrence of infections in children. However, the mechanisms leading to immune susceptibility to bacterial infections remains unclear. To elucidate the mechanism, transcriptional alteration in the Caenorhabditis elegans model caused by a PFAS contaminated environmental water and two reconstituted PFAS solutions were evaluated using RNA-sequencing. PFAS affected the expression of several genes involved in C. elegans immune surveillance to Gram-positive bacteria (cpr-2, tag-38, spp-1, spp-5, clec-7, clec-172). The combined exposure to PFAS and Staphylococcus aureus significantly reduced C. elegans survival and increased intestinal membrane permeability. Furthermore, the growth of S. aureus in the presence of PFAS increased the expression of virulence genes, specifically, the virulence gene regulator saeR and α -hemolysin, hla, which resulted in increased hemolytic activity. The present study demonstrated that PFAS exposure not only increased C. elegans susceptibility to pathogens by reducing host immunity and increasing intestinal membrane permeability, but also increased bacteria virulence. This presents a broader implication for humans and other animals, where environmental contaminants simultaneously reduce host resilience, while, increasing microbial pathogenicity.		СС
D1239	in vitro (免疫毒 性)	Berntsen, Hanne Friis; Bodin, Johanna; Ø vrevik, Johan; Berntsen, Christopher Friis; Østby, Gunn C; Brinchmann, Bendik C; Ropstad, Erik; Myhre, Oddvar	A human relevant mixture of persistent organic pollutants induces reactive oxygen species formation in isolated human leucocytes: Involvement of the β 2- adrenergic receptor	2022	Environ Int. 2022 Jan;158:106900. doi: 10.1016/j.envint.2021.106900. Epub 2021 Oct 1.	Exposure to chlorinated (CI), brominated (Br) and perfluoroalkyl acid (PFAA) persistent organic pollutants (POPs) is associated with immunotoxicity and other adverse effects in humans and animals. Previous studies on POPs have mainly focused on single chemicals, while studies on complex mixtures are limited. Using DCF and luminol assays we examined effects on ROS generation in isolated human neutrophils, monocytes and lymphocytes, after in vitro exposure to a total mixture and sub-mixtures of 29 persistent compounds (CI, Br, and PFAA). The mixtures were based on compounds prominent in blood, breast milk, and/or food. All mixture combinations induced ROS production in one or several of the cell models, and in some cases even at concentrations corresponding to human blood levels (compound range 1 pM - 16 nM). Whilst some interactions were detected (assessed using a mixed linear model), halogenated subgroups mainly acted additively. Mechanistic studies in neutrophils at 500 × human levels (0.5 nM - 8 μ M) indicated similar mechanisms of action for the CI, PFAA, the combined PFAA + CI and total (PFAA + Br + CI) mixtures, and ROS responses appeared to involve β 2-adrenergic receptor (β 2AR) and Ca(2+) signalling, as well as activation of NADPH oxidases. In line with this, the total mixture also increased cyclic AMP at levels comparable with the non-selective β AR agonist, isoproterenol. Although the detailed mechanisms involved in these responses remain to be elucidated, our data show that POP mixtures at concentrations found in human blood, may trigger stress responses in circulating immune cells. Mixtures of POPs, further seemed to interfere with adrenergic pathways, indicating a novel role of β ARs in POP-induced effects.		C C
D1240	MOA (神 経毒性)	古武 弥一郎(広島 大学 大学院医歯 薬保健学研究科)	環境化学物質の神経毒性メカニズム解明およびその評価 系構築に関する研究	2018	薬学雑誌(0031-6903)138巻10号 Page1227-1233(2018.10), doi: 10.1248/yakushi.18-00014	低濃度化学物質が引き起こす神経毒性メカニズムを明らかにすることにより、当該化学物質の危険性や疾患との関係を明らかにするこ とができると考えられる。特に低濃度でのみ起こる、毒性につながる作用に着目して行った、1)環境汚染物質有機スズの神経毒性解明 と、これを手掛かりにした化学物質の高感度毒性評価系構築、2)パーキンソン病関連化学物質による蛋白質分解異常、の二つの研究結 果について述べた。		сс

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No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン 文 ク 献 ① ラ	ン 文 ク 献 ② ラ
D1241	MOA(骨 毒性)	Di Nisio, Andrea; Rocca, Maria Santa; De Toni, Luca; Sabovic, Iva; Guidolin, Diego; Dall'Acqua, Stefano; Acquasaliente, Laura; De Filippis, Vincenzo; Plebani, Mario; Foresta, Carlo	Endocrine disruption of vitamin D activity by perfluoro- octanoic acid (PFOA)	2020	Sci Rep. 2020 Oct 8;10(1):16789. doi: 10.1038/s41598-020- 74026-8.	Perfluoroalkyl substances (PFAS) are a class of compounds used in industry and consumer products. Perfluorooctanoic acid (PFOA) is the predominant form in human samples and has been shown to induce severe health consequences, such as neonatal mortality, neurotoxicity, and immunotoxicity. Toxicological studies indicate that PFAS accumulate in bone tissues and cause altered bone development. Epidemiological studies have reported an inverse relationship between PFAS and bone health, however the associated mechanisms are still unexplored. Here, we present computational, in silico and in vitro evidence supporting the interference of PFOA on vitamin D (VD). First, PFOA competes with calcitriol on the same binding site of the VD receptor, leading to an alteration of the structural flexibility and a 10% reduction by surface plasmon resonance analysis. Second, this interference leads to an altered response of VD-responsive genes in two cellular targets of this hormone, osteoblasts and epithelial cells of the colorectal tract. Third, mineralization in human osteoblasts is reduced upon coincubation of PFOA with VD. Finally, in a small cohort of young healthy men, PTH levels were higher in the exposed group, but VD levels were comparable. Altogether these results provide the first evidence of endocrine disruption by PFOA on VD pathway by competition on its receptor and subsequent inhibition of VD-responsive genes in target cells.			В	A
D1242	MOA (酸 化ストレ ス、複合 影響)	Ojo, Atinuke F; Peng, Cheng; Ng, Jack C	Combined effects of mixed per- and polyfluoroalkyl substances on the Nrf2-ARE pathway in ARE reporter- HepG2 cells	2022	J Hazard Mater. 2022 Jan 5;421:126827. doi: 10.1016/j.jhazmat.2021.126827. Epub 2021 Aug 5.	Although the Nrf2-ARE pathway plays a critical role in cellular protection against toxicity and oxidative stress from environmental chemical stressors, the association between exposure to per- and polyfluoroalkyl substances (PFAS) mixtures and the changes of Nrf2-ARE pathway remains largely unexplored. This study evaluated the potential of PFAS to induce the Nrf2-ARE pathway as individual compounds and as binary, ternary, and multicomponent mixtures in the ARE reporter-HepG2 cells and compared the mixture toxicity data to the predictions by concentration addition (CA) model. The toxicological interactions between PFAS mixture components were also determined by the model deviation ratio (MDR) between the CA predicted and mixture toxicity values. The induction of the Nrf2-ARE pathway was quantified using the luciferase system, and the endpoint assessed was the concentration that induced an induction ratio (IR) of 1.5 (EC(IR1.5)). The results showed that exposures to both individual and mixed PFAS induced the Nrf2-ARE pathway in ARE reporter-HepG2 cells. Based on the MDRs, the combinations with PFOS showed synergistic interactive effects, while the combinations with PFOS co-exposures and may have health risk assessment implications.			A	С
D1243	in vitro	Souders, Christopher L 2nd; Sanchez, Christina L; Malphurs, Wendi; Aristizabal- Henao, Juan J; Bowden, John A; Martyniuk, Christopher J	Metabolic profiling in human SH-SY5Y neuronal cells exposed to perfluorooctanoic acid (PFOA)	2021	Neurotoxicology. 2021 Jul;85:160-172. doi: 10.1016/j.neuro.2021.05.009. Epub 2021 May 21.	Perfluorooctanoic acid (PFOA) is an abundant per- and polyfluoroalkyl substance (PFAS) detected in both indoor and outdoor environments. While studies suggest exposure concerns for humans, studies investigating PFOA-induced neurotoxicity are lacking. To address this gap, we exposed differentiated human SH-SY5Y cells to PFOA (0.1 μ M up to 500 μ M) at different time points (4, 24, 48, and 72 h) and measured cell viability, Casp3/7 activity, ATP levels, ATP synthase enzyme activity, mitochondrial membrane potential, reactive oxygen species (ROS), oxygen consumption rates for mitochondrial stress test (XFe24 Flux analyzer), glucose utilization, and global metabolome profiles to assess the potential for PFOA-induced neurotoxicity. Treatment with 10 or 100 μ M PFOA did not compromise cell viability nor induce cytotoxicity to SH-SY5Y cells over a 48-hour exposure period. However, >250 μ M PFOA compromised cell viability, induced cytotoxicity, and induced caspase 3/7 activity at 48 h. ATP levels were reduced in cells treated with 400 μ M PFOA for 24 and 48 h, and with 100 μ M PFOA and higher at 72 h. ATP synthase activity was inhibited by 250 μ M PFOA but was unchanged by PFOA treatment at 200 μ M or less. Conversely, mitochondrial membrane potential was reduced by >10 μ M PFOA after 24 h. Total ROS was increased with 100 μ M PFOA or less. One exception was mitochondria-related endpoints (basal respiration, ATP production, maximum respiration) were negatively affected at 250 μ M PFOA at both 24- and 48-hour exposure, but were unaltered at concentrations of 100 μ M PFOA or less. One exception was mitochondrial spare capacity, which was reduced by 100 μ M PFOA after 24-hour exposure. Similarly, glycolysis, glycolytic capacity, and glycolytic reserve of SH-SY5Y cells were not altered by 10 nor 100 μ M PFOA. Nontargeted metabolomics was conducted in cells treated with either 10 or 100 μ M PFOA had little effect on the SH-SY5Y metabolome, and the metabolites differed among treatments. Notable			В	A

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 象抽 ① ラ ② ラ
D1244	MOA(神 経毒性)	Chowdhury, Manjurul Islam; Sana, Tanmoy; Panneerselvan, Logeshwaran; Sivaram, Anithadevi Kenday; Megharaj, Mallavarapu	Perfluorooctane sulfonate (PFOS) induces several behavioural defects in Caenorhabditis elegans that can also be transferred to the next generations	2022	Chemosphere. 2022 Mar;291(Pt 2):132896. doi: 10.1016/j.chemosphere.2021.132896. Epub 2021 Nov 12.	Perfluorooctane sulfonate (PFOS) is a well-known global persistent organic pollutant of grave concern to ecological and human health. Toxicity of PFOS to animals and humans are well studied. Although few studies have reported the behavioral effect of PFOS on nematode Caenorhabditis elegans, it's transgenerational effects were seldom studied. Therefore, we investigated the toxicity of PFOS on several behavioral responses besides bioaccumulation and transgenerational effects in C. elegans. In contrast to the several published studies, we used lower concentrations (0.5-1000 μ g/L or 0.001-2.0 μ M) that are environmentally relevant and reported to occur close to the contaminated areas. The 48 h median lethal concentration of PFOS was found to be 3.15 μ M (1575 μ g/L). PFOS (\geq 0.01 μ M) caused severe toxicity to locomotion, and this effect was even transferred to progeny. However, after a few generations, the defect was rectified in the progeny of single-time exposed parent nematodes. Whereas, continuous exposure at 0.001 μ M PFOS, no visible defects were observed in the progeny. PFOS (\geq 0.01 μ M) also significantly decreased the brood size in a concentration-dependent manner. Besides, lifespan was affected by the higher concentration of PFOS (\geq 1.0 μ M). These two behavioral endpoints, lifespan and reproduction defects, became less severe in the progeny. Chemotaxis plasticity was also significantly retarded by \geq 1.0 μ M PFOS compared to the control group. Results indicate that PFOS can exert severe neurobehavioral defects that can be transferred from parents to their offspring. The findings of this study have significant implications for the risk assessment of perfluorinated substances in the environment.		в в
D1245	MOA(神 経毒性)	Yadav, Ajay; Amber, Mazia; Zosen, Denis; Labba, Nils Anders; Huiberts, Eva Henriette Willemijn; Samulin Erdem, Johanna; Haugen, Fred; Berntsen, Hanne Friis; Zienolddiny, Shanbeh; Paulsen, Ragnhild Elisabeth; Ropstad, Erik; Connolly, Lisa; Verhaegen, Steven	A human relevant mixture of persistent organic pollutants (POPs) and perfluorooctane sulfonic acid (PFOS) enhance nerve growth factor (NGF)-induced neurite outgrowth in PC12 cells	2021	Toxicol Lett. 2021 Mar 1;338:85-96. doi: 10.1016/j.toxlet.2020.12.007. Epub 2020 Dec 9.	Disruption of neurite outgrowth is a marker for neurotoxicity. Persistent organic pollutants (POPs) are potential developmental neurotoxicants. We investigated their effect on neurite outgrowth in PC12 rat pheochromocytoma cells, in absence or presence of nerve growth factor (NGF), an inducer of neuronal differentiation. Cells were exposed for 72 h to a defined mixture of POPs with chemical composition and concentrations based on blood levels in the Scandinavian population. We also evaluated perfluorooctane sulfonic acid (PFOS) alone, the most abundant compound in the POP mixture. Only higher concentrations of POP mixture reduced tetrazolium salt (MTT) conversion. High-content analysis showed a decrease in cell number, but no changes for nuclear and mitochondrial cellular health parameters. Robust glutathione levels were observed in NGF-differentiated cells. Live imaging, using the IncuCyte ZOOM platform indicated ongoing cell proliferation over time, but slower in presence of NGF. The pollutants did not inhibit neuritogenesis, but rather increased NGF-induced neurite length. PFOS induced neurite outgrowth to about 50 % of the level seen with the POP mixture. Neither the POP mixture nor PFOS affected neurite length in the absence of NGF. Our observations indicate that realistic complex mixtures of environmental pollutants can affect neuronal connectivity via NGF-induced neurite outgrowth.		B C
D1246	MOA(神 経毒性)	Olatunde, Olalekan C; Kuvarega, Alex T; Onwudiwe, Damian C	Photo enhanced degradation of polyfluoroalkyl and perfluoroalkyl substances	2020	Heliyon. 2020 Dec 1;6(12):e05614. doi: 10.1016/j.heliyon.2020.e05614. eCollection 2020 Dec.	The increase in the presence of highly recalcitrant poly- and per- fluoroalkyl substances (PFAS) in the environment, plant tissues and animals continues to pose serious health concerns. Several treatment methods such as physical, biological and chemical processes have been explored to deal with these compounds. Current trends have shown that the destructive treatment processes, which offer degradation and mineralization of PFASs, are the most desirable process among researchers and policy makers. This article, therefore, reviews the degradation and defluorination processes, their efficiencies and the degradation mechanism of photon-based processes. It shows that high degradation and defluorination efficiency of PFASs could be achieved by photon driven processes such as photolysis, photochemical, photocatalysis and photoreduction. The efficiency of these processes is greatly influenced by the nature of light and the reactive radical generated in the system. The limitation of these processes, however, include the long reaction time required and the use of anoxic reaction conditions, which are not obtainable at ambient conditions.		D C

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 対報 象抽 ① ラ	ン 文 ② ラ
D1247	MOA(内 分泌系)	Guan, Ruining; Luan, Feng; Li, Ningqi; Qiu, Zhiqiang; Liu, Wencheng; Cui, Zeyang; Zhao, Chunyan; Li, Xin	Identification of molecular initiating events and key events leading to endocrine disrupting effects of PFOA: Integrated molecular dynamic, transcriptomic, and proteomic analyses	2022	Chemosphere. 2022 Nov;307(Pt 2):135881. doi: 10.1016/j.chemosphere.2022.135881. Epub 2022 Aug 1.	Perfluorooctanoic acid (PFOA) can rapidly activate signaling pathways independent of nuclear hormone receptors through membrane receptor regulation, which leads to endocrine disrupting effects. In the present work, the molecular initiating event (MIE) and the key events (KEs) which cause the endocrine disrupting effects of PFOA have been explored and determined based on molecular dynamics simulation (MD), fluorescence analysis, transcriptomics, and proteomics. MD modeling and fluorescence analysis proved that, on binding to the G protein-coupled estrogen receptor-1 (GPER), PFOA could induce a conformational change in the receptor, turning it into an active state. The results also indicated that the binding to GPER was the MIE that led to the adverse outcome (AO) of PFOA. In addition, the downstream signal transduction pathways of GPER, as regulated by PFOA, were further investigated through genomics and proteomics to identify the KEs leading to thr endocrine disrupting effects. Two pathways (Endocrine resistance, ERP and Estrogen signaling pathway, ESP) containing GPER were regulated by different concentration of PFOA and identified as the KEs. The knowledge of MIE, KEs, and AO of PFOA is necessary to understand the links between PFOA and the possible pathways that lead to its negative effects.		D	A
D1248	MOA(内 分泌系)	Kim, Hun; Hong, Min-Wook; Bae, Yun-Ho; Lee, Sung-Jin	Epigenetic toxicity and cytotoxicity of perfluorooctanoic acid and its effects on gene expression in embryonic mouse hypothalamus cells	2021	Arh Hig Rada Toksikol. 2021 Sep 28;72(3):182-190. doi: 10.2478/aiht-2021-72-3555.	Even though the endocrine-disrupting potential of perfluorooctanoic acid (PFOA) is well known, the mechanisms underlying its cellular and epigenetic toxicity at the critical stage of hypothalamic development are poorly understood. This is why we studied its effects on the embryonic mouse hypothalamic cell line N46 (mHypoE-N46) with a hope to shed more light on the mechanisms through which PFOA causes embryonic hypothalamic cell damage. To do that, we studied cell viability, global DNA methylation, and gene expression in cells exposed to PFOA. As the PFOA dose increased, cell viability decreased, while global DNA methylation increased. PFOA also significantly altered the expression of genes related to the apoptosis and cell cycle, neurotrophic genes, and the Tet, Dnmt, and Mecp2 genes. Our findings suggest that exposure to PFOA affects cell survival through the reprogramming of embryonic hypothalamic DNA methylation patterns and altering cell homeostasis genes. DNA methylation and changes in the Mecp2 gene expression induced by PFOA also imply wider ramifications, as they alter genes of other major mechanisms of the embryonic hypothalamus. Our study may therefore serve as a good starting point for further research into the mechanisms of PFOA effect of hypothalamic development.		D	В
D1249	MOA(ミ トコンド リア機能 障害)	Magnifico, Maria Chiara; Xhani, Marla; Sprovera, Benedetta; Buttari, Brigitta; Abballe, Giorgia; Desideri, Flaminia; Panieri, Emiliano; Saso, Luciano; Arese, Marzia	Nitro-Oxidative Stress and Mitochondrial Dysfunction in Human Cell Lines Exposed to the Environmental Contaminants PFOA and BPA	2022	Front Biosci (Landmark Ed). 2022 Oct 27;27(10):292. doi: 10.31083/j.fbl2710292.	BACKGROUND: Bisphenol A (BPA) and perfluorooctanoic acid (PFOA) are synthetic compounds widely utilized in industrial activities devoted to the production of daily life plastic, metal products, and packaging from which they are able to migrate to food and water. Due to their persistence in the environment, living organisms are chronically exposed to these pollutants. BPA and PFOA have adverse effects on tissues and organs. The aim of this study was to identify the molecular targets and biochemical mechanisms involved in their toxicity. METHODS: HepG2 and HaCaT cells were treated with BPA or PFOA, and the trypan blue exclusion test and 3-(4,5-Dimethylthiazol-2-yl)-2,5-Diphenyltetrazolium Bromide (MTT) assay were performed to define the conditions for subsequent investigations. We conducted quantitative PCR and western blot analysis to evaluate the expression of proteins involved in nitric oxide (NO) signaling. Cell-based assays were carried out to evaluate reactive oxygen species (ROS) production, nitrite/nitrate (NOx) accumulation, 3-nitrotyrosine (3-NT) formation, and mitochondrial membrane potential (MMP) determination in treated cells. RESULTS: HepG2 and HaCaT cells incubated for 24 h with subtoxic concentrations of BPA or PFOA (50 and 10 μ M, respectively) exhibited altered mRNA and protein expression levels of NO synthase isoforms, manganese superoxide dismutase, and cytochrome c. Treatment with PFOA led to activation of inducible NO synthase (NOS), a marker of nitrosative stress, accompanied by the increased production of ROS, NOx, and 3-NT and alterations of the MMP compared to controls. CONCLUSIONS: The results of this study indicate the major involvement of the NO signaling axis in the persistent alteration of cell redox homeostasis and mitochondrial dysfunction induced by BPA and PFOA, highlighting the specific role of PFOA in NOS regulation and induction of nitro-oxidative stress.		В	В
D1250	MOA(免 疫毒性)	Liang, Luyun; Pan, Yongling; Bin, Lihua; Liu, Yu; Huang, Wenjun; Li, Rong; Lai, Keng Po	Immunotoxicity mechanisms of perfluorinated compounds PFOA and PFOS	2022	Chemosphere. 2022 Mar;291(Pt 2):132892. doi: 10.1016/j.chemosphere.2021.132892. Epub 2021 Nov 12.	Perfluorinated and polyfluorinated compounds (PFASs) are a class of synthetic chemical substances that are widely used in human production and life, such as fire-fighting foams, textiles and clothing, surfactants, and surface protective agents. Perfluorooctane sulfonic acid (PFOS) and perfluorooctanoic acid (PFOA) are the most abundant and common perfluorinated compounds in biota and humans. Currently, PFOA and PFOS have been listed in the Stockholm Convention on Persistent Organic Pollutants, and their production has been halted in many countries. However, because the high-energy carbon-fluorine bond can make it resistant to hydrolysis, photolysis, microbial degradation, and vertebrate metabolism, PFOA and PFOS have toxic effects on the immune system of the body. This article reviewed the effects of PFOA and PFOS on immune organs such as the spleen, bone marrow, and thymus of mice and zebrafish, and the effects on non-specific immune functions based on cellular immunity, and further summarized the possible immune toxicity mechanisms such as AIM2 inflammasome activation, gene dysregulation, and signal pathway disorders caused by PFOA and PFOS. The aim of this review was to provide a reference for further understanding of the immunotoxicity and the responsible mechanism of PFOA and PFOS.		В	В

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No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D1251	MOA(免 疫毒性)	Janssen, Aafke W F; Louisse, Jochem; Rijkers, Deborah; Pinckaers, Nicole E T; Hoekstra, Sjoerdtje A; Hoogenboom, Ron L A P; Peijnenburg, Ad A C M; Beekmann, Karsten	Perfluoroalkyl substances (PFASs) decrease the expression of recombination-activating genes (RAG1 and RAG2) in human B lymphoma Namalwa cells	2022	Arch Toxicol. 2022 Nov 3. doi: 10.1007/s00204-022-03405-z. Online ahead of print.	Per- and polyfluoroalkyl substances (PFASs) are omnipresent and have been shown to induce a wide range of adverse effects, including hepatotoxicity, developmental toxicity and immunotoxicity. So far, little information is available about the mechanisms underlying the toxicity of PFASs, including those related to their immunotoxicity. Reported immunotoxic effects of PFASs include decreased antibody responses in experimental animals and humans, indicating that PFASs may, among others, affect B cell function. In the present study, we first assessed the effects of PFOA on the transcriptome of the human Namalwa B cell line using RNA seq analysis. Gene expression changes, analyzed using Ingenuity Pathway Analysis, pointed to various cellular processes affected by PFOA, including 'B cell development' and 'Primary immunodeficiency signaling'. Interestingly, PFOA decreased the expression of RAG1 and RAG2, genes involved in immunoglobulin and T cell receptor V(D)J recombination. As a next step, time-and concentration-dependent changes in the expression of RAG1 and RAG2 upon exposure to PFOA, PFNA, PFHxS and PFOS were studied through RT-qPCR analysis. Analysis with the concentration-response modeling software PROAST resulted in the following potency ranking: PFNA > PFOA > PFOS > PFHxS. Altogether, the present in vitro study provides insights into the effects of selected PFASs on B cells, identifying RAG1 and RAG2 expression as possible relevant targets that may play a role in the immunotoxicity of PFASs.		D B
D1252	MOA(免 疫毒性)	Masi, Mirco; Maddalon, Ambra; Iulini, Martina; Linciano, Pasquale; Galbiati, Valentina; Marinovich, Marinovich, Marina; Racchi, Marco; Corsini, Emanuela; Buoso, Erica	Effects of endocrine disrupting chemicals on the expression of RACK1 and LPS-induced THP-1 cell activation	2022	Toxicology. 2022 Oct;480:153321. doi: 10.1016/j.tox.2022.153321. Epub 2022 Sep 13.	The existence of a complex hormonal balance among glucocorticoids, androgens and estrogens involved in the regulation of Receptor for Activated C Kinase 1 (RACK1) expression and its related immune cells activation, highlights the possibility to employ this protein as screening tool for the evaluation of the immunotoxic profile of endocrine disrupting chemicals (EDCs), hormone- active substances capable of interfering with the physiologic hormonal signaling. Hence, the aim of this work was to investigate the effect of the exposure of EDCS 17 α -ethynylestradiol (EE), diethyl phthalate (DEP) and perfluorooctanesulfonic acid (PFOS) on RACK1 expression and on lipopolysaccharide (LPS)-induced activation of the human monocytic cell line THP-1, a validated model for this investigation. In line with our previous results with estrogen-active compounds, EE treatment significantly induced RACK1 promoter transcriptional activity, mRNA expression, and protein levels, which paralleled an increase in LPS-induced IL-8, TNF- α production and CD86 expression, previously demonstrated to be dependent on RACK1/PKC β activation. EE mediates its effect on RACK1 expression through G-protein-coupled estrogen receptor (GPER) and androgen receptor (AR) ligand-independent cascade, as also suggested by in silico molecular docking simulation. Conversely, DEP and PFOS induced a dose-dependent downregulation of RACK1 promoter transcriptional activity, mRNA expression, and protein levels, which was mirrored by a reduction of IL-8, TNF- α production and CD86 expression. Mifepristone pre-treatments abolish DEP and PFOS effects, confirming their GR agonist profile, also corroborated by molecular docking. Altogether, our data confirm that RACK1 represents an interesting target of steroid active compounds, which expression offers the opportunity to screen the immunotoxic potential of different hormone-active substances of concerns due to their human exposure and environmental persistence.		C C
D1253	MOA(免 疫毒性)	Naidenko, Olga V; Andrews, David Q; Temkin, Alexis M; Stoiber, Tasha; Uche, Uloma Igara; Evans, Sydney; Perrone- Gray, Sean	Investigating Molecular Mechanisms of Immunotoxicity and the Utility of ToxCast for Immunotoxicity Screening of Chemicals Added to Food	2021	Int J Environ Res Public Health. 2021 Mar 24;18(7):3332. doi: 10.3390/ijerph18073332.	The development of high-throughput screening methodologies may decrease the need for laboratory animals for toxicity testing. Here, we investigate the potential of assessing immunotoxicity with high-throughput screening data from the U.S. Environmental Protection Agency ToxCast program. As case studies, we analyzed the most common chemicals added to food as well as per- and polyfluoroalkyl substances (PFAS) shown to migrate to food from packaging materials or processing equipment. The antioxidant preservative tert-butylhydroquinone (TBHQ) showed activity both in ToxCast assays and in classical immunological assays, suggesting that it may affect the immune response in people. From the PFAS group, we identified eight substances that can migrate from food contact materials and have ToxCast data. In epidemiological and toxicological studies, PFAS suppress the immune system and decrease the response to vaccination. However, most PFAS show weak or no activity in immune-related ToxCast assays. This lack of concordance between toxicological and high-throughput data for common PFAS indicates the current limitations of in vitro screening for analyzing immunotoxicity. High-throughput in vitro assays show promise for providing mechanistic data relevant for immune risk assessment. In contrast, the lack of immune-specific activity in the existing high- throughput assays cannot validate the safety of a chemical for the immune system.		D C
D1254	遺伝子発 現解析	Clark, Kendra L; George, Jitu W; Hua, Guohua; Davis, John S	Perfluorooctanoic acid promotes proliferation of the human granulosa cell line HGrC1 and alters expression of cell cycle genes and Hippo pathway effector YAP1	2022	Reprod Toxicol. 2022 Jun;110:49-59. doi: 10.1016/j.reprotox.2022.03.011. Epub 2022 Mar 25.	Perfluorooctanoic acid (PFOA) is a common environmental contaminant that belongs to a group of manmade fluorinated chemicals called per- and polyfluoroalkyl substances (PFAS). Due to the pervasive nature of PFOA, the environmental health risks of PFOA contamination and exposure on reproductive health have increasing concern. In the present study, we exposed HGrC1 cells, an immortalized human granulosa cell line, to environmentally relevant (1-10 μ M) concentrations of PFOA. Results indicated that HGrC1 cells treated with PFOA had increased proliferation and migration relative to vehicle treated controls. No differences in cell apoptosis were observed with 1-10 μ M PFOA. Gene expression analysis revealed increases in mRNA transcripts for cell cycle regulators CCND1, CCNA2, and CCNB1. Upregulation of YAP1 protein and downstream target CTGF protein was also observed, suggesting that the Hippo pathway is involved in the proliferation and migratory effects of PFOA on HGrC1 cells. Together, these findings support a role for the Hippo pathway effector YAP1 in response to PFOA exposure in human granulosa cells.		ВА

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 対報 ク献 象抽 ① ラ	ン 文 ク 献 ② ラ
D1255	遺伝子発 現解析	Yarahalli Jayaram, Vidhya; Baggavalli, Somesh; Reddy, Divijendra; Sistla, Srinivas; Malempati, Rajyalakshmi	Effect of endosulfan and bisphenol A on the expression of SUMO and UBC9	2020	Drug Chem Toxicol. 2020 Nov;43(6):637-644. doi: 10.1080/01480545.2018.1526179. Epub 2018 Nov 14.	This study was designed to investigate possible interference of Xenobiotics with SUMOylation in eukaryotic cells. To begin with, we docked 71 chemical structures from PubChem with human SUMO1 and UBC9 protein structures using Auto Dock 4.2 and Hex 6.3 and selected five compounds for binding studies in Surface Plasmon Resonance (SPR) with human SUMO1. In SPR studies, only endosulfan showed binding to SUMO1 (K(d)1.313 \times 10-4 M). Further, we treated HePG2 and differentiated 3T3-L1 cells with endosulfan/bisphenol A/perfluorooctanoic acid (PFOA) to test induction of oxidative stress and SUMO isoform/UBC9 expression. Treatment with these compounds resulted in higher levels of nitric oxide (NO), NOS2A mRNA, and reactive oxygen species (ROS) associated with decreased NADPH levels. Additionally, treatment with these chemicals resulted in elevated mRNA levels of IL-6 and IL-1 β in 3T3-L1 cells. In HePG2 cells, endosulfan treatment resulted in elevated mRNA levels of SUMO1, 3 and UBC9, whereas, treatment with bisphenol A resulted in increased mRNA of SUMO2, 3 and UBC9. Treatment with PFOA resulted in elevated mRNA levels of SUMO2. Apart from influencing the gene expression, endosulfan caused decrease in SUMO1-Sumoylation of few proteins. We propose that one reason for the severe health consequences of exposure to endosulfan/bisphenol could be due to induction of oxidative stress and modulation in SUMO and UBC9 gene expression.		С	
D1256	遺伝子発 現解析	Kupsco, Allison; Lee, Jenny Jyoung; Prada, Diddier; Valvi, Damaskini; Hu, Lisa; Petersen, Maria Skaalum; Coull, Brent A; Weihe, Pal; Grandjean, Philippe; Baccarelli, Andrea A	Marine pollutant exposures and human milk extracellular vesicle-microRNAs in a mother-infant cohort from the Faroe Islands	2022	Environ Int. 2022 Jan;158:106986. doi: 10.1016/j.envint.2021.106986. Epub 2021 Nov 20.	BACKGROUND/AIMS: Early life exposures to marine contaminants can adversely impact child health but modes of action are unclear. Human milk contains extracellular vesicles (EVs) that can transport biologically relevant cargo from mother to infant, including microRNAs (miRNAs), and may partly mediate the effects of pollutants on child health. However, the role of marine pollutants on miRNA expression in milk EVs is unexplored. METHODS: We isolated EV RNA from 333 milk samples collected between 2 and 74 days postpartum from a Faroese birth cohort born 1997-2000 and sequenced 2083 miRNAs using a targeted library preparation method. We quantified five perfluoroalkyl substances (PFAS), pesticide metabolite p.p'- dichlorodiphenyldichloroethylene (DDE), and the sum of three major polychlorinated biphenyls (Σ PCBs) in maternal serum at 34 weeks of gestation and maternal hair total mercury (Hg) at birth. We used negative binomial regressions to estimate associations between individual pollutants and 418 reliably expressed EV-miRNAs adjusted for potential confounders. We performed sparse principal components (PCs) analysis to derive the first four components of the EV-miRNA data and examined associations between pollutants and PCs using Bayesian kernel machine regression (BKMR). RESULTS: We observed no associations between pollutants and PCs using Bayesian after controlling the false discovery rate at 0.1. However, BKMR suggested that Hg was positively associated with PC4. Exploration of PC loadings followed by pathway analyses suggested that miRNAs in PC1 (miR-200b-3p, miR-664a-3p, miR-6738-5p, miR-429, miR-1236-5p, miR-4464, and miR-30b-5p) may be related to Hg neurotoxicity, while remaining PCs require further research. CONCLUSIONS: Our findings suggest that groups of milk EV-miRNAs may better serve as environmental biomarkers than individual miRNAs. Future studies are needed to elucidate the role of milk EV-miRNAs in child health following prenatal exposures.		С	В
D1257	遺伝子発 現解析	Yamamoto Junpei(Faculty of Applied Bioscience, Department of Nutritional Science, Tokyo University of Agriculture), Yamane Takumi, Oishi Yuichi, Kobayashi- Hattori Kazuo	ペルフロオロオクタン酸は、ペルオキシソーム増殖因子 活性化受容体 y に結合し、3T3-L1脂肪細胞の脂肪細胞分 化を促進させる (Perfluorooctanoic acid binds to peroxisome proliferator-activated receptor and promotes adipocyte differentiation in 3T3-L1 adipocytes)(英語)	2015	Bioscience, Biotechnology, and Biochemistry(0916-8451)79 巻4号 Page636-639(2015.04)	マウス3T3-L1脂肪細胞に対するペルフロオロオクタン酸(PFOA)の作用について検討した。リアルタイムPCR法により、PFOAは、3T3- L1脂肪細胞において脂肪細胞分化、トリグリセリド蓄積、脂肪細胞分化に関連する要因となるペルオキシソーム増殖因子活性化受容体 (PPAR) γ、CCAAT/エンハンサー結合蛋白α(C/EBPα)、脂肪細胞脂肪酸結合蛋白4、リポ蛋白リパーゼ、グルコーストランスポーター 4型のmRNAレベルを増加させることが認められた。さらに、PFOAのPPAR γへの結合が認められた。形態学的解析により、PFOAの添 加により3T3-L1細胞において細胞内の油滴数が増加した。さらに、50μMのPFOAは細胞中のトリグリセリド量を有意に増加させた。 これらの結果から、PFOAはPPAR γのリガンドとして脂肪細胞の分化を促進することが示唆された。		В	В
D1258	遺伝子発 現解析	グルゲ・キール ティ・シリ (動物 衛生研究所 安全 性研究チーム),山 中 典子,宮崎 茂, 山下 信義, Yeung Leo W.Y., Lam Paul K.S., Giesy John P.	パーフルオロオクタン酸は脂肪酸代謝関連遺伝子発現を 変動させる	2007	動物衛生研究成果情報(1347-6998)6号 Page63-64(2007.08)	新規環境汚染物質であるパーフルオロオクタン酸を投与したラットでは、肝臓のペルオキシソームおよびミトコンドリアでの脂肪酸β- 酸化に関与する遺伝子群の発現が誘導されることを明らかにし、本物質の毒性発現メカニズムを解明する重要な手がかりを得た。		В	В

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 ク献 ク献 泉抽 ① ラ ② ラ	
D1259	細胞毒性	Otero-Sabio, Cristina; Giacomello, Marta; Centelleghe, Cinzia; Caicci, Federico; Bonato, Marco; Venerando, Andrea; Graïc, Jean-Marie; Mazzariol, Sandro; Finos, Livio; Corain, Livio; Peruffo, Antonella	Cell cycle alterations due to perfluoroalkyl substances PFOS, PFOA, PFBS, PFBA and the new PFAS C6O4 on bottlenose dolphin (Tursiops truncatus) skin cell	2022	2 Ecotoxicol Environ Saf. 2022 Oct 1;244:113980. doi: 10.1016/j.ecoenv.2022.113980. Epub 2022 Aug 31.	Per- and polyfluoroalkyl substances (PFAS) have become ubiquitous environmental contaminants in aquatic ecosystems worldwide. Marine mammals, as top predators, are constantly exposed to several PFAS compounds that accumulate in different tissues. As a proxy to assess cytotoxicity of PFAS in the bottlenose dolphin (Tursiops truncatus), we generated a new immortalized cell line derived from skin samples of bottlenose dolphin. Using high content imaging, we assessed the effects of increasing concentrations of PFOS, PFOA, PFBS, PFBA and C6O4 on cell viability and cell cycle phases. In particular, we classified all cells based on multiple morphometric differences of the nucleus in three populations, named respectively "Normal" (nuclei in G0, S and M phase); "Large" (nuclei showing characteristics of senescence) and "Small" (nuclei with fragmentation and condensed chromatin). Combining this approach with cell cycle analysis we determined which phases of the cell cycle were influenced by PFAS. The results revealed that the presence of PFOS, PFBS and PFBA could increase the number of cells in G0+G1 phase and decrease the number of those in the S phase. Moreover, PFOS and PFBS lowered the fraction of cells in the M phase. Interestingly PFOS, PFBS and PFBA reduced the prevalence of the senescence phenotype ("large" nuclei), suggesting a potential tumorigenic effect. Besides, the presence of PFOS and PFBS correlated also with a significant decrease in the number of "small" nuclei. The C6O4 exposure did not highlighted morphometric alteration or cell cycle modification bottlenose dolphin skin cell nuclei. While the effects of PFAS on cell cycle was clear, no significant change was detected either in term of cell proliferation or of viability. This study fosters the overall knowledge on the cellular effects of perfluoroalkyl substances in marine mammals.		B A	
D1260	細胞毒性	Abdulhasan, Mohammed; Ruden, Ximena; Marben, Teya; Harris, Sean; Ruden, Douglas M; Awonuga, Awoniyi O; Puscheck, Elizabeth E; Rappolee, Daniel A	Using Live Imaging and Fluorescence Ubiquitinated Cell Cycle Indicator Embryonic Stem Cells to Distinguish G1 Cell Cycle Delays for General Stressors like Perfluoro-Octanoic Acid and Hyperosmotic Sorbitol or G2 Cell Cycle Delay for Mutagenic Stressors like Benzo(a)pyrene	2022	2 2 2 2 2 10.1089/scd.2021.0330.	Lowest observable adverse effects level (LOAEL) is a standard point-of-departure dose in toxicology. However, first observable adverse effects level (FOAEL) was recently reported and is used, in this study, as one criterion to detect a mutagenic stimulus in a live imager. Fluorescence ubiquitinated cell cycle indicator (FUCCI) embryonic stem cells (ESC) are green in the S-G2-M phase of the cell cycle and not green in G1-phase. Standard media change here is a mild stress that delays G1-phase and media change increases green 2.5- to 5-fold. Since stress is mild, media change rapidly increases green cell number, but higher stresses of environmental toxicants and positive control hyperosmotic stress suppress increased green after media change. Perfluoro-octanoic acid (PFOA) and diethyl phthalate (DEP) previously suppressed progression of nongreen to green cell cycle progression. Here, bisphenol A (BPA), cortisol, and positive control hyperosmotic sorbitol also suppress green fluorescence, but benzo(a) pyrene (BaP) at high doses (10 μ M) increases green fluorescence throughout the 74-h exposure. Since any stress can affect many cell cycle phases, messenger RNA (mRNA) markers are best interpreted in ratios as dose-dependent mutagens increase in G2/G1 and nonmutagens increase G1/G2. After 74-h exposure, RNAseq detects G1 and G2 markers and increasing BaP doses increase G2/G1 ratios but increasing hyperosmotic sorbitol and PFOA doses increase G1/G2 marker ratios. BaP causes rapid green increase in FOAEL at 2 h of stimulus, whereas retinoic acid caused significant green fluorescence increases only late in culture. Using a live imager to establish FOAEL and G2 delay with FUCCI ESC is a new method to allow commercial and basic developmental biologists to detect drugs and environmental stimuli that are mutagenic. Furthermore, it can be used to test compounds that prevent mutations. In longitudinal studies, uniquely provided by this viable reporter and live imager protocol, follow-up can be done to test whether the preve		СВ	
D1261	細胞毒性	Calabrese, Edward J	Hormesis and bone marrow stem cells: Enhancing cell proliferation, differentiation and resilience to inflammatory stress	2022	2 Chem Biol Interact. 2022 Jan 5;351:109730. doi: 10.1016/j.cbi.2021.109730. Epub 2021 Oct 30.	This paper identifies and provides the first detailed assessment of hormetic dose responses by bone marrow stem cells (BMSCs) from a broad range of animal models and humans with particular emphasis on cell renewal (proliferation), cell differentiation and enhancing resilience to inflammatory stress. Such hormetic dose responses are commonly reported, being induced by a broad range of chemicals, including pharmaceuticals (e.g., caffeine, dexamethasone, nicotine), dietary supplements (e.g., curcumin, Ginkgo biloba, green tea extracts. resveratrol, sulforaphane), endogenous agents (e.g., hydrogen sulfide, interleukin 10), environmental contaminants (e.g., arsenic, PFOS) and physical stressor agents (e.g., adipose-derived stem cells (ADSCs), dental pulp stem cells (DPSCs), periodontal ligament stem cells (PDLSCs), neuro stem cells (NSCs), embryonic stem cells (ESCs)], indicating a substantial degree of generality for hormetic responses in stem cells. The paper assesses both the underlying mechanistic foundations of BMSC hormetic responses and their potential therapeutic implications.		D B	
No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 村 報 参 抽	ン文 ン文 ク献 ① ラ ② ラ
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D1262	細胞毒性	Ojo, Atinuke F; Peng, Cheng; Annamalai, Prasath; Megharaj, Mallavarapu; Ng, Jack C	Toxicity assessment of historical aqueous film-forming foams (AFFFs) using cell-based assays	2022	Environ Pollut. 2022 Oct 1;310:119806. doi: 10.1016/j.envpol.2022.119806. Epub 2022 Jul 19.	Aqueous film-forming foam (AFFF) has historically contained high concentrations of long-chain per-and polyfluoroalkyl substances (PFAS), which have been linked with adverse health outcomes. However, the toxicity of historical AFFFs remains largely unknown, presenting uncertainties in their risk assessment. This study assessed the toxicity of historical AFFFs by exposing human liver cells (HepG2) to various dilutions of 3M Light Water AFFF or Ansulite AFFF (0.001%, 0.002%, 0.005%, 0.009%, 0.019%, 0.038%, 0.075%, 0.15%, and 0.3%) for 24 h. The effects of the two AFFF formulations on the cell viability, intracellular reactive oxygen species (ROS) production, Nrf2-ARE activity, and DNA damage were assessed by CellTiter 96® Aq(ueous) One Solution Cell Proliferation Assay (MTS kit), dichlorofluorescein diacetate assay, luciferase assay, and alkaline Comet assay, respectively. The results revealed that the two brands of AFFFs tested were toxic to HepG2 cells at dilutions lower than the recommended 3% application formulation. Specifically, exposure to 3M Light Water AFFF or Ansulite AFFF induced a dilution-dependent decrease in cell viability, increased intracellular ROS production, and increased Nrf2-ARE activity. However, except for the highest concentration (lowest dilution) of 3M Light Water AFFF tested (0.038%.), both 3M Light Water AFFF and Ansulite AFFF did not significantly induce cellular DNA damage. Overall, 3M Light Water AFFF was more toxic than Ansulite AFFF. The findings from this study provided valuable in vitro toxicity data that may better inform the health risk assessment of these historical AFFFs.			D B
D1263	実、管理、学校の支援を行った。	D'Amico, Ramona; Gugliandolo, Enrico; Cordaro, Marika; Fusco, Roberta; Genovese, Tiziana; Peritore, Alessio Filippo; Crupi, Rosalia; Interdonato, Livia; Di Paola, Davide; Cuzzocrea, Salvatore; Impellizzeri, Daniela; Siracusa, Rosalba; Di Paola, Rosanna	Toxic Effects of Endocrine Disruptor Exposure on Collagen-Induced Arthritis	2022	Biomolecules. 2022 Apr 10;12(4):564. doi: 10.3390/biom12040564.	Endocrine disruptors (EDs) are chemical substances capable of affecting endocrine system functioning and interfering with organ morphogenesis and physiological functions. The development and regeneration of bone tissues have a complex hormonal regulation, and therefore, bone tissue cells can be considered potential targets for endocrine disruptors. In that regard, the aim of this research was to investigate the impact of ED exposure on the inflammatory response and oxidative stress in an experimental model of collagen-induced arthritis (CIA). Arthritis was induced by an emulsion of type II collagen (CII) and complete Freund's adjuvant, which was administered intradermally on days 0 and 21. Mice from day 21 to day 35 received the following EDs by oral gavage: cypermethrin (CP), diethyl phthalate (DEP), vinclozolin (VCZ), 17 α -ethinylestradiol (EE), perfluorooctanesulfonic acid (PFOS) and atrazine (ATR). ED exposure caused worsening of clinical signs (erythema and edema in the hind paws), histological and radiographic changes, as well as behavioral deficits, induced by arthritis; this upregulation was more evident after exposure to ATR than to other EDs. The results from our study suggest that exposure to EDs may play a deleterious role in the progression of RA; therefore, exposure to EDs should be limited.			ВВ
D1264	実験動物 (消化 管)	Shi, Licai; Zheng, Jiaojiao; Yan, Shikai; Li, Yinxia; Wang, Yajie; Liu, Xuebo; Xiao, Chunxia	Exposure to Perfluorooctanoic Acid Induces Cognitive Deficits via Altering Gut Microbiota Composition, Impairing Intestinal Barrier Integrity, and Causing Inflammation in Gut and Brain	2020	J Agric Food Chem. 2020 Nov 25;68(47):13916-13928. doi: 10.1021/acs.jafc.0c05834. Epub 2020 Nov 5.	Perfluorooctanoic acid (PFOA) is an eight-carbon perfluoroalkyl chemical and has been detected widely in many media. Although the toxic effect of PFOA has been confirmed, the influence on gut and brain has not been cleared. Male C57BL/6J mice were exposed to different concentrations (0, 0.5, 1, and 3 mg/Kg (bw)/day of PFOA for 35 days in this work. The results indicate that exposure to PFOA could damage intestinal barrier integrity and impair the synaptic structure. PFOA exposure also caused inflammation in gut and brain by increasing lipopolysaccharide, tumor necrosis factor- α , interleukin-1 beta, and cyclooxygenase-2 and decreasing interleukin-10. Interestingly, fecal microbiota transplantation treatment could attenuate a series of PFOA-induced changes to a certain extent. The results suggest that exposure to PFOA has potential deleterious effects on gut and brain, and inflammation may play an essential role in evaluating the influence induced by PFOA exposure.			A B
D1265	実験動物 (神経毒 性)	Pierozan, Paula; Karlsson, Oskar	Differential susceptibility of rat primary neurons and neural stem cells to PFOS and PFOA toxicity	2021	Toxicol Lett. 2021 Oct 1;349:61-68. doi: 10.1016/j.toxlet.2021.06.004. Epub 2021 Jun 11.	Per and polifluorinated substances (PFAS) are ubiquitous and persistent contaminants. Studies have indicated that fetuses and infants can be exposed to these chemicals in utero and through breastfeeding. Despite this, limited data about their effects on brain development are available. Here, we compared the effects of perfluoroctane sulfonate (PFOS) and perfluoroctanoic acid (PFOA) exposure in rat primary neurons and neural stem cells (NSC). Treatment with 1-250 μ M of either of these compounds caused no effects on cell viability or proliferation in primary neurons, while PFOS exposure increased the NSC proliferation already at the lowest concentration tested (1-100 μ M). Further analysis showed that both PFOS and PFOA caused morphological alterations of NSC-derived neurons. The neurons derived from NSC treated with either of the PFAS demonstrated a decrease in cell body area. Exposure to 1 and 10 μ M PFOA also affected the neurite network and caused an increase in the number of processes and branches per cell. None of the PFAS caused morphological alterations in primary neurons. These data suggest that NSC, mimicking the immature brain, is clearly more susceptible to PFOS and PFOA exposure than the primary neurons. The PFAS-induced alterations in NSC may be related to neurobehavioral alterations observed in rodents developmentally exposed to these compounds, and show the importance to consider the effects of these compounds on human brain development and disease.			B D

パーフルオロ化合物に係る国際機関等の評価及び科学的知見の情報収集並びに整理

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨 (原文)	備考	出 情 対 報 象 抽	ン 文 ク 献 ① ラ	ン 文 ク 献 ② ラ
D1266	実験動物 (神経毒 性)	Shi, Licai; Deng, Xu; Liu, Xiaoning; Yan, Shikai; Wang, Yajie; Li, Yinxia; Zheng, Jiaojiao; Jiang, Li; Liu, Xuebo; Xiao, Chunxia	The effect of chronic exposure to a low concentration of perfluorooctanoic acid on cognitive function and intestinal health of obese mice induced by a high-fat diet	2022	Food Chem Toxicol. 2022 Oct;168:113395. doi: 10.1016/j.fct.2022.113395. Epub 2022 Aug 30.	Perfluorooctanoic acid (PFOA) is a persistent organic pollutant associated with many adverse health risks. Evidence suggests that obese individuals may be more susceptible to environmental substances. In the present work, we explored the effects of PFOA exposure on the cognitive function and intestinal health of obese mice. Obese mice induced by a high-fat diet were exposed to PFOA (0.5 mg/kg (bw)/day) via drinking water for 100 days. After exposure to PFOA, decreased body weight, enlarged liver, abnormal behavior, impaired synapse structure, neuroinflammation, activated glial cell, decreased nerve growth factor, altered gut microbiota, and disturbed serum metabolites were observed, while the gut inflammation and intestinal barrier were not significantly influenced. These results suggest that exposure to PFOA is associated with cognitive impairment in obese mice.			В	A
D1267	実験動物 (神経毒 性)	Wang, Ya; Zhang, Yajie; Shi, Zhaochun; Di, Tingting; Yu, Wenfeng; Chen, Ling	Exposure of male mice to perfluorooctanoic acid induces anxiety-like behaviors by increasing corticotropin-releasing factor in the basolateral amygdala complex	2022	Chemosphere. 2022 Jan;287(Pt 3):132170. doi: 10.1016/j.chemosphere.2021.132170. Epub 2021 Sep 22.	Perfluorooctanoic acid (PFOA), a hazardous environmental pollutant, has been found to enhance hepatic synthesis of fibroblast growth factor 21 (FGF21). FGF21 can enter the brain and increase the expression of corticotropin-releasing factor (CRF) in the paraventricular nucleus (PVN). In this study, adult male mice were orally administered PFOA to evaluate how it regulates emotion. Exposure of mice to PFOA (1 mg kg-1 bw) for 10 consecutive days (PFOA-mice) caused anxiety-like behaviors and a peroxisome proliferator-activated receptor α (PPAR α)-dependent increase in hepatic FGF21 synthesis. The levels of CRF expression in not only PVN but also basolateral amygdala complex (BLA) neurons of PFOA-mice were increased via FGF receptor 1 (FGF-R1) activation. However, the microinjection of FGF-R1 or CRF 1 receptor (CRF-R1) antagonist in the BLA rather than the PVN of PFOA-mice could relieve their anxiety-like behaviors. In addition, external capsule-BLA synaptic transmission in PFOA-mice was enhanced by increasing CRF-R1-mediated presynaptic glutamate release, which was corrected by the blockade of PPAR α , FGF-R1 and CRF-R1 or the inhibition of PKA. Furthermore, the threshold of frequency-dependent long-term potentiation (LTP) induction was decreased in the BLA of PFOA-mice, which depended on the activation of PPAR α , FGF-R1, CRF-R1, PKA and NMDA receptor (NMDAR), whereas long-term depression (LTD) induction was unchanged. Thus, the results indicate that the exposure of male mice to PFOA (1 mg kg-1 bw) enhances CRF expression in BLA neurons by increasing hepatic FGF21 synthesis, which then enhances CRF-R1-mediated presynaptic glutamate release to facilitate NMDAR-dependent BLA-LTP induction, leading to the production of anxiety-like behaviors.			В	В
D1268	実験動物 (神経毒 性)	Basaly, Veronia; Hill, Jaunetta; Bihaqi, Syed Waseem; Marques, Emily; Slitt, Angela L; Zawia, Nasser H	Developmental Perfluorooctanesulfonic acid (PFOS) exposure as a potential risk factor for late-onset Alzheimer's disease in CD-1 mice and SH-SY5Y cells	2021	Neurotoxicology. 2021 Sep;86:26-36. doi: 10.1016/j.neuro.2021.06.008. Epub 2021 Jul 2.	Alzheimer's disease (AD) is a progressive neurodegenerative disorder that accounts for approximately 60-80% of dementia cases worldwide and is characterized by an accumulation of extracellular senile plaques composed of β -amyloid (A β) peptide and intracellular neurofibrillary tangles (NFTs) containing hyperphosphorylated tau protein. Sporadic or late-onset AD (LOAD) represents 95 % of the AD cases and its etiology does not appear to follow Mendelian laws of inheritance, thus, implicating the role of epigenetic programming and environmental factors. Apolipoprotein allele 4 (ApoE4), the only established genetic risk factor for LOAD, is suggested to accelerate the pathogenesis of AD by increasing tau hyperphosphorylation, inhibiting the clearance of amyloid- β (A β), and promoting A β aggregation. Perfluorooctanesulfonic acid (PFOS) is a persistent organic pollutant, with potential neurotoxic effects, that poses a major threat to the ecosystem and human health. By employing in vivo and in vitro models, the present study investigated PFOS as a potential risk factor for LOAD by assessing its impact on amyloidogenesis, tau pathology, and rodent behavior. Our behavioral analysis revealed that developmentally exposed male and female mice exhibited a strong trend of increased rearing and significantly increased distance traveled in the open field test. Biochemically, GSK3 β and total ApoE were increased following developmental exposure, in vivo. Furthermore, in vitro, low concentrations of PFOS elevated protein levels of APP, tau, and its site-specific phosphorylation. Differentiated SH-SY5Y cells exposed to a series of PFOS concentrations, also, had elevated protein expression of GSK3 β . These data suggest that total ApoE is inducible by environmental exposure to PFOS.			В	В
D1269	実験動物 (神経毒 性)	Sim, Kyeong Hwa; Lee, Youn Ju	Perfluorohexane sulfonate induces memory impairment and downregulation of neuroproteins via NMDA receptor-mediated PKC-ERK/AMPK signaling pathway	2022	Chemosphere. 2022 Feb;288(Pt 1):132503. doi: 10.1016/j.chemosphere.2021.132503. Epub 2021 Oct 7.	Perfluorohexane sulfonate (PFHxS) is a widely used industrial chemical detected in human umbilical cord blood and breast milk, and has been suggested to exhibit developmental neurotoxicity. Previous studies on mice reported that neonatal exposure to PFHxS altered neuroprotein levels in the developing brain, and caused behavioral toxicity and cognitive dysfunction in the mature brain. However, the underlying mechanisms responsible for PFHxS-induced neuroprotein dysregulation are poorly understood. In this study, we examined the effect of neonatal exposure to PFHxS on memory function using an in vivo mice model. Furthermore, we examined the levels of growth associated protein-43 (GAP-43) and calcium/calmodulin dependent protein kinase II (CaMKII) (biomarkers of neuronal development) and the involved signaling pathways using differentiated neuronal PC12 cells. PFHxS decreased cell viability, GAP-43 and CaMKII levels, and neurite formation. These effects were mediated by the NMDA receptor, PKC- α , PKC- δ , AMPK and ERK pathways. MK801, an NMDA receptor antagonist, reduced the activation of PKC- α , nec- δ . Interestingly, the AMPK pathway was selectively inhibited by inhibiting PKC- δ but not PKC- α . Consistent with PFHxS-induced neuronal death, and GAP-43 and CaMKII downregulation, neonatal exposure to PFHxS caused significant memory impairment in adult mice. Collectively, these results demonstrate that PFHxS induces persistent developmental neurotoxicity, as well as GAP-43 and CaMKII downregulation via the NMDA receptor-mediated PKCs (α and δ)-ERK/AMPK pathways.			В	В

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No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 情 対	ン文 ン文 ク献 ① ラ ② ラ
D1270	実験動物 (神経毒 性)	Ninomiya, Ayane; Mshaty, Abdallah; Haijima, Asahi; Yajima, Hiroyuki; Kokubo, Michifumi; Khairinisa, Miski Aghnia; Ariyani, Winda; Fujiwara, Yuki; Ishii, Sumiyasu; Hosoi, Nobutake; Hirai, Hirokazu; Amano, Izuki; Koibuchi, Noriyuki	The neurotoxic effect of lactational PFOS exposure on cerebellar functional development in male mice	2022	Food Chem Toxicol. 2022 Jan;159:112751. doi: 10.1016/j.fct.2021.112751. Epub 2021 Dec 3.	Recent studies showed a possible association between perfluorooctane sulfonate (PFOS) and developmental disabilities. We previously found the specific effects of PFOS exposure on learning and memory, however, its effect on the other developmental disabilities such as motor and social deficits remains unclear. We examined the effect of early lactational PFOS exposure on motor coordination, social activity, and anxiety in male mice. We orally administered a PFOS solution to dams from postnatal day 1-14. At 10 weeks old, we conducted a behavior test battery to evaluate motor performance, social activity, and anxiety, followed by electrophysiology and Western blot analysis. PFOS-exposed mice displayed impaired motor coordination. Whole-cell patch-clamp recordings from Purkinje cells revealed that the short-term and long-term plasticity at parallel fiber-Purkinje cell synapses are affected by PFOS exposure. Western blot analysis indicated that PFOS exposure increased syntaxin binding protein 1 (Munc18-1) and glutamate metabotropic receptor 1 (mGluR1) protein levels, which may be associated with the change in neurotransmitter release from parallel fibers and the level of long-term depression, respectively. The present study demonstrates that lactational PFOS exposure may have disrupted the pre- and postsynaptic plasticity at parallel fiber-Purkinje cell synapses, causing profound, long-lasting abnormal effects on the cerebellar function.			В
D1271	実験動物 (神経毒 性)	Gore, Andrea C; Moore, Tatum; Groom, Matthew J; Thompson, Lindsay M	Prenatal Exposure to an EDC Mixture, NeuroMix: Effects on Brain, Behavior, and Stress Responsiveness in Rats	2022	Toxics. 2022 Mar 3;10(3):122. doi: 10.3390/toxics10030122.	Humans and wildlife are exposed to endocrine-disrupting chemicals (EDCs) throughout their lives. Environmental EDCs are implicated in a range of diseases/disorders with developmental origins, including neurodevelopment and behavior. EDCs are most often studied one by one; here, we assessed outcomes induced by a mixture designed to represent the real-world situation of multiple simultaneous exposures. The choice of EDCs, which we refer to as "NeuroMix," was informed by evidence for neurobiological effects in single-compound studies and included bisphenols, phthalates, vinclozolin, and perfluorinated, polybrominated, and polychlorinated compounds. Pregnant Sprague Dawley rats were fed the NeuroMix or vehicle, and then offspring of both sexes were assessed for effects on postnatal development and behaviors and gene expression in the brain in adulthood. In order to determine whether early-life EDCs predisposed to subsequent vulnerability to postnatal life challenges, a subset of rats were also given a stress challenge in adolescence. Prenatal NeuroMix exposure decreased body weight and delayed puberty in males but not females. In adulthood, NeuroMix caused changes in anxiety-like, social, and mate preference behaviors only in females. Effects of stress were predominantly observed in males. Several interactions of NeuroMix and stress were found, especially for the mate preference behavior and gene expression in the brain. These findings provide novel insights into how two realistic environmental challenges lead to developmental and neurobehavioral deficits, both alone and in combination, in a sex-specific manner.			D C
D1272	実験動物 (神経毒 性)	Berntsen, Hanne Friis; Duale, Nur; Bjørklund, Cesilie Granum; Rangel- Huerta, Oscar Daniel; Dyrberg, Kine; Hofer, Tim; Rakkestad, Kirsten Eline; Ø stby, Gunn; Halsne, Ruth; Boge, Gudrun; Paulsen, Ragnhild Elisabeth; Myhre, Oddvar; Ropstad, Erik	Effects of a human-based mixture of persistent organic pollutants on the in vivo exposed cerebellum and cerebellar neuronal cultures exposed in vitro	2021	Environ Int. 2021 Jan;146:106240. doi: 10.1016/j.envint.2020.106240. Epub 2020 Nov 11.	Exposure to persistent organic pollutants (POPs), encompassing chlorinated (CI), brominated (Br) and perfluoroalkyl acid (PFAA) compounds is associated with adverse neurobehaviour in humans and animals, and is observed to cause adverse effects in nerve cell cultures. Most studies focus on single POPs, whereas studies on effects of complex mixtures are limited. We examined the effects of a mixture of 29 persistent compounds (CI + Br + PFAA, named Total mixture), as well as 6 sub-mixtures on in vitro exposed rat cerebellar granule neurons (CGNs). Protein expression studies of cerebella from in vivo exposed mice offspring were also conducted. The selection of chemicals for the POP mixture was based on compounds being prominent in food, breast milk or blood from the Scandinavian human population. The Total mixture and sub-mixtures containing PFAAs caused greater toxicity in rat CGNs than the single or combined Cl/Br sub-mixtures, with significant impact on viability from 500x human blood levels. The potencies for these mixtures based on LC(50) values were Br + PFAA mixture > Total mixture > CI + PFAA mixture > PFAA mixture. These mixtures also accelerated induced lipid peroxidation. Protection by the competitive N-methyl-D-aspartate (NMDA) receptor antagonist 3-((R)-2-Carboxypiperazin-4-yl)-propyl-1-phosphonic acid (CPP) indicated involvement of the NMDA receptor in PFAA and Total mixture-, but not Cl mixture-induced toxicity. Gene-expression studies in rat CGNs using a sub-toxic and marginally toxic concentration ((0.4 nM-5.5 μM) 333 x and (1 nM-8.2 μM) 500x human blood levels) of the mixtures, revealed differential expression of genes involved in apoptosis, oxidative stress, neurotransmission and cerebellar development, with more genes affected at the marginally toxic concentration. The two important neurodevelopmental markers Pax6 and Grin2b were downregulated at 500x human blood levels, accompanied by decreases in PAX6 and GluN2B protein levels, in cerebellum of offspring mice from mothers exposed to the Total			D C

パーフルオロ化合物に係る国際機関等の評価及び科学的知見の情報収集並びに整理

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D1273	実験動物 (神経毒 性)	Kawamoto Kosuke(岩手大学 農学部獣医学), Sato Itaru, Tsuda Shuji, Yoshida Midori, Yaegashi Kaori, Saito Norimitsu, Liu Wei, Jin Yihe	硫酸ペルフルオロオクタン(PFOS)に亜慢性曝露後のラッ トにおける超音波誘発性強直性痙攣(Ultrasonic-induced tonic convulsion in rats after subchronic exposure to perfluorooctane sulfonate (PFOS))(英語)	2011	The Journal of Toxicological Sciences(0388-1350)36巻1号 Page55-62(2011.02)	ラットに2~128ppmのPFOSを13週間、混餌投与し、PFOSの神経毒性を検討した。PFOSは肝重量を増加、摂食量と体重を減少させ た。血清、肝臓、脳および腎臓中のPFOS濃度は総用量にほぼ比例して上昇した。脳、肝臓および腎臓中のPFOSの血清中濃度に対する 相対濃度比は0.13~0.24、2.7~6.3、0.82~1.6であった。PFOSは単独では神経毒性を惹起しなかったが、128ppm群(総投与量 338mg/kg)のラットに超音波刺激を適用すると、6週目に6匹中5匹で強直性痙攣が生じた。電子顕微鏡検査を含めた組織病理学的検査 では、脳に異常は見られなかった。痙攣を起こすPFOSの急性経口用量は250mg/kgと報告されているため、PFOS誘導性の痙攣は投与 スケジュールに無関係に総用量に依存していると考えられた。		В
D1274	実験動物 (神経毒 性)	Sato Itaru(岩手大 学 獣医公衆衛生 学), Kawamoto Kosuke, Nishikawa Yasuo, Tsuda Shuji, Yoshida Midori, Yaegashi Kaori, Saito Norimitsu, Liu Wei, Jin Yihe	ラットおよびマウスへの単回経口曝露による perfluorooctane sulfonate(PFOS)の神経毒性 (Neurotoxicity of perfluorooctane sulfonate (PFOS) in rats and mice after single oral exposure)(英語)	2009	The Journal of Toxicological Sciences(0388-1350)34巻5号 Page569-574(2009.10), doi: 10.2131/jts.34.569	ラットおよびマウスを用いて神経行動学的観察、病理組織学的検索および生化学検査によりPFOSの神経毒性を調べた。PFOSおよび perfluorooctanoateの単独投与では、それぞれの亜致死量の500および1000mg/kgを投与しても神経毒性症状が出現しなかった。しか し、PFOSを250mg/kg以上投与したラットおよび125mg/kg以上投与したマウスに超音波刺激を与えることにより強直性痙攣が発現し た。脳組織中のPFOS濃度は他の組織より低かったが、時間経過と共に漸増した。脳組織に病理組織学的変化はみられなかった。脳内 の神経伝達物質の濃度に変化はみられなかった。本研究によりPFOSの神経毒性が認められた。		В
D1275	実験動物 (腎毒 性)	Tang, Leilei; Yu, Jiawen; Zhuge, Sheng; Chen, Hangping; Zhang, Lingdi; Jiang, Guojun	Oxidative stress and Cx43-mediated apoptosis are involved in PFOS-induced nephrotoxicity	2022	Toxicology. 2022 Aug;478:153283. doi: 10.1016/j.tox.2022.153283. Epub 2022 Aug 5.	Perfluorooctane sulfonate (PFOS) is a persistent organic pollutant that can cause nephrotoxicity. However, the underlying mechanisms are not fully understood and require further investigation. In the present study, we established a PFOS-exposed Sprague-Dawley (SD) rat kidney injury model by intraperitoneal injection of PFOS (1 mg/kg and 10 mg/kg body weight) every alternate day for 15 days and cytotoxicity models of normal rat kidney epithelial (NRK52E) and human renal proximal tubular (HK2) cells exposed to PFOS (20 μ M and 60 μ M) for 24 h to reveal the mechanisms underlying PFOS-induced nephrotoxicity. Data showed that PFOS increased the kidney index and induced nephrotoxicity in rats. Furthermore, PFOS significantly increased malondialdehyde (MDA) levels, decreased GSH peroxidase (GSH-PX) activity in kidney tissues, and increased intracellular reactive oxygen species (ROS) levels in NRK52E and HK2 cells. Following PFOS treatment, mitochondrial damage in the renal tubular epithelial cells of rats was observed and the mitochondrial membrane potential ($\Delta \Psi$ m) was decreased in NRK52E cells. PFOS upregulated apoptosis of tubular epithelial cells and expression of Connexin 43 (Cx43) in vitro and in vivo. The Cx43 inhibitor gap26 attenuated the apoptosis of tubular epithelial cells. In conclusion, our findings reveal that PFOS may trigger renal tubular cell apoptosis through oxidative stress and upregulation of Cx43, resulting in PFOS-induced nephrotoxicity.		1 A A
D1276	実験動物 (腎毒 性)	Wen, Yi; Rashid, Faizan; Fazal, Zeeshan; Singh, Ratnakar; Spinella, Michael J; Irudayaraj, Joseph	Nephrotoxicity of perfluorooctane sulfonate (PFOS)- effect on transcription and epigenetic factors	2022	Environ Epigenet. 2022 Apr 16;8(1):dvac010. doi: 10.1093/eep/dvac010. eCollection 2022.	Perfluorooctane sulfonate (PFOS) is a widespread persistent environmental pollutant implicated in nephrotoxicity with altered metabolism, carcinogenesis, and fibrosis potential. We studied the underlying epigenetic mechanism involving transcription factors of PFOS-induced kidney injury. A 14-day orally dosed mouse model was chosen to study acute influences in vivo. Messenger RNA expression analysis and gene set enrichment analysis were performed to elucidate the relationship between epigenetic regulators, transcription factors, kidney disease, and metabolism homeostasis. PFOS was found to accumulate in mouse kidney in a dose-dependent manner. Kidney injury markers Acta2 and Bcl2l1 increased in expression significantly. Transcription factors, including Nef2l2, Hes1, Ppara, and Ppard, were upregulated, while Smarca2 and Pparg were downregulated. Furthermore, global DNA methylation levels decreased and the gene expression of histone demethylases Kdm1a and Kdm4c were upregulated. Our work implicates PFOS-induced gene expression alterations in epigenetics, transcription factors, and kidney biomarkers with potential implications for kidney fibrosis and kidney carcinogenesis. Future experiments can focus on epigenetic mechanisms to establish a panel of PFOS-induced biomarkers for nephrotoxicity evaluation.		ВВ

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン 文 ク 献 ① ラ (ン 文 ク 献 ② ラ
D1277	実験動物 (内分泌 系)	Han, Xuejingping; Alam, Md Nur; Cao, Meiyi; Wang, Xiaojuan; Cen, Meifeng; Tian, Meiping; Lu, Yanyang; Huang, Qingyu	Low Levels of Perfluorooctanoic Acid Exposure Activates Steroid Hormone Biosynthesis through Repressing Histone Methylation in Rats	2022	Environ Sci Technol. 2022 May 3;56(9):5664-5672. doi: 10.1021/acs.est.1c08885. Epub 2022 Apr 19.	Perfluorooctanoic acid (PFOA) is a persistent organic pollutant, which has endocrine-disrupting properties and can interfere with the synthesis and secretion of testicular steroid hormones, but the underlying molecular mechanisms are still not fully understood. In this study, we investigated the effects of low doses of PFOA exposure on testicular steroidogenesis in rats and revealed the role of histone modifications. It was found that the serum levels of progesterone, testosterone, and estradiol were significantly increased after 0.015 and 0.15 mg/kg of PFOA exposure, and the expression of Star, a key rate-limiting gene, was up-regulated, while other steroidogenic genes Cyp11a1, Hsd3b, Cyp17a1, and Hsd17b were down-regulated. In addition, the levels of multiple histone modifications (H3K9me1/2/3 and H3K9/18/23ac) were all significantly reduced by PFOA in rat testis. Histone H3K9 methylation is associated with gene silencing, while histone acetylation leads to gene activation. ChIP analysis further showed that H3K9me1/3 was significantly decreased in the promoter region of Star, while H3K18ac levels were down-regulated in other gene promoters. Accordingly, we suggest that low-level PFOA enhances StAR expression through the repression of H3K9me1/3, which stimulates steroid hormone production in rat testis. These results are expected to shed new light on the molecular mechanisms by which low-dose PFOA disturbs male reproductive endocrine from an epigenetic aspect and may be useful for human health risk assessment regarding environmental PFOA exposure.			В	В
D1278	実験動物 (内分泌 系)	Su, Yanrong; Santucci-Pereira, Julia; Dang, Nhi M; Kanefsky, Joice; Rahulkannan, Vishnuprabha; Hillegass, Meardey; Joshi, Shalina; Gurdogan, Hafsa; Chen, Zhen; Bessonneau, Vincent; Rudel, Ruthann; Ser- Dolansky, Jennifer; Schneider, Sallie S; Russo, Jose	Effects of Pubertal Exposure to Butyl Benzyl Phthalate, Perfluorooctanoic Acid, and Zeranol on Mammary Gland Development and Tumorigenesis in Rats	2022	Int J Mol Sci. 2022 Jan 26;23(3):1398. doi: 10.3390/ijms23031398.	Endocrine-disrupting chemicals (EDCs)-including butyl benzyl phthalate (BBP), perfluorooctanoic acid (PFOA), and zeranol (<i>a</i> - ZAL, referred to as ZAL hereafter)-can interfere with the endocrine system and produce adverse effects. It remains unclear whether pubertal exposure to low doses of BBP, PFOA, and ZAL has an impact on breast development and tumorigenesis. We exposed female Sprague Dawley rats to BBP, PFOA, or ZAL through gavage for 21 days, starting on day 21, and analyzed their endocrine organs, serum hormones, mammary glands, and transcriptomic profiles of the mammary glands at days 50 and 100. We also conducted a tumorigenesis study for rats treated with PFOA and ZAL using a 7,12-dimethylbenz[a]anthracene (DMBA) model. Our results demonstrated that pubertal exposure to BBP, PFOA, and ZAL affected endocrine organs and serum hormones, and induced phenotypic and transcriptomic changes. The exposure to PFOA + ZAL induced the most phenotypic and transcriptomic changes in the mammary gland. PFOA + ZAL downregulated the expression of genes related to development at day 50, whereas it upregulated genes associated with tumorigenesis at day 100. PFOA + ZAL exposure also decreased rat mammary tumor latency, reduced the overall survival of rats after DMBA challenge, and affected the histopathology of mammary tumors. Therefore, our study suggests that exposure to low doses of EDCs during the pubertal period could induce changes in the endocrine system and mammary gland development in rats. The inhibition of mammary gland development by PFOA + ZAL might increase the risk of developing mammary tumors through activation of signaling pathways associated with tumorigenesis.			В	С
D1279	実験動物 (内分泌 系)	Davidsen, Nichlas; Ramhøj, Louise; Lykkebo, Claus Asger; Kugathas, Indusha; Poulsen, Rikke; Rosenmai, Anna Kjerstine; Evrard, Bertrand; Darde, Thomas A; Axelstad, Marta; Bahl, Martin Iain; Hansen, Martin; Chalmel, Frederic; Licht, Tine Rask; Svingen, Terje	PFOS-induced thyroid hormone system disrupted rats display organ-specific changes in their transcriptomes	2022	Environ Pollut. 2022 Jul 15;305:119340. doi: 10.1016/j.envpol.2022.119340. Epub 2022 Apr 20.	Perfluorooctanesulfonic acid (PFOS) is a persistent anthropogenic chemical that can affect the thyroid hormone system in humans and animals. In adults, thyroid hormones (THs) are regulated by the hypothalamic-pituitary-thyroid (HPT) axis, but also by organs such as the liver and potentially the gut microbiota. PFOS and other xenobiotics can therefore disrupt the TH system at various locations and through different mechanisms. To start addressing this, we exposed adult male rats to 3 mg PFOS/kg/day for 7 days and analysed effects on multiple organs and pathways simultaneously by transcriptomics. This included four primary organs involved in TH regulation, namely hypothalamus, pituitary, thyroid, and liver. To investigate a potential role of the gut microbiota in thyroid hormone regulation, two additional groups of animals were dosed with the antibiotic vancomycin (8 mg/kg/day), either with or without PFOS. PFOS exposure decreased thyroxine (T4) and triiodothyronine (T3) without affecting thyroid stimulating hormone (TSH), resembling a state of hypothyroxinemia. PFOS exposure resulted in 50 differentially expressed genes (DEGs) in the hypothalamus, 68 DEGs in the pituitary, 71 DEGs in the thyroid, and 181 DEGs in the liver. A concomitant compromised gut microbiota did not significantly change effects of PFOS exposure. Organ-specific DEGs did not align with TH regulating genes; however, genes associated with vesicle transport and neuronal signaling were affected in the hypothalamus, and phase I and phase I metabolism in the liver. This suggests that a decrease in systemic TH levels may activate the expression of factors altering trafficking, metabolism and excretion of TH. At the transcriptional level, little evidence suggests that the pituitary or thyroid gland is involved in PFOS-induced TH system disruption.			В	В

著者

Randi; Johanson,

Silje Modahl; Mü

ller, Mette H B;

Schlenk, Daniel;

Tanabe, Philip;

Munro; Ræder,

Erik M; Lyche,

Jan L; Shi,

Qingyang;

Augustine

Arukwe,

B; Jenssen, Bjørn mice

Krøkje, Åse;

実験動物

(内分泌

系)

D1282

タイトル

Effects of an environmentally relevant PFAS mixture

Jaspers, Veerle L on dopamine and steroid hormone levels in exposed

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land, and brain were largely unchanged. Brain tissue T4 was reduced in , had recovered in the PN6 pup brain. Neither treatment resulted in a low neurobehavior, raising questions for the interpretation of serum biomark reliance on serum hormones as prescriptive of specific neurodevelopme nyroid-mediated neurotoxicity we must expand our thinking beyond that In the present study, we investigated the dopaminergic and steroid hormone systems of A/J concentrations of a perfluoroalkyl substance (PFAS) mixture over a period of 10 weeks. The measured PFAS concentrations in earthworms at a Norwegian skiing area (Trondheim) and Dietary exposure to PFAS led to lower total brain dopamine (DA) concentrations in male mic transcript level, brain tyrosine hydroxylase (th) of PFAS exposed males was reduced, compar significant differences were observed on the transcript levels of enzymes responsible for DA Toxicol Appl Pharmacol. 2021 Oct 1;428:115670. doi: oxidase (maoa and maob) and catechol-O methyltransferase (comt). We detected increased 2021 10.1016/j.taap.2021.115670. Epub 2021 Aug 8. (dr2) in PFAS exposed females, while expression of DA receptor 1 (dr1), DA transporter (dat transporter (vmat) were not affected by PFAS exposure. Regarding the steroid hormones, pla 11-ketotestosterone (11-KT) and 17 β -estradiol (E2) levels, as well as transcripts for estroge gonadotropin releasing hormone (gnrh) and aromatase (cyp19) were unaltered by the PFAS exposure to PFAS doses, comparable to previous observation in earthworms at a Norwegian dopaminergic system of mice with overt consequences for health, general physiology, cognit metabolism.

要旨(原文)	備考	出 情 対 報 象 抽	ン 文 ク 献 ① ラ	ン 文 ク 献 ② ラ
id (PFOA) is an environmentally persistent perfluoroalkyl substance that is widely used in consumer products. associated with reproductive and developmental effects including endocrine disruption, delayed puberty in fetal growth. In the United States, obesity affects 40% of women and 20% of girls, with higher rates in esity causes infertility, poor oocyte quality, miscarriage, and offspring defects. This study proposed that PFOA act estrous cyclicity, ovarian steroid hormones, and the ovarian proteome and further hypothesized that t PFOA-induced ovotoxicity. Female wild type (KK.Cg-a/a; lean) or KK.Cg-Ay/J mice (obese) received saline ng/kg) per os for 15 days beginning at 7 weeks of age. There were no effects on food intake, body weight, um progesterone, and heart, spleen, kidney, or uterus weight ($p > .05$). Ovary weight was decreased ($p <$ ure relative to vehicle control-treated mice in lean but not obese mice. Liquid chromatography-tandem mass erformed on isolated ovarian protein and PFOA exposure altered the ovarian abundance of proteins involved in g and repair pathways and reproduction pathways ($p < .05$) differentially in lean and obese mice. The data xposure alters ovary weight and differentially targets ovarian proteins in lean and obese females in ways that fecundity.			В	В
e identified as potential thyroid disruptors due to their action to reduce circulating levels of thyroid hormone, ne (T4). Developmental neurotoxicity is a primary concern for thyroid disrupting chemicals yet correlating the induced changes in serum T4 to perturbed brain development remains elusive. A number of thyroid-specific assays have been proposed, based largely on the model thyroid hormone synthesis inhibitor propylthiouracil amined whether thyroid disrupting chemicals acting distinct from synthesis inhibition would result in the orain as expected with PTU. The perfluoroalkyl substance perfluorohexane sulfonate (50 mg/kg/day) and the an (300 mg/kg/day) were administered to pregnant rats from gestational day 6 to postnatal day (PN) 21, and fined assays for neurotoxicity evaluated. Both chemicals reduced serum T4 but did not increase thyroid . Both chemicals increased expression of hepatic metabolism genes, while thyroid hormone-responsive genes land, and brain were largely unchanged. Brain tissue T4 was reduced in newborns, but despite persistent T4 had recovered in the PN6 pup brain. Neither treatment resulted in a low dose PTU-like phenotype in either neurobehavior, raising questions for the interpretation of serum biomarkers in regulatory toxicology. They reliance on serum hormones as prescriptive of specific neurodevelopmental outcomes may be too simplistic aproid-mediated neurotoxicity we must expand our thinking beyond that which follows thyroid hormone			В	В
we investigated the dopaminergic and steroid hormone systems of A/J mice fed environmentally relevant berfluoroalkyl substance (PFAS) mixture over a period of 10 weeks. The PFAS mixture was chosen based on centrations in earthworms at a Norwegian skiing area (Trondheim) and consisted of eight different PFAS. PFAS led to lower total brain dopamine (DA) concentrations in male mice, as compared to control. On the in tyrosine hydroxylase (th) of PFAS exposed males was reduced, compared to the control group. No es were observed on the transcript levels of enzymes responsible for DA metabolism, namely - monoamine maob) and catechol-O methyltransferase (comt). We detected increased transcript level for DA receptor 2 ed females, while expression of DA receptor 1 (dr1), DA transporter (dat) and vesicular monoamine ere not affected by PFAS exposure. Regarding the steroid hormones, plasma and muscle testosterone (T), (11-KT) and 17 β -estradiol (E2) levels, as well as transcripts for estrogen receptors (esr1 and esr2), ng hormone (gnrh) and aromatase (cyp19) were unaltered by the PFAS treatment. These results indicate that bases, comparable to previous observation in earthworms at a Norwegian skiing area, may alter the no f mice with overt consequences for health, general physiology, cognitive behavior, reproduction and			D	С

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D1283	実験動物 (反復投 与毒性)	Kohei Kawabata, Suzuka Tamaki, Eri Kokubo, Yukari Kobayashi, Tomoya Shinohara, Ayako Sakai, Hiroshi Kawai, Atsushi Mitsumoto, Yoichi Kawashima, Naomi Kudo	Disposition of perfluorododecanoic acid in male rats after oral administration	2017	Fundamental Toxicological Sciences, 4 巻 4 号 179-186, doi: 10.2131/fts.4.179	The disposition of perfluorododecanoic acid (PFDoA), a perfluorocarboxylic acid with 12 carbon atoms, was studied in male rats. Rats received an oral administration of PFDoA at a dose of 50 mg/kg. The body weights of PFDoA-treated rats were slightly less than those of vehicle-treated control rats. PFDoA administration resulted in an increase in liver weight; it was highest at 5 days after the treatment and gradually decreased thereafter. Higher liver weight was observed until 70 days after the treatment. Concentrations of PFDoA in plasma and various tissues were estimated up to 70 days after dosing. A large amount of PFDoA was found in the liver. The PFDoA concentration was 263.94 \pm 32.94 μ g/g in the liver; the value was 7.93 times higher than that of serum 5 days after treatment. The hepatic PFDoA amount was found to be 29.63% of the dose. A certain amount of PFDoA was found in the brain and adipose tissues where perfluorocarboxylic acids with less than 11 carbon atoms were sparsely distributed. The half-life of PFDoA was 55.3, 49.3, 52.4, 57.1, and 49.8 days for serum, liver, kidneys, brain, and adipose tissue, respectively. PFDoA increased hepatic levels of mRNA for Cyp4A10, Acot1, and Acox1, target genes of PPAR α , suggesting that PFDoA can activate PPAR α , as was observed with other PFCAs. Elevated levels of these 3 genes were observed 70 days after treatment, and the levels were less than those at 7 days. The differences between PFDoA and PFCAs with less than 11 carbon atoms were discussed.		B C
D1284	実験動物 (反復投 与毒性)	Kim Hyung- Sub(韓国), Kwack Seung Jun, Han Eui Sik, Kang Tae Seok, Kim Seung Hee, Han Soon Young	低用量ペルフルオロオクタンスルホン酸塩に曝露した Sprague-Dawleyラットにおけるアポトーシスおよび CYP4A1発現の誘導(Induction of apoptosis and CYP4A1 expression in Sprague-Dawley rats exposed to low doses of perfluorooctane sulfonate)(英語)	2011	J Toxicol Sci. 2011 Apr;36(2):201-10. doi: 10.2131/jts.36.201.	Sprague-Dawleyラットに0、1.25、5、10mg/kg/日のペルフルオロオクタンスルホン酸塩(PFOS)を28日間経口投与し、低用量PFOSの 毒性およびその作用機序について検討した。いずれの用量においても、死亡および異常症状はみられなかった。対照群に比べ、 10mg/kg投与雌ラットにおいて平均体重の有意な低下が、また10mg/kg投与雌・雄両ラットにおいて相対的肝重量の有意な増加が観察 された。組織病理学的に、5、10mg/kg投与雄ラット肝における脂肪変化、10mg/kg投与雌ラットにおける肝肥大および肝細胞腫脹が 明らかであった。アポトーシス、脂質代謝それぞれに関連する肝カスパーゼ-3、チトクロームP450 4A1(CYP4A1)の発現誘導が示され た。以上より、PFOSの無毒性量は1.25mg/kgであるが、毒性反応には性差があることが示唆された。PFOSの考えられる毒性機序とし て、アポトーシス誘導および肝毒性を導く脂質代謝の変化が示唆された。		В
D1285	実験動物 (経皮毒 性)	Mousavi, Sayed Esmaeil; Delgado-Saborit, Juana Maria; Godderis, Lode	Exposure to per- and polyfluoroalkyl substances and premature skin aging	2021	J Hazard Mater. 2021 Mar 5;405:124256. doi: 10.1016/j.jhazmat.2020.124256. Epub 2020 Oct 24.	Per- and polyfluoroalkyl substances (PFASs) are a ubiquitous group of persistent chemicals distributed globally in the environment. Skin aging is a notorious process that is prematurely induced by the interaction between endogenous and exogenous factors, including exposure to environmental chemicals. The existing evidence suggests that skin absorption of PFASs through dermal contact may be an important route of exposure to these chemicals in humans. On the other hand, PFASs intake by other routes may lead to PFASs bioaccumulation in the skin via tissue bio-distribution. Additionally, the presence of PFASs in consumer and cosmetic products combined with their daily close contact with the skin could render humans readily susceptible to dermal absorption. Therefore, chronic low-dose dermal exposure to PFASs can occur in the human population, representing another important route of exposure to these chemicals. Studies indicate that PFASs can threaten skin health and contribute to premature skin aging. Initiation of inflammatory-oxidative cascades, induction of DNA damage such as telomere shortening, dysregulation of genes engaged in dermal barrier integrity and its functions, signaling of the mitogen activated protein kinase (MAPK) pathway, and last but not least the down-regulation of extracellular matrix (ECM) components are among the most likely mechanisms by which PFASs can contribute to premature skin aging.		D C
D1286	実験動物 (免疫毒 性)	Yang, Mo; Li, Li- Yue; Qin, Xiao- Di; Ye, Xiao-Yan; Yu, Shu; Bao, Qing; Sun, Lin; Wang, Zhi-Bin; Bloom, Michael S; Jalava, Pasi; Hu, Li-Wen; Yu, Hong-Yao; Zeng, Xiao-Wen; Yang, Bo-Yi; Dong, Guang-Hui; Li, Chun-Wei	Perfluorooctanesulfonate and perfluorooctanoate exacerbate airway inflammation in asthmatic mice and in vitro	2021	Sci Total Environ. 2021 Apr 20;766:142365. doi: 10.1016/j.scitotenv.2020.142365. Epub 2020 Sep 19.	Emerging evidence suggests associations between Perfluoroalkyl substances (PFASs) exposure and asthma, but the findings are inconsistent. The current study sought to investigate whether perfluoroactanesulfonate (PFOS) and perfluoroactanoate (PFOA) could contribute to asthma exacerbation and to clarify the underlying biological mechanisms. The objectives are a) to determine whether PFOS or PFOA could aggravate the mouse asthma and pulmonary inflammation b) to investigate whether PFOS and PFOA regulate the balance of Th1/Th2 through the JAK-STAT signaling pathway and aggravated asthma. Ovalbumin (OVA) induced asthmatic mice were exposed to PFOS or PFOA by gavage. PFOS and PFOA serum level and toxicity in organs were assessed; and the impacts on respiratory symptoms, lung tissue pathology, T helper cell (Th2) response, and STAT6 pathway activity were also evaluated. In vitro Jurkat cells were used to study the mechanisms of PFOS and PFOA mediated Th1 and Th2 responses. Both PFOS and PFOA exacerbated lung tissue inflammation (greater number of eosinophils and mucus hyperproduction), upregulated Th2 cytokine production (IL-4 and IL-13), and promoted Th2 cells and STAT6 activation. Furthermore, PFOS and PFOA enhanced the Th2 response in Jurkat cells via STAT6 activation; and the effect of PFOS exposure on GATA-3, IL-4 and IFN- γ was blocked after the expression of STAT6 was suppressed in Jurkat cells, however, the effects of PFOA exposure were only partially blocked. PFOS and PFOA aggravated inflammation among OVA-induced asthmatic mice, by promoting the Th2 response in lymphocytes and disturbing the balance of Th1/Th2 through the JAK-STAT signaling pathway.		B A

分野 タイトル 発行年 書誌情報 要旨 (原文) No 著者 (参考) Novel per- and polyfluoroalkyl substances (PFAS) were recently identified in drinking water These include the perfluoroether acids (PFEAs) perfluoro-2-methoxyacetic acid (PFMOAA) (PFMOPrA), and perfluoro-4-methoxybutanioc acid (PFMOBA). Little toxicological data exist present study described signs of toxicity and immunotoxicity following oral exposure. Adult exposed once/day for 30 days to PFMOAA (0, 0.00025, 0.025, or 2.5 mg/kg), PFMOPrA, or PI Woodlief, Tracey 実験動物 Immunotoxicity of Per- and Polyfluoroalkyl of 7.5 mg/kg of perfluorooctanoic acid (PFOA) was used as a positive control. Terminal body Vance. Samuel: D1287 (免疫毒 2021 Toxics. 2021 May 1;9(5):100. doi: 10.3390/toxics9050100. Hu, Qing; DeWitt, Substances: Insights into Short-Chain PFAS Exposure or thymus weights did not differ by dose for any compound; exposure to 50 mg/kg of PFMO 性) males. Changes in splenic cellularity were observed in males exposed to PFMOPrA and decr Jamie (NK) cells were observed in males and females exposed to PFMOBA. Exposure did not alter dependent antibody responses at doses administered. Our results indicate that these "unde potential but require additional investigation across endpoints and species, including humar drinking water exposure Aqueous film-forming foams (AFFFs) are complex per- and polyfluoroalkyl substance (PFAS extensively as fire suppressants. AFFF-impacted groundwater and surface water have conta many communities, raising concerns about health effects from drinking water exposures. As as immune hazards, the immunotoxicity of complex PFAS mixtures is also a concern. Adult f McDonough, given a commercial AFFF formulation for 10 days via gavage; administered dose was based Carrie A; Ward, perfluorooctanoate (PFOA) and perfluorooctane sulfonate (PFOS) measured in the formulat 実験動物 Chastity; Hu, mmunotoxicity of an Electrochemically Fluorinated Toxicol Sci. 2020 Nov 1;178(1):104-114. doi: PFOS+PFOA/kg body weight). A PFOA positive control of 7.5 mg/kg body weight was also 2020 10.1093/toxsci/kfaa138. D1288 (免疫毒 Qing; Vance, Aqueous Film-Forming Foam group, the following changes were noted: Body weights of males exposed to 7.5 and 10 mg Samuel; Higgins 性) on average; female body weights did not differ. Average relative liver weights were increase Christopher P; in females and liver peroxisome proliferation was increased 2- to 12-fold in all doses of both DeWitt. Jamie C production was suppressed, on average, by 13% in males and by 12.4% in females across all lymphocyte subpopulations did not differ by dose for either sex. Our data indicate that thoug contained fairly low PFOA content, it induced changes in C57BL/6 mice similar to changes in the presence of PFOS and many other PFASs. Perfluorooctanoic acid (PFOA), a synthetic and widely used chemical, has aroused wide pub bioaccumulation, and potential toxicity. To investigate splenic atrophy induced by PFOA, ma Guo, Hua; Zhang, mg/kg/d PFOA for 28 d. Results demonstrated that spleen weight and relative spleen weigh Hongxia; Sheng, 実験動物 Perfluorooctanoic acid (PFOA) exposure induces mg/kg/d PFOA exposure groups. Iron levels in the spleen and serum were also reduced in al J Hazard Mater. 2021 Apr 5;407:124862. doi: Nan: Wang. 2021 10.1016/j.jhazmat.2020.124862. Epub 2020 Dec 15. D1289 (免疫毒 splenic atrophy via overactivation of macrophages in gene co-expression network analysis (WGCNA) of 7 043 genes highlighted enrichment in cel Jinghua: Chen. 性) male mice the spleen. In addition, changes in the levels of hemoglobin, platelets, bilirubin, and heme ox Jiamiao; Dai, anemia. The ratio of total macrophages to M1 macrophages in the spleen, phagocytic ability Jiayin cytokines such as TNF- α , IL-1 β , and IL-6 all increased, thus suggesting the occurrence of concluded that overactivation of macrophages may be an important reason for splenic atrop Perfluorooctanoic acid (PFOA), a member of the Per- and polyfluoroalkyl substances, is a his with increasing concern for its potential health effects. However, the mechanisms of PFOA i understood. We assessed the antibody response to a physiological antigen stimulation and PFOA exposure. The significant decrease in the IgM antibody response to the T cell depende nemocyanin (KLH) at a dose lower than the previously documented LOAEL was accompanie Suppression of Th2 cytokines as a potential 実験動物 De Guise, Toxicol Lett. 2021 Oct 15;351:155-162. doi: serum cytokines IL-5 and IL-13, a non-significant dose-response reduction of IL-4, a signific D1290 (免疫毒 Sylvain; Levin, mechanism for reduced antibody response following 2021 10.1016/j.toxlet.2021.09.002. Epub 2021 Sep 10. 12, and a non-significant dose-response increase in IL-2 and IFN γ . PFOA significantly decr 性) Milton PFOA exposure in female B6C3F1 mice IL-17 α and IL-1 α , decreased (non-significantly but dose-response) IL-6, and a significantl modulation of serum Th1/Th2 cytokines could explain the reduction in antibody response, po cells in the immunotoxicity of PFOA. Further, the higher than anticipated weight loss and inc previous studies using similar doses, highlight the potential importance of the route and dur total accumulated dose, in assessing the toxicity of PFOA.

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sources throughout North Carolina. perfluoro-2-methoxypropanoic acid t for these PFEAs. Therefore, the male and female C57BL/6 mice were FMOBA (0, 0.5, 5, or 50 mg/kg). A dose y weights, and absolute liver, spleen, BA increased relative liver weights in reased numbers of B and natural killer NK cell cytotoxicity or T cell- rstudied" PFAS have toxicological as, to understand health effects via			D	В
 containing mixtures used aminated drinking water with PFASs in individual PFASs have been identified emale and male C57BL/6 mice were on combined content of ion (0, 1.88, 3.75, 7.5, or 10 mg given. Compared with the 0 mg/kg PFOS+PFOA/kg were reduced by 15%, d 50%-200% in males and 37.5%-193% on sexes. Antigen-specific antibody doses. Spleen cellularity and gh this complex PFAS mixture induced by PFOA alone, likely due to 			С	В
lic concern due to its persistence, le mice were exposed to 0, 0.4, 2, or 10 nt (RSW) decreased in the 2 and 10 II PFOA exposure groups. Weighted II cycle, autoimmunity, and anemia in kygenase-1 were consistent with of macrophages, and levels of autoimmune disorder. Therefore, we hy induced by PFOA exposure.			A	В
ghly persistent "forever" chemicals mmunotoxic effects are poorly associated cytokine response upon ent antigen keyhole limpet ed by a significant reduction of the Th2 cant reduction of the Th1 cytokine IL- eased the pro-inflammatory cytokines y increased TNF α . Overall, the ointing to a potential role for T helper creased liver weight, compared to ation of exposure, contributing to the			В	В

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 象抽 ① ラ ② ラ
D1291	実験動物 (免疫毒 性)	Torres, Luisa; Redko, Amie; Limper, Candice; Imbiakha, Brian; Chang, Sue; August, Avery	Effect of Perfluorooctanesulfonic acid (PFOS) on immune cell development and function in mice	2021	lmmunol Lett. 2021 May;233:31-41. doi: 10.1016/j.imlet.2021.03.006. Epub 2021 Mar 12.	Perfluoroctanesulfonate (PFOS) belongs to a larger family of compounds known as Per- and polyfluoroalkyl substances (PFAS). The strength of the carbon-fluorine bond makes PFOS extremely resistant to environmental degradation. Due to its persistent nature, research has been directed to elucidating possible health effects of PFOS on humans and laboratory animals. Here we have explored the effects of PFOS exposure on immune development and function in mice. We exposed adult mice to 3 and 1.5 μ g/kg/day of PFOS for 2 and 4 weeks, respectively, and examined the effects of PFOS exposure on populations of T cells, B cells, and granulocytes. These doses of PFOS resulted in serum levels of approximately 100 ng/mL with no weight loss during exposure. We find that PFOS does not affect T-cell development during this time. However, while PFOS exposure reduced immune cell populations in some organs, it also led to an increase in the numbers of cells in others, suggesting possible relocalization of cells. We also examined the effect of PFOS for 4 weeks does not affect weight loss or survival, nor is viral clearance affected. Analysis of antibody and T cell specific antiviral responses indicate that at this concentration, PFOS does not suppress the immune cell development or antigen specific immune response.		B A
D1292	実験動物 (免疫毒 性)	Yang, Zhao; Roth, Katherine; Ding, Jiahui; Kassotis, Christopher D; Mor, Gil; Petriello, Michael C	Exposure to a mixture of per-and polyfluoroalkyl substances modulates pulmonary expression of ACE2 and circulating hormones and cytokines	2022	Toxicol Appl Pharmacol. 2022 Dec 1;456:116284. doi: 10.1016/j.taap.2022.116284. Epub 2022 Oct 18.	Genetic and environmental factors impact on the interindividual variability of susceptibility to communicable and non- communicable diseases. A class of ubiquitous chemicals, Per- and polyfluoroalkyl substances (PFAS) have been linked in epidemiological studies to immunosuppression and increased susceptibility to viral infections, but possible mechanisms are not well elucidated. To begin to gain insight into the role of PFAS in susceptibility to one such viral infection, Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), male and female C57BL/6 J mice were exposed to control water or a mixture of 5 PFAS (PFOS, PFOA, PFNA, PFHxS, Genx) for 12 weeks and lungs were isolated for examination of expression of SARS-CoV-2-related receptors Angiotensin-Converting Enzyme 2 (ACE2) and others. Secondary analyses included circulating hormones and cytokines which have been shown to directly or indirectly impact on ACE2 expression and severity of viral infections. Changes in mRNA and protein expression were analyzed by RT-qPCR and western blotting and circulating hormones and cytokines were determined by ELISA and MESO QuickPlex. The PFAS mixture decreased Ace2 mRNA 2.5-fold in male mice ($p < 0.0001$), with no significant change observed in females. In addition, TMPRSS2, ANPEP, ENPEP and DPP4 (other genes implicated in COVID-19 infection) were modulated due to PFAS. Plasma testosterone, but not estrogen were strikingly decreased due to PFAS which corresponded to PFAS-mediated repression of 4 representative pulmonary AR target genes; hemoglobin, beta adult major chain (Hbb-b1), Ferrochelatase (Fech), Collagen Type XIV Alpha 1 Chain (Col14a1), 5'-Aminolevulinate Synthase 2 (Alas2). Finally, PFAS modulated circulating pro and anti-inflammatory mediators including IFN- γ (downregulated 3.0-fold in females; $p = 0.0301$, 2.1- fold in males; $p = 0.0418$) and IL-6 (upregulated 5.6-fold in males; $p = 0.030$, no change in females). In conclusion, our data indicate long term exposure to a PFAS mixture impacts mechanism		СВ
D1293	実験動物 (免疫毒 性)	Wang, Mengjing; Li, Qianqian; Hou, Meifang; Chan, Louisa L Y; Liu, Meng; Ter, Soo Kai; Dong, Ting; Xia, Yun; Chotirmall, Sanjay H; Fang, Mingliang	Inactivation of common airborne antigens by perfluoroalkyl chemicals modulates early life allergic asthma	2021	Proc Natl Acad Sci U S A. 2021 Jun 15;118(24):e2011957118 doi: 10.1073/pnas.2011957118.	Allergic asthma, driven by T helper 2 cell-mediated immune responses to common environmental antigens, remains the most common respiratory disease in children. Perfluorinated chemicals (PFCs) are environmental contaminants of great concern, because of their wide application, persistence in the environment, and bioaccumulation. PFCs associate with immunological disorders including asthma and attenuate immune responses to vaccines. The influence of PFCs on the immunological response to allergens during childhood is unknown. We report here that a major PFC, perfluoroctane sulfonate (PFOS), inactivates house dust mite (HDM) to dampen 5-wk-old, early weaned mice from developing HDM-induced allergic asthma. PFOS further attenuates the asthma protective effect of the microbial product lipopolysaccharide (LPS). We demonstrate that PFOS prevents desensitization of lung epithelia by LPS, thus abolishing the latter's protective effect. A close mechanistic study reveals that PFOS specifically binds the major HDM allergen Der p1 with high affinity as well as the lipid A moiety of LPS, leading to the inactivation of both antigens. Moreover, PFOS at physiological human (nanomolar) concentrations inactivates Der p1 from HDM and LPS in vitro, although higher doses did not cause further inactivation because of possible formation of PFOS aggregates. This PFOS-induced neutralization of LPS has been further validated in primary human cell models and extended to an in vivo bacterial infection mouse model. This study demonstrates that early life exposure of mice to a PFC blunts airway antigen bioactivity to modulate pulmonary inflammatory responses, which may adversely affect early pulmonary health.		ВВ

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No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨 (原文)	備考	 出情ン文ン文 対報ク献ク の の テ の テ
D1294	実験動物 (免疫毒 性)	Wang, Li-Qiu; Liu, Tao; Yang, Shuai; Sun, Lin; Zhao, Zhi-Yao; Li, Li-Yue; She, Yuan-Chu; Zheng, Yan-Yan; Ye, Xiao-Yan; Bao, Qing; Dong, Guang-Hui; Li, Chun-Wei; Cui,	Perfluoroalkyl substance pollutants activate the innate immune system through the AIM2 inflammasome	2021	Nat Commun. 2021 May 18;12(1):2915. doi: 10.1038/s41467 021-23201-0.	Perfluoroalkyl substances (PFAS) are widely used in various manufacturing processes. Accumulation of these chemicals has adverse effects on human health, including inflammation in multiple organs, yet how PFAS are sensed by host cells, and how tissue inflammation eventually incurs, is still unclear. Here, we show that the double-stranded DNA receptor AIM2 is able to recognize perfluorooctane sulfonate (PFOS), a common form of PFAS, to trigger IL-1 <i>β</i> secretion and pyroptosis. Mechanistically, PFOS activates the AIM2 inflammasome in a process involving mitochondrial DNA release through the Ca(2+)-PKC-NF- <i>κ</i> B/JNK- BAX/BAK axis. Accordingly, Aim2(-/-) mice have reduced PFOS-induced inflammation, as well as tissue damage in the lungs, livers, and kidneys in both their basic condition and in an asthmatic exacerbation model. Our results thus suggest a function of AIM2 in PFOS-mediated tissue inflammation, and identify AIM2 as a major pattern recognition receptor in response to the environmental organic pollutants.		DВ
D1295	実験動物 (免疫毒 性)	Liang, Hai; Yang, Miao; Zeng, Cheng; Wu, Wei; Zhao, Liying; Wang, Yu	Perfluorooctane sulfonate exerts inflammatory bowel disease-like intestinal injury in rats	2021	PeerJ. 2021 Jan 8;9:e10644. doi: 10.7717/peerj.10644. eCollection 2021.	BACKGROUND: Perfluorooctane sulfonate (PFOS), a type of perfluorinated compounds (PFCs), can induce various organ toxicity, including hepatomegaly, immunotoxicity, and gut microbiota disorder. PFCs have been associated with inflammatory bowel disease (IBD). Yet, whether PFOS exposure causes IBD-like disorder and the underlying mechanism remains undefined. Here, we investigated the influence of PFOS exposure on the development of IBD-like disorder in rats. METHODS: Sprague-Dawley rats were intraperitoneally injected with PFOS (1 or 10 mg/kg) or normal saline (NS) every other day for 15 days. Body weight, serum concentrations of serum amyloid A (SAA) and high sensitivity C reactive protein (hsCRP) were measured. Pathological assessments of villi height and crypt depth in the proximal duodenum and jejunum were performed using H&E staining. Terminal deoxynucleotidyl transferase dUTP nick end labeling (TUNEL) staining was used to assay cell apoptosis in the jejunum. The infiltration of inflammatory cells and cytokines in the jejunum were detected by immunohistochemistry analysis. RESULTS: PFOS (10 mg/kg) significantly increased the body weight, SAA and hsCRP, whereas no significant differences were observed in PFOS 1 mg/kg group of rats. The villi height and crypt depth in the proximal duodenum and jejunum were significantly reduced upon PFOS exposure. PFOS induced higher histopathological score in intestinal tissues compared to NS. Notably, TUNEL-positive cells were significantly higher in the jejunum upon PFOS exposure. Further, neutrophil and macrophage accumulated, and inflammatory cytokines infiltration to intestinal.		ВВ
D1296	実験動物 (免疫毒 性)	Zeng, Zeyu; Ma, Weihui; Zhao, Ran; Dong, Xiaoyan	Airway exposure to perfluorooctanoate exacerbates airway hyperresponsiveness and downregulates glucocorticoid receptor expression in asthmatic mice	2021	Transl Pediatr. 2021 Feb;10(2):323-332. doi: 10.21037/tp- 20-246.	BACKGROUND: Multiple environmental risk factors play a vital role in the pathogenesis of asthma, which contribute to the phenotypic expression of asthma. Perfluorooctanoate (PFOA) is the most common and abundant perfluorocarbon (PFC) in humans, and it has been detected in water and the atmosphere worldwide. Glucocorticoid receptor (GR) is considered to exert a protective effect on asthma and is associated with the sensitivity to glucocorticoids. Dermal or oral exposure to PFOA has been shown to contribute various effects on airway inflammation in individuals with ovalbumin (OVA)-induced asthma. Notably, airway exposure has a critical contribution to the pathogenesis of asthma. However, the effect of airway exposure to PFOA on airway hyperresponsiveness (AHR) in patients with asthma is not currently understood. METHODS: BALB/c mice were administered OVA to induce asthma. PFOA was then administered intratracheally to OVA-induced mice for seven days. Then we assessed the effect of airway exposure to PFOA on AHR and the regulation of the GR expression in asthmatic mice. RESULTS: The results showed aggravated AHR and T helper type 2 (Th2) airway inflammation in asthmatic mice. Furthermore, these mice show a substantial decrease in the expression of the GR mRNA and protein. CONCLUSIONS: These data strongly suggest that acute airway exposure to PFOA leads to Th2-related AHR and decreases GR expression, which may increase the difficulty in the treatment of asthma.		ВВ
D1297	実験動物 (免疫毒 性)	Wang, Li-Qiu; Liu, Tao; Yang, Shuai; Sun, Lin; Zhao, Zhi-Yao; Li, Li-Yue; She, Yuan-Chu; Zheng, Yan-Yan; Ye, Xiao-Yan; Bao, Qing; Dong, Guang-Hui; Li, Chun-Wei; Cui, Jun	Author Correction: Perfluoroalkyl substance pollutants activate the innate immune system through the AIM2 inflammasome	2022	Nat Commun. 2022 Sep 27;13(1):5667. doi: 10.1038/s41467 022-33408-4.	/- No abstract available		D D

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No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨 (原文)	備考	出 情 対 報 象 抽	ン 文 ク 献 ① ラ	ン 文 ク 献 ② ラ
D1298	実験動物 (免疫毒 性)	Guruge Keerthi S.(動物衛生研究 所 安全性研究 チーム), Hikono Hirokazu, Shimada Nobuaki, Murakami Kenji, Hasegawa Jun, Yeung Leo W.Y., Yamanaka Noriko, Yamashita Nobuyoshi	ペルフルオロオクタンスルホン酸塩が雌性B6C3F1マウ スにおけるインフルエンザA型ウイルス誘導性死亡率に 及ぼす影響(Effect of perfluorooctane sulfonate (PFOS) on influenza A virus-induced mortality in female B6C3F1 mice)(英語)	2009	J Toxicol Sci. 2009 Dec;34(6):687-91. doi: 10.2131/jts.34.687.	哺乳類の免疫系に影響を及ぼすペルフルオロオクタンスルホン酸塩(PFOS)を雌性B6C3F1マウスへ前投与した時、インフルエンザA型 ウイルス感染が宿主抵抗性にどのような影響を及ぼすか検討した。PFOSへの曝露量は0、5および25µg/kg、前投与期間は21日とし、 曝露終了後にマウスへの影響を評価した。その結果、曝露後の体/器官重量には有意な変化が見られなかったが、血漿、脾臓、胸腺お よび肺へのPFOS分布は用量依存的に増加し、インフルエンザA型ウイルスに対応した宿主の衰弱と死亡率は有意に上昇した。雌性マウ スにおけるPFOSの有効血漿中濃度は、偶発的なPFOS曝露を受けたヒトで報告された平均血中PFOS濃度の少なくとも数分の一であ り、正常なヒトや広範囲な野生動物のPFOSの血中濃度の上限範囲に低下した。この結果から、高用量PFOS曝露で認められた過剰な死 亡率に対する正確な機序の解明が重要と思われた。			В	A
D1299	ゼプラ フィッ シュ (神 経毒性)	Adedara, Isaac A; Souza, Thiele P; Canzian, Julia; Olabiyi, Ayodeji A; Borba, João V; Biasuz, Eduarda; Sabadin, Giovana R; Gonçalves, Falco L; Costa, Fabiano V; Schetinger, Maria R C; Farombi, Ebenezer O; Rosemberg, Denis B	a Induction of aggression and anxiety-like responses by perfluorooctanoic acid is accompanied by modulation of cholinergic- and purinergic signaling-related parameters in adult zebrafish	2022	Ecotoxicol Environ Saf. 2022 Jul 1;239:113635. doi: 10.1016/j.ecoenv.2022.113635. Epub 2022 May 20.	Perfluorooctanoic acid (PFOA) is a contaminant of global concern owing to its prevalent occurrence in aquatic and terrestrial environments with potential hazardous impact on living organisms. Here, we investigated the influence of realistic environmental concentrations of PFOA (0, 0.25, 0.5, or 1.0 mg/L) on relevant behaviors of adult zebrafish (Danio rerio) (e.g., exploration to novelty, social preference, and aggression) and the possible role of PFOA in modulating cholinergic and purinergic signaling in the brain after exposure for 7 consecutive days. PFOA significantly increased geotaxis as well as reduced vertical exploration (a behavioral endpoint for anxiety), and increased the frequency and duration of aggressive episodes without affecting their social preference. Exposure to PFOA did not affect ADP hydrolysis, whereas ATP and AMP hydrolysis were significantly increased at the highest concentration tested. However, AChE activity was markedly decreased in all PFOA-exposed groups when compared with control. In conclusion, PFOA induces aggression and anxiety-like behavior in adult zebrafish and modulates both cholinergic and purinergic signaling biomarkers. These novel data can provide valuable insights into possible health threats related to human activities, demonstrating the utility of adult zebrafish to elucidate how PFOA affects neurobehavioral responses in aquatic organisms.			В	A
D1300	ゼブラ フィッ シュ (神 経毒性)	Yu, Tingting; Zhou, Guangdi; Cai, Zhenzhen; Liang, Wei; Du, Yatao; Wang, Weiye	Behavioral effects of early-life exposure to perfluorooctanoic acid might synthetically link to multiple aspects of dopaminergic neuron development and dopamine functions in zebrafish larvae	2021	Aquat Toxicol. 2021 Jul 24;238:105926. doi: 10.1016/j.aquatox.2021.105926. Online ahead of print.	Perfluorooctanoic acid (PFOA) is known as an environmental endocrine disruptor and has developmental neurotoxicity that could be associated with behavior changes in human and animal studies. Previous studies have shown that PFOA might affect the dopaminergic nervous system. However, the mode of action underlying the effects of PFOA remains poorly understood. Our study used zebrafish as an animal model to investigate the effects of early-life PFOA exposure on dopaminergic neuron development and dopamine functions in zebrafish larvae. Zebrafish fertilized eggs were exposed to different concentrations of PFOA (0, 10, 100, 1000 μ g/L). After exposure to PFOA for 7 days, the locomotor activity of zebrafish was decreased; the mRNA levels of nuclear receptor subfamily 4 group a member 2b (nr4a2b), paired box 2 and 5 (pax2, pax5), tyrosine hydroxylase 1/2 (th1/th2) and dopamine transporter (dat) were increased; mRNA and protein level of mesencephalic astrocyte-derived neurotrophic factor (manf) were decreased. Neural cell proliferation in the preoptic area of hypothalamus was increased. In conclusion, dopaminergic neuron development might be one of the targets of early-life PFOA exposure. The neurobehavior changes induced by PFOA exposure might link to multiple aspects of dopaminergic neuron development and dopamine functions in zebrafish larvae.			В	A
D1301	ゼブラ フィッ シュ (神 経毒性)	Wang, Xin; Shi, Xiaoling; Zheng, Shukai; Zhang, Qiong; Peng, Jiajun; Tan, Wei; Wu, Kusheng	Perfluorooctane sulfonic acid (PFOS) exposures interfere with behaviors and transcription of genes on nervous and muscle system in zebrafish embryos	2022	Sci Total Environ. 2022 Nov 20;848:157816. doi: 10.1016/j.scitotenv.2022.157816. Epub 2022 Aug 2.	Perfluorooctane sulfonic acid (PFOS) has been widely detected in environment and organisms. PFOS has been identified as the driving agent for the behavioral changes of zebrafish larvae, while the underlying molecular mechanism remains unclear. In this study, zebrafish embryos/larvae were exposed to 0, 0.04, 0.1, 0.4 and 1 μ M PFOS for 166 h. The locomotor behaviors and the mRNA transcription of genes in neuromuscular system were detected. Exposure to PFOS did not affect the hatching/death rates and body length, but increased the heart beat rates and frequency of spontaneous tail coiling. Locomotor behavior in zebrafish larvae of 0.4 and 1 μ M PFOS groups were increased in the light condition. Additionally, the levels of acetylcholine (Ach) in 0.4 μ M PFOS group and dopamine (DA) in 0.1, 0.4 and 1 μ M PFOS groups were found to be significantly increased. The expression of genes related to the synthesis and decomposition of ACh, the synthesis and receptor of DA, and fosab was increased in the different PFOS treatment groups, while the expression of all the other genes of the neuromuscular system were significantly reduced. The findings of this investigation demonstrated that PFOS exposure may alter the locomotor behavior of zebrafish through disrupting the expressions of genes in neuromuscular system. The disturbed process of neurotransmitter transmission and muscle contraction caused by PFOS may be the dominant mechanism of hyperactivity in zebrafish.			В	A

分野 タイトル 発行年 書誌情報 要旨 (原文) No. 著者 (参考) While the developmental neurotoxicity of perfluorooctane sulfonate (PFOS) has been reported been investigated. Behavior assessment was conducted in zebrafish larvae exposed to PFOS and 20 μ M. Changes in electrophysiological signals and in the concentration of 20 neuroche Lee, Hyojin; assessment revealed that PFOS altered larval behaviors and significantly increased the cour Tran, Cong M; irregular high-speed movement). Electrophysiological analysis showed that the number of se ゼブラ seizure-like signals were significantly increased, corresponding to results observed using pe Jeong, Soomin; Neurotoxicology. 2022 Dec;93:257-264. doi: Seizurogenic effect of perfluorooctane sulfonate in D1302 2022 seizurogenic agent. The outbreak of seizures detected via abnormal electrophysiological sign Kim, Seong 10.1016/j.neuro.2022.10.007. Epub 2022 Oct 13. シュ(神 zebrafish larvae Soon; Bae, expression of c-fos and bdnf, which are typical seizure-related genes. Analysis of neurocher 経毒性) Myung Ae; Kim, dysregulated overall neurotransmission systems, and aberrant endogenous concentrations o Ki-Tae acid, cholinergic, dopaminergic, serotonergic and kynurenergic, and GABAergic systems wer behavior and signals. This study, the first to demonstrate that exposure to PFOS provokes a zebrafish larvae, should stimulate further research on the association between PFOS exposu neurological disorders. Wu, Luyin; Dang Yao; Liang, Li-Xia; Gong, Yan-Chen; Zeeshan It has been reported that exposure to perfluorooctane sulfonates (PFOS) causes behavioral Mohammed: the possible mechanisms underlying these changes remain unexplored. In this study, zebrafi Qian, Zhengmin hpf) were exposed to PFOS at different concentrations (0, 0.032, 0.32 and 3.2 mg/L) for 120 Geiger, Sarah locomotion behavior of larvae were evaluated. Reactive oxygen species (ROS) levels, dopam Dee; Vaughn, proteins related to neurodevelopment and dopamine signaling were examined. Our results ir ゼブラ Michael G; Zhou, Perfluorooctane sulfonates induces neurobehavioral the zebrafish larvae heads may be causally associated with neurodevelopment damage. Mea Chemosphere. 2022 Jun;297:134234. doi: D1303 Yang; Li, Qing-2022 factor (BDNF) and alpha1-Tubulin (α 1-Tubulin) protein contents were significantly increase changes and increases dopamine neurotransmitter シュ(神 10.1016/j.chemosphere.2022.134234. Epub 2022 Mar 5. Qing; Chu, Chu; levels in zebrafish larvae mechanism for the impaired central nervous system. PFOS-induced locomotor hyperactivity 経毒性) Tan, Ya-Wen; and dark phase at the 0.32 and 3.2 mg/L of PFOS. Upregulation of dopamine-related genes Lin, Li-Zi; Liu, dopamine transporter (dat) associated with increased dopamine contents in the 3.2 mg/L of Ru-Qing; Hu, Liof TH and DAT were noted at the 0.32 and 3.2 mg/L of PFOS concentrations. Our results sug Wen; Yang, Boneurobehavioral changes in zebrafish larvae, possibly by perturbing a dopamine signaling pa Yi: Zeng, Xiaodevelopment damage, such as increased malformation rate and shorter body length. Wen; Yu, Yunjiang; Dong, Guang-Hui Recent studies have reported potential neurotoxicity and epigenetic alteration associated wi polyfluoroalkyl substances (PFASs). However, such information is limited to a few compound primarily based on rodent experiments, and the underlying toxicological mechanism(s) for m poorly understood. In the present study, we investigated 8:8 perfluoroalkyl phosphinic acid (with high persistency in the environment and biota, using the zebrafish model. We exposed Kim, Sujin; concentrations of 8:8 PFPiA (0, 0.0116, 0.112, 0.343, 1.34, 5.79 μ M) for 144 h. Although ther Stroski, Kevin M ゼブラ hatchability and malformations, zebrafish locomotor speed at 120 h significantly decreased Killeen, Grace; 8:8 Perfluoroalkyl phosphinic acid affects フィッ Sci Total Environ. 2020 Sep 20;736:139600. doi: genes related to thyroid hormones that are essential for neurodevelopment, including cortico D1304 Smitherman. 2020 neurobehavioral development, thyroid disruption, and 10.1016/j.scitotenv.2020.139600. Epub 2020 May 26. シュ (神 iodothyronine deiodinase 3a (dio3a), thyroid-stimulating hormone receptor (tshr) and nkx2 h Cynthia; Simcik, DNA methylation in developing zebrafish 経毒性) regulated by 8:8 PFPiA at 5.79 μ M. 8:8 PFPiA also significantly down-regulated a neurodeve Matt F; Brooks, specific RNA binding protein (elavl3), at 1.34 and 5.79 μ M; in addition, one oxidative stress Bryan W regulated. Further, global DNA methylation was significantly decreased at higher treatment on epigenetic regulation. However, promoter DNA methylation of selected genes (dio3, tshr, though dio3 methylation showed a decreasing trend with 8:8 PFPiA exposure. Our results sp molecular toxicology of PFPiA and more broadly present an approach to define diverse respo assessments of PFASs

	備考	出 対 象	ン 文 ク 献 ① ラ	ン 文 ク 献 ② ラ
ed, its seizurogenic potential has not S at concentrations of 0, 0.1, 1, 5, 10, emicals were measured. Behavior nts and duration of bursting (an eizure-like events and duration of ntylenetetrazol as a positive nals was confirmed by the increased nicals indicated that PFOS of various neurochemicals in the amino e associated with seizure-like seizurogenic effect in developing ure and neurodevelopmental toxicity or			В	В
abnormalities in zebrafish larvae, but ish embryos (2 h postfertilization, 2- h. Developmental endpoints and the ine contents, several genes and ndicate that increased ROS levels in anwhile, brain-derived neurotrophic ed, which may be a compensatory was observed in the first light phase tyrosine hydroxylase (th) and FPFOS. In addition, protein expression ggested that PFOS induces thway. In addition, PFOS induced			В	A
th exposure to several per- and ds (e.g., perfluorooctane sulfonate), any PFAS in the environment remain 8:8 PFPiA), an under-studied PFAS zebrafish embryos (<4 hpf) to various e was no significant change in survival, in dark photoperiod. At 144 h, several otropin releasing hormone b (crhb), nomeobox1 (nkx 2.1), were up- elopmental gene, elav like neuron- gene was slightly but significantly up- levels, identifying effects of 8:8 PFPiA nkx2.1) were not statistically altered, recifically advance an understanding of onses during animal alternative			С	D

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨 (原文)	備考	 出情 ン文 ン文 対報 ク献 ク献 の献
D1305	ゼブラ フィッ シュ (発 達神経毒 性)	Lee, Hyojin; Sung, Eun Ji; Seo, Seungwoo; Min, Eun Ki; Lee, Ji-Young; Shim, Ilseob; Kim, Pilje; Kim, Tae-Young; Lee, Sangkyu; Kim, Ki-Tae	Integrated multi-omics analysis reveals the underlying molecular mechanism for developmental neurotoxicity of perfluorooctanesulfonic acid in zebrafish	202:	Environ Int. 2021 Dec;157:106802. doi: 10.1016/j.envint.2021.106802. Epub 2021 Aug 4.	Limited studies on multi-omics have been conducted to comprehensively investigate the molecular mechanism underlying the developmental neurotoxicity of perfluorooctanesulfonic acid (PFOS). In this study, the locomotor behavior of zebrafish larvae was assessed under the exposure to $0.1-20 \ \mu$ M PFOS based on its reported neurobehavioral effect. After the number of zebrafish larvae was optimized for proteomics and metabolomics studies, three kinds of omics (i.e., transcriptomics, proteomics, and metabolomics) were carried out with zebrafish larvae exposed to $0.1, 1, 5, and 10 \ \mu$ M PFOS. More importantly, a data-driven integration of multi-omics was performed to elucidate the toxicity mechanism involved in developmental neurotoxicity. In a concentration-dependent manner, exposure to PFOS provoked hyperactivity and hypoactivity under light and dark conditions, respectively. Individual omics revealed that PFOS exposure caused perturbations in the pathways of neurological function, oxidative stress, and energy metabolism. Integrated omics implied that there were decisive pathways for axonal deformation, neuroinflammatory stimulation, and dysregulation of calcium ion signaling, which are more clearly specified for neurotoxicity. Overall, our findings broaden the molecular understanding of the developmental neurotoxicity of PFOS, for which multi-omics and integrated omics analyses are efficient for discovering the significant molecular pathways related to developmental neurotoxicity in zebrafish.		A B
D1306	ゼブラ フィッ シュ (免 疫毒性)	Diaz, Oscar E; Sorini, Chiara; Morales, Rodrigo A; Luo, Xinxin; Frede, Annika; Krais, Annette M; Chávez, Myra N; Wincent, Emma; Das, Srustidhar; Villablanca, Eduardo J	Perfluorooctanesulfonic acid modulates barrier function and systemic T-cell homeostasis during intestinal inflammation	2023	Dis Model Mech. 2021 Dec 1;14(12):dmm049104. doi: 10.1242/dmm.049104. Epub 2021 Dec 23.	The intestinal epithelium is continuously exposed to deleterious environmental factors that might cause aberrant immune responses leading to inflammatory disorders. However, what environmental factors might contribute to disease are poorly understood. Here, to overcome the lack of in vivo models suitable for screening of environmental factors, we used zebrafish reporters of intestinal inflammation. Using zebrafish, we interrogated the immunomodulatory effects of polyfluoroalkyl substances, which have been positively associated with ulcerative colitis incidence. Exposure to perfluorooctanesulfonic acid (PFOS) during 2,4,6-trinitro-benzene sulfonic acid (TNBS)-induced inflammation enhanced the expression of proinflammatory cytokines as well as neutrophil recruitment to the intestine of zebrafish larvae, which was validated in the TNBS-induced colitis mouse model. Moreover, PFOS exposure in mice undergoing colitis resulted in neutrophil-dependent increased intestinal permeability and enhanced PFOS translocation into the circulation. This was associated with a neutrophil-dependent expansion of systemic CD4+ T cells. Thus, our results indicate that PFOS worsens inflammation-induced intestinal damage with disruption of T-cell homeostasis beyond the gut and provides a novel in vivo toolbox to screen for pollutants affecting intestinal homeostasis.		СВ
D1307	ゼブラ フィッ シュ(免 疫毒性)	Zhang, Hangjun; Shen, Lilai; Fang, Wendi; Zhang, Xiaofang; Zhong, Yuchi	Perfluorooctanoic acid-induced immunotoxicity via NF-kappa B pathway in zebrafish (Danio rerio) kidney	2023	Fish Shellfish Immunol. 2021 Jun;113:9-19. doi: 10.1016/j.fsi.2021.03.004. Epub 2021 Mar 14.	Perfluorooctanoic acid (PFOA) is widely used in industrial production due to its stable chemical structure and hydrophobic and oleophobic characteristics. PFOA has been frequently detected in environmental media and organisms, leading to increased health risks. There is a lack of information about the immunotoxicity of aquatic organisms induced by PFOA, and the molecular mechanisms remain unclear. In this study, LC-MS analysis proved that PFOA can accumulate in the kidney of zebrafish. In the 0.05 mg/L PFOA treatment group, the accumulation of PFOA in the kidney after 21 days of exposure significantly increased by 79.89%, compared to 14 days of exposure. And a hydropic endoplasmic reticulum, swelling of mitochondria and vacuolization were observed in kidney immune cells of zebrafish. The Toll-like receptor 2 (TLR2)/myeloid differentiation factor 88 (myd88)/NF- <i>κ</i> B (P65) pathway was activated when PFOA exerted its effects, which led to regulation of antibody expression; RT-PCR results showed that the mRNA expression level of interleukin-4 (IL-4) decreased in a dose-dependent manner, decreasing to 29.6% of the control level in the 1 mg/L PFOA group after 21 d of exposure. According to triangle plot analysis, immunoglobulin exhibited a notable stress response to PFOA at an early phase; a high concentration of PFOA may disrupt the immune system of zebrafish. Third-order polynomial fitting analysis showed that the high-mRNA-expression regions of IL-4 and antibodies were partially consistent. The results indicated that PFOA could affect antibodies by increasing the concentrations of proinflammatory cytokines. Changes in antibody levels further influenced the expression of other cytokines, which eventually caused disorders in the zebrafish immune system. This study expands the understanding of PFOA-induced immunosuppression and suggests that toxicity mechanisms should be considered for further health risk assessment of emerging pollutants.		сс
D1308	ゼブラ フィッ シュ (免 疫毒性)	Huang, Jing; Wang, Qiyu; Liu, Shuai; Lai, Hong; Tu, Wenqing	Comparative chronic toxicities of PFOS and its novel alternatives on the immune system associated with intestinal microbiota dysbiosis in adult zebrafish	2022	2 Hazard Mater. 2022 Mar 5;425:127950. doi: 10.1016/j.jhazmat.2021.127950. Epub 2021 Dec 2.	6:2 Chlorinated polyfluorinated ether sulfonate (F-53B) and sodium p-perfluorous nonenoxybenzene sulfonate (OBS) are widely used as perfluorooctane sulfonate (PFOS) alternatives in the Chinese market. Here, adult zebrafish were chronically exposed to 1 μ M PFOS, F-53B, and OBS for 21 days to investigate the comparative immunotoxicity of these three per- and polyfluoroalkyl substances (PFAS). PFOS induced more severe oxidative stress in the liver than F-53B and OBS, and these three PFAS induced similar anti-inflammatory effects by repressing the expression of pro-inflammatory cytokines. The intestinal microbiota analysis showed that the relative abundance of Plesiomonas, Aeromonas, Cetobacterium, Shewanella, and Vibrio changed with the same trend in the three PFAS treatment groups. Furthermore, the PFAS increased the expression of hepcidin, muc, the immune-related genes mpo and saa, and decreased the expression of the tight junction-related gene occ in the intestine; moreover, villus height of the intestine was reduced after PFAS exposure, which indicated the functional disruption of the intestine. In particular, the significant correlation between the changed intestinal microbiota and liver and intestinal indicators also suggested the interaction between the immune system and intestinal microbiota. Taken together, our results indicate that exposure to PFOS and its alternatives F-53B and OBS can induce hepatic immunotoxicity associated with intestinal microbiota dysbiosis in adult zebrafish.		c c

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨 (原文)	備考	出情 ン 文 対報 ク 献 象抽 ① ラ	ン 文 ク 献 ② ラ
D1309	トキシコ ゲノミク ス	仲山 慶	トキシコゲノミクスによるPOPs等有害化学物質の生体 影響評価	200	5 環境毒性学会誌, 9 巻 2 号 81-86, doi: 10.11403/jset.9.81	No abstract available		D	D
D1310	トキシコ ゲノミク ス	根本 明日香, 牛嶋 大	定量的ハイスループットスクリーニングによる化学物質 の生物学的活性評価のための統計学的手法	201	3 計量生物学, 38 巻 2 号 93-105, doi: 10.5691/jjb.38.93	Quantitative high throughput sreening (qHTS) is a technique which has originally developed as a powerful tool for drug discovery and lately is expanding its application to the neighboring field, e.g. toxicological screening test for environmental chemicals. A wide variety of in-vitro biological activity of a large amount of chemical materials can be assayed with a low cost and in a short time period. As a result of two largescale pharmacogenomic studies being published in 2012, the reproducibility of the result of screening assay of cytotoxicity for 15 drugs in 471 cell lines was revealed to be unexpectedly low. The necessity of developments of statistical methods suitable for qHTS data were emphasized. In this review, the authors explain 3 statistical methods with applications to qHTS data, which has been proposed since 2013: 1. robust ridge regression estimators for nonlinear models in the purpose of testing bioactivity of chemicals; 2. Bayesian hierarchical dose-response modeling; 3. using weighted entropy to rank chemicals. Characteristics of each method were compared, and the prospects were presented.		D	C
D1311	メダカ (内分泌 系)	Myosho, Taijun; Ishibashi, Ayaka; Fujimoto, Shingo; Miyagawa, Shinichi; Iguchi, Taisen; Kobayashi, Tohru	Preself-Feeding Medaka Fry Provides a Suitable Screening System for in Vivo Assessment of Thyroid Hormone-Disrupting Potential	202	2 2 2 10.1021/acs.est.1c06729. Epub 2022 Apr 27.	Endocrine-disrupting chemicals are assessed based on their physiological potential and their potential associated adverse effects. However, suitable end points for detection of chemicals that interfere with the thyroid hormone (TH) system have not been established in nonmammals, with the exception of amphibian metamorphosis. The aims of the current study were to develop an in vivo screening system using preself-feeding medaka fry (Oryzias latipes) for the detection of TH-disrupting chemicals and elucidate the underlying molecular mechanism. 17 α -Ethinylestradiol (EE2: <100 ng/L) did not induce mRNA expression of estrogen-responsive genes, vitellogenins (vtgs) mRNA. Meanwhile, coexposure with thyroxin (T4) induced an increase of vtg expression. TH-disrupting chemicals (thiourea (TU), perfluorooctanoic acid (PFOA), and tetrabromobisphenol A (TBBPA)) significantly suppressed EE2 (1,000 ng/L)-induced vtg1 expression, while T4 rescued their expression as well as that of thyroid hormone receptor α (tR α) and estrogen receptors (esrs). These results were supported by in silico analysis of the 5'- transcriptional regulatory region of these genes. Furthermore, the esr1 null mutant revealed that EE2-induced vtg1 expression requires mainly esr2a and esr2b in a TH-dependent manner in preself-feeding fry. Application of preself-feeding medaka fry as a screening system might help decipher the in vivo mechanisms of action of TH-disrupting molecules, while providing an alternative to the traditional animal model.		В	В
D1312	野生ネズ ミ (神経 毒性)	Grønnestad, Randi; Schlenk, Daniel; Krøkje, Å se; Jaspers, Veerle L B; Jenssen, Bjørn Munro; Coffin, Scott; Bertotto, Luísa Becker; Giroux, Marissa; Lyche, Jan L; Arukwe, Augustine	Alteration of neuro-dopamine and steroid hormone homeostasis in wild Bank voles in relation to tissue concentrations of PFAS at a Nordic skiing area	202	1 Sci Total Environ. 2021 Feb 20;756:143745. doi: 10.1016/j.scitotenv.2020.143745. Epub 2020 Nov 24.	Perfluoroalkyl substances (PFAS) are contaminants that are applied in a wide range of consumer products, including ski products. The present study investigated the neuro-dopamine (DA) and cellular steroid hormone homeostasis of wild Bank voles (Myodes glareolus) from a skiing area in Norway (Trondheim), in relation to tissue concentrations of PFAS. We found a positive association between brain DA concentrations and the concentration of several PFAS, while there was a negative association between PFAS and dopamine receptor 1 (dr1) mRNA. The ratio between DA and its metabolites (3,4-dihydroxyphenylacetic acid: DOPAC and homovanillic acid: HVA) showed a negative association between DOPAC/DA and several PFAS, suggesting that PFAS altered the metabolism of DA via monoamine oxidase (Mao). This assumption is supported by an observed negative association between mao mRNA and PFAS. Previous studies have shown that DA homeostasis can indirectly regulate cellular estrogen (E2) and testosterone (T) biosynthesis. We found no association between DA and steroid hormone levels, while there was a negative association between Sing that PFAS and T concentrations, suggesting that PFAS might affect T through other mechanisms. The results from the current study indicate that PFAS may alter neuro-DA and steroid hormone homeostasis in Bank voles, with potential consequences on reproduction and general health.		D	D
D1313	実験動物 (乳腺密 度)	Hamilton, Alina M; Olsson, Linnea T; Midkiff, Bentley R; Morozova, Elena; Su, Yanrong; Haslam, Sandra Z; Vandenberg, Laura N; Schneider, Sallie S; Santucci- Pereira, Julia; Jerry, D Joseph; Troester, Melissa A; Schwartz, Richard C	Toward a digital analysis of environmental impacts on rodent mammary gland density during critical developmental windows	202	2 Reprod Toxicol. 2022 Aug;111:184-193. doi: 10.1016/j.reprotox.2022.06.002. Epub 2022 Jun 8.	While mammographic breast density is associated with breast cancer risk in humans, there is no comparable surrogate risk measure in mouse and rat mammary glands following various environmental exposures. In the current study, mammary glands from mice and rats subjected to reproductive factors and exposures to environmental chemicals that have been shown to influence mammary gland development and/or susceptibility to mammary tumors were evaluated for histologic density by manual and automated digital methods. Digital histological density detected changes due to hormonal stimuli/reproductive factors (parity), dietary fat, and exposure to environmental chemicals, such as benzophenone-3 and a combination of perfluorooctanoic acid and zeranol. Thus, digital analysis of mammary gland density offers a high throughput method that can provide a highly reproducible means of comparing a measure of histological density across independent experiments, experimental systems, and laboratories. This methodology holds promise for the detection of environmental impacts on mammary gland structure in mice and rats that may be comparable to human breast density, thus potentially allowing comparisons between rodent models and human breast cancer studies.		D	С

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No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D1314	遺伝毒性	Robinson, Sonia L; Zeng, Xuehuo; Guan, Weihua; Sundaram, Rajeshwari; Mendola, Pauline; Putnick, Diane L; Waterland, Robert A; Gunasekara, Chathura J; Kannan, Kurunthachalam; Gao, Chongjing; Bell, Erin M; Yeung, Edwina H	Perfluorooctanoic acid (PFOA) or perfluorooctane sulfonate (PFOS) and DNA methylation in newborn dried blood spots in the Upstate KIDS cohort	2021	Environ Res. 2021 Mar;194:110668. doi: 10.1016/j.envres.2020.110668. Epub 2020 Dec 30.	Perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS) are persistent organic pollutants which may alter prenatal development, potentially through epigenetic modifications. Prior studies examining PFOS/PFOA and DNA methylation have relatively few subjects (n < 200) and inconsistent results. We examined relations of PFOA/PFOS with DNA methylation among 597 neonates in the Upstate KIDS cohort study. PFOA/PFOS were quantified in newborn dried blood spots (DBS) using high-performance liquid chromatography/tandem mass spectrometry. DNA methylation was measured using the Infinium MethylationEPIC BeadChip with DNA extracted from DBS. Robust linear regression was used to examine the associations of PFOA/PFOS with DNA methylation at individual CPG sites. Covariates included sample plate, estimated cell type, epigenetically derived ancestry, infant sex and plurality, indicators of maternal socioeconomic status, and prior pregnancy loss. In supplemental analysis, we restricted the analysis to 2242 CpG sites previously identified as Correlated Regions of Systemic Interindividual Variation (CoRSIVs) which include metastable epialleles. At FDR<0.05, PFOA concentration >90th percentile was related to DNA methylation at cg15557840, near SCR72, SRXN1; PFOS>90th percentile was related to 2 CpG sites in a sex-specific manner (cg19039925 in GVIN1 in boys and cg05754408 in ZNF26 in girls). When analysis was restricted to CoRSIVs, log-scaled, continuous PFOS concentration was related to DNA methylation at cg03278866 within PTBP1. In conclusion, there was limited evidence of an association between high concentrations of PFOA/PFOS and DNA methylation in newborn DBS in the Upstate KIDS cohort. These findings merit replication in populations with a higher median concentration of PFOA/PFOS.		С
D1315	遺伝毒性	Sivaram, Anithadevi Kenday; Logeshwaran, Panneerselvan; Surapaneni, Aravind; Shah, Kalpit; Crosbie, Nicholas; Rogers, Zoe; Lee, Elliot; Venkatraman, Kartik; Kannan, Kurunthachalam; Naidu, Ravi; Megharaj, Mallavarapu	Evaluation of Cyto-genotoxicity of Perfluorooctane Sulfonate (PFOS) to Allium cepa	2021	Environ Toxicol Chem. 2021 Mar;40(3):792-798. doi: 10.1002/etc.4905. Epub 2020 Dec 10.	Per- and polyfluoroalkyl substances (PFAS) have emerged as contaminants of global concern. Among several PFAS, perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS) are persistent and bioaccumulative compounds. We investigated the cyto-genotoxic potential of PFOS to Allium cepa root meristem cells. The A. cepa root tips were exposed to 6 different concentrations (1-100 mg L(-1)) of PFOS for 48 h. Reduction in mitotic index and chromosomal aberrations was measured as genotoxic endpoints in meristematic root cells. Exposure to PFOS significantly affected cell division by reducing the mitotic index at higher concentrations (>10 mg L(-1)). The median effect concentration of PFOS to elicit cytotoxicity based on the mitotic index was 43.2 mg L(-1). Exposure to PFOS significantly increased chromosomal aberrations at concentrations >25 mg L(-1). The common aberrations were micronuclei, vagrant cells, and multipolar anaphase. The alkaline comet assay revealed a genotoxic potential of PFOS with increased tail DNA percentage at concentrations >25 mg L(-1). To our knowledge, this is the first study to report the cyto-genotoxic potential of PFOS in higher plants. Environ Toxicol Chem 2021;40:792-798. © 2020 SETAC.		С
D1316	遺伝毒性	Pierozan, Paula; Cattani, Daiane; Karlsson, Oskar	Perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA) induce epigenetic alterations and promote human breast cell carcinogenesis in vitro	2020	Arch Toxicol. 2020 Nov;94(11):3893-3906. doi: 10.1007/s00204-020-02848-6. Epub 2020 Jul 22.	Gene-environment interactions are involved in the development of breast cancer, the tumor type that accounts for the majority of the cancer-related deaths among women. Here, we demonstrate that exposure to PFOS (10 μ M) and PFOA (100 μ M)-two contaminants ubiquitously found in human blood-for 72 h induced breast epithelial cell (MCF-10A cell line) proliferation and alteration of regulatory cell-cycle proteins (cyclin D1, CDK6, p21, p53, p27, ERK 1/2 and p38) that persisted after a multitude of cell divisions. The contaminants also promoted cell migration and invasion by reducing the levels of E-cadherin, occludin and β -integrin in the unexposed daughter cells. The compounds further induced an increase in global DNA methylation and differentially altered histone modifications, epigenetic mechanisms implicated in tumorigenesis. This mechanistic evidence for PFOS- and PFOA-induced malignant transformation of human breast cells supports a role of these abundant contaminants in the development and progression of breast cancer. Increased knowledge of contaminant-induced effects and their contribution to breast tumorigenesis is important for a better understanding of gene-environment interactions in the etiology of breast cancer.		C

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D1317	遺伝毒性	Ojo, Atinuke F; Peng, Cheng; Ng, Jack C	Genotoxicity assessment of per- and polyfluoroalkyl substances mixtures in human liver cells (HepG2)	2022	Toxicology. 2022 Dec;482:153359. doi: 10.1016/j.tox.2022.153359. Epub 2022 Nov 2.	Per- and polyfluoroalkyl substances (PFAS) are ubiquitous, toxic, and persistent environmental chemicals of concern that have been widely detected in all environmental matrices including human biological fluids. Although humans are exposed to complex mixtures of PFAS, it remains uncertain whether the co-exposure to PFAS mixtures could induce genotoxic damage in humans. Hence, this study evaluated the combined genotoxicity of PFAS mixtures in a human cell line system. To assess the possible genotoxic damage caused by human exposure to PFAS and their mixtures, we investigated their potential to induce cytotoxicity (cell viability) and genotoxicity (DNA damage) in a human liver cell line (HepG2). The selected PFAS include perfluorononanoic acid (PFNA), perfluorooctane sulfonic acid (PFOS), perfluorodecanoic acid (PFDA), perfluorooctanoic acid (PFOA), and perfluorohexane sulfonic acid (PFHxS). The interaction toxicities of these PFAS in binary mixtures were also determined using the additive index approach. The results revealed that exposure to PFNA, PFOS, PFDA, PFOA, and PFHxS singly and in binary mixtures induced a concentration-dependent decrease in cell viability. The additive index values indicated that the binary mixtures of PFOS + PFNA, PFOS + PFDA, and PFOS + PFOA displayed synergistic interaction, whereas the binary mixtures of PFOS + PFHxS, PFOA + PFNA, PFOA + PFDA, and PFOA + PFHxS behaved additively. Using the alkaline Comet assay, the potential of PFAS and their mixtures to induce DNA damage was evaluated based on a 1:1 ratio of the concentration of respective compounds required to produce a 1/10th of effective concentrations causing 50 % inhibition in cell viability (EC(50)). The results revealed that exposure to PFNA, PFOS, PFDA, PFOA, and PFNA singly and in binary mixtures (PFOS + PFNA, PFOS + PFDA, PFOS + PFHxS, PFOA + PFNA, PFOA + PFDA, and PFOA + PFHxS) caused a moderate increase in cellular DNA damage, but no dose-response relationship was observed. Overall, this study indicates that the tested		в
D1318	遺伝毒性	Pierozan, Paula; Cattani, Daiane; Karlsson, Oskar	Correction to: Perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA) induce epigenetic alterations and promote human breast cell carcinogenesis in vitro	2020	Arch Toxicol. 2020 Nov;94(11):3907-3909. doi: 10.1007/s00204-020-02864-6.	The original article can be found online.		С
D1319	遺伝毒性	Zhao, Han; Xie, Junkai; Wu, Shichen; Sá nchez, Oscar F; Zhang, Xinle; Freeman, Jennifer L; Yuan, Chongli	Pre-differentiation exposure of PFOA induced persistent changes in DNA methylation and mitochondrial morphology in human dopaminergic-like neurons	2022	Environ Pollut. 2022 Sep 1;308:119684. doi: 10.1016/j.envpol.2022.119684. Epub 2022 Jun 25.	Perfluorooctanoic acid (PFOA) is abundant in environment due to its historical uses in consumer products and industrial applications. Exposure to low doses of PFOA has been associated with various disease risks, including neurological disorders. The underlying mechanism, however, remains poorly understood. In this study, we examined the effects of low dose PFOA exposure at 0.4 and 4 μ g/L on the morphology, epigenome, mitochondrion, and neuronal markers of dopaminergic (DA)-like SH-SY5Y cells. We observed persistent decreases in H3K4me3, H3K27me3 and 5 mC markers in nucleus along with alterations in nuclear size and chromatin compaction percentage in DA-like neurons differentiated from SH-SY5Y cells exposed to 0.4 and 4 μ g/L PFOA. Among the selected epigenetic features, DNA methylation pattern can be used to distinguish between PFOA-exposed and naïve populations, suggesting the involvement of epigenetic regulation. Moreover, DA-like neurons with pre-differentiation PFOA exposure exhibit altered network connectivity, mitochondrial volume, and TH expression, implying impairment in DA neuron functionality. Collectively, our results revealed the prolonged effects of developmental PFOA exposure on the fitness of DA-like neurons and identified epigenome and mitochondrion as potential targets for bearing long-lasting changes contributing to increased risks of neurological diseases later in life.		С

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D1320 遺伝毒性	Goodrich, Jaclyn M; Calkins, Miriam M; Caban-Martinez, Alberto J; Stueckle, Todd; Grant, Casey; Calafat, Antonia M; Nematollahi, Amy; Jung, Alesia M; Graber, Judith M; Jenkins, Timothy; Slitt, Angela L; Dewald, Alisa; Cook Botelho, Julianne; Beitel, Shawn; Littau, Sally; Gulotta, John; Wallentine, Darin; Hughes, Jeff; Popp,	Per- and polyfluoroalkyl substances, epigenetic age and DNA methylation: a cross-sectional study of firefighters	2021	Epigenomics. 2021 Oct;13(20):1619-1636. doi: 10.2217/epi- 2021-0225. Epub 2021 Oct 21.	Background: Per- and polyfluoroalkyl substances (PFASs) are persistent chemicals that firefighters encounter. Epigenetic modifications, including DNA methylation, could serve as PFASs toxicity biomarkers. Methods: With a sample size of 197 firefighters, we quantified the serum concentrations of nine PFASs, blood leukocyte DNA methylation and epigenetic age indicators via the EPIC array. We examined the associations between PFASs with epigenetic age, site- and region-specific DNA methylation, adjusting for confounders. Results: Perfluorohexane sulfonate, perfluoroctanoate (PFOA) and the sum of branched isomers of perfluoroctane sulfonate (Sm-PFOS) were associated with accelerated epigenetic age. Branched PFOA, linear PFOS, perfluoronanoate, perfluorodecanoate and perfluoroundecanoate were associated with differentially methylated loci and regions. Conclusion: PFASs concentrations are associated with accelerated epigenetic age and locus-specific DNA methylation. The implications for PFASs toxicity merit further investigation.			С
D1321 遺伝毒性	Courant, Florestan; Bougras-Cartron, Gwenola; Abadie, Caroline; Frenel, Jean-Sébastien; Cartron, Pierre- François	Modulation of DNA Methylation/Demethylation Reactions Induced by Nutraceuticals and Pollutants of Exposome Can Promote a C > T Mutation in the Breast Cancer Predisposing Gene PALB2	2022	Epigenomes. 2022 Sep 30;6(4):32. doi: 10.3390/epigenomes6040032.	BACKGROUND: Deregulation of DNA methylation/demethylation reactions may be the source of C > T mutation via active deamination of 5-methylcytosine to thymine. Exposome, that is to say, the totality of exposures to which an individual is subjected during their life, can deregulate these reactions. Thus, one may wonder whether the exposome can induce C > T mutations in the breast cancer-predisposing gene PALB2. METHODS: Our work is based on the exposure of MCF10A mammary epithelial cells to seven compounds of our exposome (folate, Diuron, glyphosate, PFOA, iron, zinc, and ascorbic acid) alone or in cocktail. The qMSRE and RMS techniques were used to study the impact of these exposures on the level of methylation and mutation of the PALB2 gene. RESULTS: Here, we have found that exposome compounds (nutriments, ions, pollutants) promoting the cytosine methylation and the 5-methylcytosine deamination have the ability to promote a specific C > T mutation in the PALB2 gene. Interestingly, we also noted that the addition of exposome compounds promoting the TET-mediated conversion of 5-methylcytosine (Ascorbic acid and iron) abrogates the presence of C > T mutation in the PALB2 gene. CONCLUSIONS: Our study provides a proof of concept supporting the idea that exposomes can generate genetic mutation by affecting DNA methylation/demethylation.			с
D1322 遺伝毒性	Xu, Yiyi; Jurkovic-Mlakar, Simona; Lindh, Christian H; Scott, Kristin; Fletcher, Tony; Jakobsson, Kristina; Engströ m, Karin	Associations between serum concentrations of perfluoroalkyl substances and DNA methylation in women exposed through drinking water: A pilot study in Ronneby, Sweden	2020	Environ Int. 2020 Dec;145:106148. doi: 10.1016/j.envint.2020.106148. Epub 2020 Sep 30.	BACKGROUND: Perfluoroalkyl substances (PFAS) are widespread synthetic substances with various adverse health effects. A potential mechanism of toxicity for PFAS is via epigenetic changes, such as DNA methylation. However, few studies have evaluated associations between PFAS exposure and DNA methylation among adults, and data is especially scarce for women. Furthermore, exposure to environmental pollutants has been associated with epigenetic age acceleration, but no studies have yet evaluated whether PFAS is associated with epigenetic age acceleration. OBJECTIVES: To investigate whether exposure to PFAS is associated with epigenetic age acceleration of DNA methylation and epigenetic age acceleration among women. METHODS: In this observational pilot study, 59 women (aged 20-47 years at enrollment in 2014) from Ronneby, Sweden, an area with historically high PFAS exposure due to local drinking water contamination, were divided into three PFAS exposure groups (low, medium, and high). Genome-wide methylation of whole-blood DNA was analyzed using the Infinium MethylationEPIC BeadChip. Ingenuity Pathway Analysis was used for in silico functional assessment. Epigenetic age acceleration was derived from the DNA methylation data using Horvath's epigenetic skin and blood clock. RESULTS: 117 differentially methylated positions (q < 0.017) and one near-significantly differentially methylated region (S100A13, FWER = 0.020) were identified. In silico functional analyses suggested that genes with altered DNA methylation (q < 0.05) were annotated to cancer, endocrine system disorders, reproductive system disease, as well as pathways such as estrogen receptor signaling, cardiac hypertrophy signaling, PPAR $\alpha/RXR \alpha$ activation and telomerase signaling. No differences in epigenetic age acceleration between PFAS exposure groups were noted (p = 0.43). CONCLUSION: The data suggests that PFAS exposure alters DNA methylation in women highly exposed to PFAS from drinking water. The observed associations should be verified in larger coh			С

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D1323	遺伝毒性	ltoh, Hiroaki; Harada, Kouji H; Kasuga, Yoshio; Yokoyama, Shiro; Onuma, Hiroshi; Nishimura, Hideki; Kusama, Ritsu; Yokoyama, Kazuhito; Zhu, Jing; Harada Sassa, Mariko; Yoshida, Teruhiko; Tsugane, Shoichiro; Iwasaki, Motoki	Association between serum concentrations of perfluoroalkyl substances and global DNA methylation levels in peripheral blood leukocytes of Japanese women: A cross-sectional study	2022	Sci Total Environ. 2022 Nov 7;859(Pt 1):159923. doi: 10.1016/j.scitotenv.2022.159923. Online ahead of print.	Global DNA methylation levels in peripheral blood leukocytes can be a biomarker for cancer risk; however, levels can be changed by various factors such as environmental pollutants. We investigated the association between serum concentrations of perfluoroalkyl substances (PFASs) and global DNA methylation levels of leukocytes in a cross-sectional study using the control group of a Japanese breast cancer case-control study [397 women with a mean age of 54.1 (SD 10.1) years]. Importantly, our analysis distinguished branched PFAS isomers as different from linear isomers. The serum concentrations of 20 PFASs were measured by in-port arylation gas-chromatography negative chemical ionization mass spectrometry. Global DNA methylation levels in peripheral blood leukocytes were measured using a luminometric methylation assay. Associations between log(10)- transformed serum PFAS concentrations and global DNA methylation levels were evaluated by regression coefficients in multivariable robust linear regression analyses. Serum concentrations of 13 PFASs were significantly associated with increased global DNA methylation levels in leukocytes. Global DNA methylation was significantly increased by 1.45 %-3.96 % per log(10)-unit increase of serum PFAS concentration. Our results indicate that exposure to PFASs may increase global DNA methylation levels in peripheral blood leukocytes of Japanese women.			С
D1324	遺伝毒性	Maki Nakamura, Tomomi Takahashi, Takuya Izumi, Masanori Miura, Satomi Kawaguchi, Ayumi Yamamoto, Shuji Tsuda, Takanori Nakamura, Shuhei Tanaka, Naoto Shimizu, Yu F. Sasaki	Peroxisome proliferator activated receptor-mediated genotoxicity of perfluoroalkyl acids using human lymphoblastoid cells	2016	Fundamental Toxicological Sciences, 3 巻 4 号 143-150, doi: 10.2131/fts.3.143	Perfluoroalkyl acids (PFAAs) have been widely used since 1950s. The long chained-PFAAs, such as perfluorooctanoic acid (PFOA) are persistent and bio-accumulative, and are detected in humans. PFOA, which is a peroxisome proliferator activated receptor (PPAR) α agonist, has been suggested to be a carcinogen in epidemiological and animal studies. In some studies PFOA is shown to be non-mutagenic in Ames and micronucleus tests, but in other studies it caused oxidative DNA damage and micronucleus formation. However, there has been no report that has examined whether PFOA-induced genotoxicity is mediated by PPAR α . In order to relate genotoxicity of PFAAs to PPAR α , we conducted two kinds of comet assays (cellular and acellular), a micronucleus (MN) test, and a TK mutation assay with and without PPAR α antagonists by using human lymphoblastoid cells. PFAAs at 125-1000 µg/mL showed positive responses in the cellular comet assay but not in the MN test and TK mutation assay. A PPAR α antagonist GW6471 (2 µg/mL) only partly reduced PFOA-induced DNA damage (in the cellular comet assay), but abolished PFOA-induced intracellular ROS formation. PFAAs with 8-12 carbons also showed positive responses in the acellular comet assay where there is no cellular function such as PPAR. Therefore, PFOA-induced DNA damage was partly related to the oxidative stress via PPAR α , without manifestation of chromosome aberration and point mutation in this cell line.		1	A
D1325	遺伝毒性	Yoshikazu ARAI, Jun OHGANE, Shintaro YAGI, Rie ITO, Yusuke IWASAKI, Koichi SAITO, Kazuhiko AKUTSU, Satoshi TAKATORI, Rie ISHII, Rumiko HAYASHI, Shun- Ichiro IZUMI, Norihiro SUGINO, Fumio KONDO, Masakazu HORIE, Hiroyuki NAKAZAWA, Tsunehisa MAKINO, Kunio SHIOTA	Epigenetic Assessment of Environmental Chemicals Detected in Maternal Peripheral and Cord Blood Samples	2011	J Reprod Dev. 2011 Sep;57(4):507-17. doi: 10.1262/jrd.11- 034a. Epub 2011 May 23.	Epigenetic alteration is an emerging paradigm underlying the long-term effects of chemicals on gene functions. Various chemicals, including organophosphate insecticides and heavy metals, have been detected in the human fetal environment. Epigenetics by DNA methylation and histone modifications, through dynamic chromatin remodeling, is a mechanism for genome stability and gene functions. To investigate whether such environmental chemicals may cause epigenetic alterations, we studied the effects of selected chemicals on morphological changes in heterochromatin and DNA methylation status in mouse ES cells (ESCs). Twenty-five chemicals, including organophosphate insecticides, heavy metals and their metabolites, were assessed for their effect on the epigenetic status of mouse ESCs by monitoring heterochromatin stained with 46,6-diamino-2-phenylindole (DAPI). The cells were surveyed after 48 or 96 h of exposure to the chemicals at the serum concentrations of cord blood. The candidates for epigenetic mutagens were examined for the effect on DNA methylation at genic regions. Of the 25 chemicals, five chemicals (liethyl phosphate (DEP), mercury (Hg), cotinine, selenium (Se) and octachlorodipropyl ether (S-421)) caused alterations in nuclear staining, suggesting that they affected heterochromatin changes in ESCs, and DEP-, Hg- and S-421-exposed cells also exhibited impaired formation of the embryoid body (EB), which is an in vitro model for early embryos. We established a system for assessment of epigenetic mutagens. We identified environmental chemicals that could have effects on the human fetus epigenetic status.			С

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D1326	遺伝毒性	Nakamura Maki(BOZO Research Center), Takahashi Tomomi, Izumi Takuya, Miura Masanori, Kawaguchi Satomi, Yamamoto Ayumi, Tsuda Shuji, Nakamura Takanori, Tanaka Shuhei, Shimizu Naoto, Sasaki Yu F.	ペルオキシソーム増殖因子活性化受容体が媒介する、ヒ トリンパ芽球様細胞を用いたペルフルオロアルキル酸の 遺伝毒性(Peroxisome proliferator activated receptor- mediated genotoxicity of perfluoroalkyl acids using human lymphoblastoid cells)(英語)	2016	Fundamental Toxicological Sciences(2189-115X)3巻4号 Page143-150(2016.06), doi: 10.2131/fts.3.143	ペルフルオロアルキル酸(PFAA)類が示す遺伝毒性においてペルオキシソーム増殖因子活性化受容体(PPAR)αが関与していることを証明 するため、ヒトリンパ芽球様細胞株を材料に各種アッセイを施行した。TK遺伝子(+/-)ヘテロ接合型のヒトリンパ芽球様TK6細胞株を 各種PFAAで処理したところ、コメットアッセイでは陽性反応が示されたが、小核試験やTK遺伝子変異アッセイでは陽性反応は見られ なかった。ペルフルオロオクタン酸(PFOA)にPPARα拮抗薬のMK886やGW6471を添加したところ、コメットアッセイでのtail長は拮抗 薬無添加の対照と比較して有意に短縮したが、その効果は限定的であった。PFOAに30分間曝露すると細胞内活性酸素種のレベルは著 明に上昇したが、GW6471を添加すると顕著に低下した。PPARなどの細胞機能が働かない無細胞系でのコメットアッセイでも、炭素数 8~12のPFAA類は陽性反応を示した。PFOA誘発性のDNA損傷は部分的にはPPARαを媒介した酸化ストレスと関連し、その際には少 なくともTK6細胞株では染色体異常や点変異が顕在化しないことを示す結果であった。	評価書文 献と重複	A
D1327	遺伝毒性	Oda Yoshimitsu(大阪 府立公衆衛生研究 所), Nakayama Shoji, Harada Kouji H., Koizumi Akio	フッ素テロマーアルコールとペルフルオロアルキル酸の umu遺伝毒性試験の否定的結果(Negative Results of umu Genotoxicity Test of Fluorotelomer Alcohols and Perfluorinated Alkyl Acids)(英語)	2007	Environ Health Prev Med. 2007 Sep;12(5):217-9. doi: 10.1265/ehpm.12.217.	近年、ペルフルオロオクタン酸(PFOA)はヒト血清や環境から遍在的に検出される。PFOAの前駆物質であるフッ素テロマーアルコール (FTOH)がいくつかの代謝経路によって生分解され、様々な生分解生成物が形成される。FTOHの分解は、求電子性を持ちDNAを含む細 胞高分子に反応し得るα,β不飽和アルデヒドを生成する。3種のFTOH (6:2、8:2、10:2の各FTOH)、PFOA、ペルフルオロオクタンスル ホン酸(PFOS)の遺伝毒性をumuテストで調べた。その結果、FTOH、PFOA、PFOSはS9 mix非存在下では0~1000μMでβガラクトシ ダーゼ活性が有意に亢進しなかった。以上、FTOH、PFOA、PFOSの遺伝毒性試験は現行の手法では検出できないことから、突然変異 原ではないと考えられる。		В
D1328	リスク評 価、複合 影響等	Bjork, James A; Dawson, Douglas A; Krogstad, Jacob O; Wallace, Kendall B	Transcriptional effects of binary combinations of PFAS in FaO cells	2021	Toxicology. 2021 Dec;464:152997. doi: 10.1016/j.tox.2021.152997. Epub 2021 Oct 22.	Per- and polyfluoroalkyl substances (PFAS) represent a large class of structurally diverse chemicals of increasing public concern, mostly due to their chemical stability and undetermined toxicity profiles. In laboratory animals, adverse effects implicated for certain PFAS, perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS) in particular, include liver toxicity and the associated metabolic dysregulation, immune and thyroid alterations, reproductive toxicity, and selected tumors. The broad commercialization and environmental distribution of PFAS has drawn attention to the need for understanding risks associated with combined exposure to multiple PFAS in complex mixtures. The purpose of this investigation is to determine whether binary combinations of PFAS elicit a molecular response that is either greater than or less than the sum of the individual responses. Exposure of FaO rat hepatoma cells for 24 h to 25 μ M-200 μ M of the 4- and 8-carbon perfluorocarboxylic acids (PFBA and PFOA) or the 4, 6, and 8-carbon perfluorosulfonic acids (PFBS, PFHxS, and PFOS, respectively) individually caused a dose- dependent increase in PPAR α -regulated expression of peroxisomal bifunctional enzyme (Ehhadh). Potency increased with carbon number, with the carboxylates eliciting a greater transcriptional response than the corresponding sulfonates. Combined exposure to PFOA and PFBA produced an effect that was significantly less than the sum of the individual responses. The response to the combination of PFOA and PFOS produced a summative effect at concentrations that were not cytotoxic. Combined exposures to PFOS and either PFBS or PFHxS at low noncytotoxic concentrations produced a transcriptional effect that was significantly less than the sum of the individual effects. The results demonstrate that among the five structurally related perfluoroalkyl acids included in this investigation, PPAR α transcriptional activation in response to combined binary exposures is consistently at or below that predicted by		СВ

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D1329	リスク評 価、複合 影響等	Mumtaz, M M; Buser, M C; Pohl, H R	Per- and polyfluoroalkyl mixtures toxicity assessment "Proof-of-Concept" illustration for the hazard index approach	2021 J 1	' Toxicol Environ Health A. 2021 Jul 3;84(13):553-567. doi: 10.1080/15287394.2021.1901251. Epub 2021 Mar 23.	The 2018 ATSDR mixture framework recommends three approaches including the hazard index (HI) for environmental mixture toxicity assessment. Per- and polyfluoroalkyls (PFAS) are found in our environment and general populations. Recent experimental mixture toxicity studies of perfluorooctane sulfonic acid (PFOS) and perfluorooctanoic acid (PFOA) and an assessment of 17 PFAS indicate the use of additivity for their joint toxicity assessment. The aim of this investigation was to detail the stepwise procedures and examine the extent and use of the HI approach for PFAS mixture assessment. Using estimated general public lifetime exposures (high, medium, and low), binary mixtures of PFOS and PFOA yielded, respectively, hazard indices (HIs) of 30.67, 8.33, and 3.63 for developmental toxicity; 10.67, 5.04, and 2.34 for immunological toxicity; 3.57, 1.68, and 0.78 for endocrine toxicity; 4.51, 1.73, and 0.79 for hepatic toxicity; and 15.08, 2.29, and 0.88 for reproductive toxicity. A heterogeneous mixture of PFOA, PFAS, dioxin (CDD), and polybrominated compounds (PBDE) for high exposure scenario yielded HIs of 30.99 for developmental, 10.77 for immunological, 3.64 for endocrine, 4.61 for hepatic, and 17.36 for reproductive effects. The HI values are used as a screening tool; the potential concern for exposures rises as HI values increase. For HI values >1, a follow-up including further analysis of specific exposures, use of internal dosimetry, and uncertainty factors is conducted before recommending appropriate actions. The HI approach appears suitable to address present-day PFAS public health concerns for initial assessment of multiple health effects, until further insights are gained into their mechanistic toxicology. The findings and conclusions in this article are those of the author(s) and do not necessarily represent the official position of the Centers for Disease Control and Prevention/the Agency for Toxic Substances and Disease Registry.		D	С	
D1330	リスク評 価、複合 影響等	Ojo, Atinuke F; Xia, Qing; Peng, Cheng; Ng, Jack C	Evaluation of the individual and combined toxicity of perfluoroalkyl substances to human liver cells using biomarkers of oxidative stress	2021 C 1	Chemosphere. 2021 Oct;281:130808. doi: l0.1016/j.chemosphere.2021.130808. Epub 2021 May 5.	Although human exposure is to mixtures of per- and polyfluoroalkyl substances (PFAS), their combined effects and underlying mechanisms remain largely unknown. In this study, the combined effects of PFAS was investigated by treating human liver cells (HepG2) with various concentrations of perfluorooctanoic acid (PFOA), perfluorooctane sulfonate (PFOS), perfluorodecanoic acid (PFDA), perfluorononanoic acid (PFNA), and perfluorohexanoic acid (PFHxS) individually or in binary combinations (PFOS + PFOA, PFOS + PFDA, PFOS + PFNA, PFOS + PFHxS, PFOA + PFDA, PFOA + PFNA, and PFOA + PFHxS) for 24 h using an orthogonal design. The individual and binary combination effects of PFAS on the cytotoxicity, intracellular reactive oxygen species (ROS) production, and glutathione (GSH) levels were determined by MTS assay, dichlorofluorescein diacetate assay, and GSH-Glo ™ Glutathione assay, respectively. The results showed that exposure to PFOA, PFOS, PFDA, PFNA, and PFHxS individually and in binary combinations caused concentration-dependent cytotoxicity to HepG2 cells. Also, intracellular ROS production was not significantly induced in both the individual and co-treatment groups, indicating that ROS production may not be likely influencing the combined cytotoxicity of PFAS to HepG2 cells. However, the depletion of the intracellular glutathione levels was correlated with cytotoxicity. Moreover, the factorial analysis results showed no significant interactive effects between PFOS + PFOA, PFOS + PFDA, PFOA + PFDA, PFOA + PFNA, and PFOA + PFNAS. Taken together, the results showed that both individual and combined PFAS could induce concentration-dependent cytotoxicity and depletion of GSH levels, but could not induce significant increases in ROS production at the concentration range tested. Overall, these results provided valuable toxicological data on the combined effects of mixed PFAS that may help to better assess their human health risk.		с	В	
D1331	リスク評 価、複合 影響等	Monnot, Andrew D; Massarsky, Andrey; Garnick, Lindsey; Bandara, Suren B; Unice, Kenneth M	Can oral toxicity data for PFAS inform on toxicity via inhalation?	2022 <mark>6</mark> 0	Risk Anal. 2022 Oct 6. doi: 10.1111/risa.14039. Online ahead of print.	Per- and poly-fluoroalkyl substances (PFAS) are ubiquitous in the environment and are detected in wildlife and humans. With respect to human exposure, studies have shown that ingestion is the primary route of exposure; however, in certain settings, exposure via inhalation could also be a significant source of exposure. While many studies examined toxicity of PFAS via ingestion, limited information is available for PFAS toxicity via the inhalation route, translating into a lack of exposure guidelines. Consequently, this article examined whether route-to-route extrapolation to derive guidelines for inhalation exposure is appropriate for PFAS. Perfluorooctanoic acid (PFOA) and perfluorooctanesulfonic acid (PFOS) were used as exemplary PFAS given the abundance of toxicity data for these two compounds. Our evaluation determined that available toxicity and toxicokinetic data support route-to-route extrapolation for PFAS in order to derive inhalation-based standards. Results from this analysis suggest that an air concentration of 7.0 × 10(-5) mg/m(3) (or 0.07 μ g/m(3)) would be an appropriate RfC for PFOA and PFOS assuming the 2016 EPA RfD of 0.00002 mg/kg-day, whereas use of the interim RfDs proposed in 2022 of 1.5 × 10(-9) and 7.9 × 10(-9) mg/kg would yield much lower RfCs of 5.25 × 10(-9) and 2.77 × 10(-8) mg/m(3) (or 5.25 × 10(-6) and 2.77 × 10(-5) μ g/m(3)) for PFOA and PFOS, respectively.		В	В	1

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No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ンコ 対報 ク 象抽 ①	文 文 シ 、 、 、 、 、 、 、 、 、 、 、 、	 文 前 え) ラ
D1332	リスク評 価、複合 影響等	Rowan-Carroll, Andrea; Reardon, Anthony; Leingartner, Karen; Gagné, Remi; Williams, Andrew; Meier, Matthew J; Kuo, Byron; Bourdon- Lacombe, Julie; Moffat, Ivy; Carrier, Richard; Nong, Andy; Lorusso, Luigi; Ferguson, Stephen S; Atlas, Ella; Yauk, Carole	High-Throughput Transcriptomic Analysis of Human Primary Hepatocyte Spheroids Exposed to Per- and Polyfluoroalkyl Substances as a Platform for Relative Potency Characterization	2021	Toxicol Sci. 2021 May 27;181(2):199-214. doi: 10.1093/toxsci/kfab039.	Per- and poly-fluoroalkyl substances (PFAS) are widely found in the environment because of their extensive use and persistence. Although several PFAS are well studied, most lack toxicity data to inform human health hazard and risk assessment. This study focused on 4 model PFAS: perfluorooctanoic acid (PFOA; 8 carbon), perfluorobutane sulfonate (PFBS; 4 carbon), perfluorooctane sulfonate (PFOS; 8 carbon), and perfluorodecane sulfonate (PFDS; 10 carbon). Human primary liver cell spheroids (pooled from 10 donors) were exposed to 10 concentrations of each PFAS and analyzed at 4 time points. The approach aimed to: (1) identify gene expression changes mediated by the PFAS, (2) identify similarities in biological responses, (3) compare PFAS potency through benchmark concentration analysis, and (4) derive bioactivity exposure ratios (ratio of the concentration at which biological responses occur, relative to daily human exposure). All PFAS induced transcriptional changes in cholesterol biosynthesis and lipid metabolism pathways, and predicted PPAR α activation. PFOS exhibited the most transcriptional activity and had a highly similar gene expression profile to PFDS. PFBS induced the least transcriptional changes and the highest benchmark concentration (ie, was the least potent). The data indicate that these PFAS may have common molecular targets and toxicities, but that PFOS and PFDS are the most similar. The transcriptomic bioactivity exposure ratios derived here for PFOA and PFOS were comparable to those derived using rodent apical endpoints in risk assessments. These data provide a baseline level of toxicity for comparison with other known PFAS using this testing strategy.		В		A
D1333	リスク評 価、複合 影響等	Tang, Jiaxi; Zhu, Yongle; Li, Yu; Xiang, Biao; Tan, Ting; Lv, Linyou; Luo, Qing	Occurrence characteristics and health risk assessment of per- and polyfluoroalkyl substances from water in residential areas around fluorine chemical industrial areas, China	2022	Environ Sci Pollut Res Int. 2022 Aug;29(40):60733-60743. doi: 10.1007/s11356-022-20155-8. Epub 2022 Apr 15.	Recently, identifying the contamination status and assessing the health risk of per- and polyfluoroalkyl substances (PFASs) in surface water and groundwater have been of great significance. Eighteen individual PFASs were analyzed in thirty-three surface/groundwater samples during one period in a fluorine chemical park (Park A) and during two periods in Park B. The mean total concentration of 18 PFASs (Σ PFASs) in Park A (9104.63 ng·L(-1)) was significantly higher than that in the wet season (WS) (801.68 ng·L(-1)) or DS (714.64 ng·L(-1)) in Park B. The perfluorobutane sulfonate (PFBS) was the predominant substance in the two parks, and the maximum concentration in groundwater exceeded 10,000 ng·L(-1). The contamination status in the wet season (WS) was higher than that in the dry season (DS) in Park B. The Σ PFASs in Park A presented an increasing tendency following the groundwater flow direction, whereas this rule was limited to all periods in Park B. Two relative source contributions (RSCs) of 20% or 100% allowed assessing the PFASs risk to different age groups, and the results revealed that some PFASs ($4 \le C \le 7$ or $9 \le C \le 12$) were identified as having a low risk quotient (RQ), except for perfluorooctane sulfonate (PFOS) and PFOA (C = 8). The RQ(mix) value mainly relies on PFOA and PFOS, with a larger contribution rate of 80-90%. All assessed cases (case 1, case 2, case 3, and case 4) in all age groups revealed that infants were vulnerable to PFASs influence, followed by children, teenagers, and adults.		С		С
D1334	リスク評 価、複合 影響等	Han, Jiajun; Fu, Jesse; Sun, Jianxian; Hall, David Ross; Yang, Diwen; Blatz, Donovan; Houck, Keith; Ng, Carla; Doering, Jon; LaLone, Carlie; Peng, Hui	Quantitative Chemical Proteomics Reveals Interspecies Variations on Binding Schemes of L- FABP with Perfluorooctanesulfonate	2021	Environ Sci Technol. 2021 Jul 6;55(13):9012-9023. doi: 10.1021/acs.est.1c00509. Epub 2021 Jun 16.	Evaluating interspecies toxicity variation is a long-standing challenge for chemical hazard assessment. This study developed a quantitative interspecies thermal shift assay (QITSA) for in situ, quantitative, and modest-throughput investigation of chemical-protein interactions in cell and tissue samples across species. By using liver fatty acid binding protein (L-FABP) as a case study, the QITSA method was benchmarked with six per- and polyfluoroalkyl substances, and thermal shifts (ΔT(m)) were inversely related to their dissociation constants (R(2) = 0.98). The QITSA can also distinguish binding modes of chemicals exemplified by palmitic acid. The QITSA was applied to determine the interactions between perfluorooctanesulfonate (PFOS) and L-FABP in liver cells or tissues from humans, mice, rats, and zebrafish. The largest thermal stability enhancement by PFOS was observed for human L-FABP followed by the mouse, rat, and zebrafish. While endogenous ligands were revealed to partially contribute to the large interspecies variation, recombinant proteins were employed to confirm the high binding affinity of PFOS to human L-FABP, compared to the rat and mouse. This study implemented an experimental strategy to characterize chemical-protein interactions across species, and future application of QITSA to other chemical contaminants is of great interest.		В		В

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨 (原文)	備考	出情 ン 対報 象抽 ①	文 献 ラ	ン 文 ク 献 ② ラ
D1335	リスク評 価、複合 影響等	Bil, Wieneke; Zeilmaker, Marco; Fragki, Styliani; Lijzen, Johannes; Verbruggen, Eric; Bokkers, Bas	Risk Assessment of Per- and Polyfluoroalkyl Substance Mixtures: A Relative Potency Factor Approach	2021	Environ Toxicol Chem. 2021 Mar;40(3):859-870. doi: 10.1002/etc.4835. Epub 2020 Sep 8.	Per- and polyfluoroalkyl substances (PFAS) often occur together as contamination in exposure media such as drinking water or food. The relative potency factor (RPF) methodology facilitates the risk assessment of mixture exposure. A database of liver endpoints was established for 16 PFAS, using data with the same species (rat), sex (male), and exposure route (oral) and comparable exposure duration (42-90 d). Dose-response analysis was applied to derive the relative potencies of 3 perfluoroalkyl sulfonic acids (perfluorobutane sulfonic acid, perfluorohexane sulfonic acid, perfluoroactane sulfonic acid), 8 perfluoroalkyl carboxylic acids (perfluorobutanoic acid, perfluorohexanoic acid, perfluorononanoic acid, perfluorootadecanoic acid, perfluoroalkyl ether carboxylic acids (tetrafluoro-2-[heptafluoropropoxy]propanoic acid, 3H-perfluoro-3-[(3-methoxy-propoxy)propanoic acid]), and 2 fluorotelomer alcohols (6:2 FTOH, 8:2 FTOH) compared to perfluorooctanoic acid (PFOA), based on liver effects. In addition, the RPFs of 7 other perfluoroalkyl acids were estimated based on read-across. This resulted in the relative potencies of 22 PFAS compared to the potency of index compound PFOA. The obtained RPFs can be applied to measured PFAS quantities, resulting in the sum of PFOA equivalents in a mixture. This sum can be compared with an established PFOA concentration limit (e.g., in drinking water or food) or an external health-based guidance value (e.g., tolerable daily intake, acceptable daily intake, or reference dose) to estimate the risk resulting from direct oral exposure to mixtures. Assessing mixture exposure is particularly relevant for PFAS, with omnipresent exposure in our daily lives. Environ Toxicol Chem 2021;40:859-870. © 2020 SETAC.		E	З	В
D1336	リスク評 価、 影響等	Lindborg, Analise; Bradley, Ann; Durda, Judi	An analysis of the use of the relative source contribution term in derivation of drinking water standards using perfluorooctanoic acid as an example	2022	Integr Environ Assess Manag. 2022 Jul 15. doi: 10.1002/ieam.4659. Online ahead of print.	The relative source contribution (RSC) term has long been used by the US Environmental Protection Agency (USEPA) and state regulatory agencies in setting criteria in water. The RSC reflects the proportion of the total daily intake of a chemical that can be derived from water when all other sources of exposure (e.g., food, air) are considered. This term is applied by the USEPA and state regulatory agencies when deriving ambient water quality criteria, maximum contaminant level goals, and drinking water health advisories for noncarcinogenic and threshold carcinogenic compounds. The value assigned to the RSC term affects the calculated criteria directly, with the allowable concentration in water decreasing with a decreasing RSC. A default RSC value of 20%-applied by regulatory entities in the USA for more than 40 years-assumes that 80% of an individual's exposure to a chemical's reference dose is from nonwater sources. Although the RSC is a chemical-specific parameter, there are few instances where a value other than the default of 20% has been approved and used. In 2000, USEPA outlined the process for developing chemical-specific RSC values, yet primary use of the default RSC value has continued since then. This article reviews USEPA's methodology for deriving chemical-specific RSC values and provides a case example using perfluoroctanoic acid (PFOA) to explore how the USEPA and state regulatory agencies are applying USEPA's guidance. The case study highlights inconsistent derivation of the RSC term, rooted in limitations in the current methodology. We suggest additional clarification of and more thoughtful use of the available data that may not meet USEPA's current adequacy requirements. We also recommend that the USEPA discuss recommendations for using biomonitoring data to set RSCs. Integr Environ Assess Manag 2022;00:1-8. © 2022 SETAC.		, A	٩.	С
D1337	リスク評 価、複合 影響等	Romano, Joseph D; Hao, Yun; Moore, Jason H; Penning, Trevor M	Automating Predictive Toxicology Using ComptoxAl	2022	Chem Res Toxicol. 2022 Aug 15;35(8):1370-1382. doi: 10.1021/acs.chemrestox.2c00074. Epub 2022 Jul 12.	ComptoxAl is a new data infrastructure for computational and artificial intelligence research in predictive toxicology. Here, we describe and showcase ComptoxAl's graph-structured knowledge base in the context of three real-world use-cases, demonstrating that it can rapidly answer complex questions about toxicology that are infeasible using previous technologies and data resources. These use-cases each demonstrate a tool for information retrieval from the knowledge base being used to solve a specific task: The "shortest path" module is used to identify mechanistic links between perfluoroctanoic acid (PFOA) exposure and nonalcoholic fatty liver disease; the "expand network" module identifies communities that are linked to dioxin toxicity; and the quantitative structure-activity relationship (QSAR) dataset generator predicts pregnane X receptor agonism in a set of 4,021 pesticide ingredients. The contents of ComptoxAl's source data are rigorously aggregated from a diverse array of public third-party databases, and ComptoxAl is designed as a free, public, and open-source toolkit to enable diverse classes of users including biomedical researchers, public health and regulatory officials, and the general public to predict toxicology of unknowns and modes of action.		(0	С

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 対報 ク献 象抽 ① ラ	ン ク ②	文 献 ^ラ
D1338	リスク評価	Loizou, George; McNally, Kevin; Dorne, Jean-Lou C M; Hogg, Alex	Derivation of a Human In Vivo Benchmark Dose for Perfluorooctanoic Acid From ToxCast In Vitro Concentration-Response Data Using a Computational Workflow for Probabilistic Quantitative In Vitro to In Vivo Extrapolation	2021	Front Pharmacol. 2021 May 11;12:630457. doi: 10.3389/fphar.2021.630457. eCollection 2021.	A computational workflow which integrates physiologically based kinetic (PBK) modeling, global sensitivity analysis (GSA), approximate Bayesian computation (ABC), and Markov Chain Monte Carlo (MCMC) simulation was developed to facilitate quantitative in vitro to in vivo extrapolation (QIVIVE). The workflow accounts for parameter and model uncertainty within a computationally efficient framework. The workflow was tested using a human PBK model for perfluorooctanoic acid (PFOA) and high throughput screening (HTS) in vitro concentration-response data, determined in a human liver cell line, from the ToxCast/Tox21 database. In vivo benchmark doses (BMDs) for PFOA intake (ng/kg BW/day) and drinking water exposure concentrations (μ g/L) were calculated from the in vivo dose responses and compared to intake values derived by the European Food Safety Authority (EFSA). The intake benchmark dose lower confidence limit (BMDL(5)) of 0.82 was similar to 0.86 ng/kg BW/day for altered serum cholesterol levels derived by EFSA, whereas the intake BMDL(5) of 6.88 was six-fold higher than the value of 1.14 ng/kg BW/day for altered antibody titer also derived by the EFSA. Application of a chemical-specific adjustment factor (CSAF) of 1.4, allowing for inter-individual variability in kinetics, based on biological half-life, gave an intake BMDL(5) of 0.59 for serum cholesterol and 4.91 (ng/kg BW/day), for decreased antibody titer, which were 0.69 and 4.31 the EFSA-derived values, respectively. The corresponding BMDL(5) for drinking water concentrations, for estrogen receptor binding activation associated with breast cancer, pregnane X receptor binding associated with altered serum cholesterol levels, thyroid hormone receptor α binding leading to thyroid disease, and decreased antibody titer (pro-inflammation from cytokines) were 0.883, 0.139, 0.086, and 0.295 ng/ml, respectively, with application of no uncertainty factors. These concentrations are 5.7-, 36-, 58.5-, and 16.9- fold lower than the median measured drinking water leve		1 A	A	Ą
D1339	リスク評 価、複合 影響等	Yao, Jingzhi; Pan, Yitao; Dai, Jiayin	Response to Comment on "Novel Perfluoroalkyl Ether Carboxylic Acids (PFECAs) and Sulfonic Acids (PFESAs)": Overlooked Interactions with Perfluorooctanoic Acid	2021	Environ Sci Technol. 2021 Jun 1;55(11):7752-7754. doi: 10.1021/acs.est.1c02603. Epub 2021 May 13.	No abstract available		D	С	;
D1340	リスク評 価、複合 影響等	Lyu, Zhaoqing; Michikawa, Takehiro; Harada, Kouji H	Comment on "Novel Perfluoroalkyl Ether Carboxylic Acids (PFECAs) and Sulfonic Acids (PFESAs)": Overlooked Interactions with Perfluorooctanoic Acid	2021	Environ Sci Technol. 2021 Jun 1;55(11):7755-7756. doi: 10.1021/acs.est.1c01945. Epub 2021 May 13.	No abstract available		D	С	;
D1341	リスク評 価、複合 影響等	Zhang, Qianru; Zhang, Yidi; Hu, Diexuan; Wen, Wu; Xia, Xinghui	An unexpected synergistic toxicity caused by competitive bioconcentration of perfluoroalkyl acid mixtures to Daphnia magna: Further promoted by elevated temperature	2022	Environ Pollut. 2022 Dec 15;315:120336. doi: 10.1016/j.envpol.2022.120336. Epub 2022 Oct 7.	The mixed pollution of the global water environment by perfluoroalkyl acids (PFAAs) and their ecological risks have aroused widespread concern. However, the relationship between the combined toxicity of PFAA mixtures and their accumulation in aquatic organisms is not well understood in the context of global warming. Here, we study the bioconcentration and combined toxicity of three PFAA mixtures (PFOA, PFDA, PFDoA) to Daphnia magna (D. magna) under different exposure concentrations and temperatures. The results show that although competitive bioconcentration exists, the combined toxicity of the PFAA mixtures to D. magna is synergistic. These contradictory phenomena occur because although the longer-chain PFDoA inhibits the bioconcentration of the shorter-chain PFOA and PFDA, the bioconcentration for the PFAA mixture is 1.38-1.67 times higher than that obtained from simple addition for the three PFAAs when exposed separately. Moreover, elevated temperature promotes not only the bioconcentration of each PFAA and the competition of bioconcentration between shorter-chain and longer-chain PAFF, but also the synergistic toxicity of PFAA mixtures to D. magna. This study suggests that the effect of the interactions among different PFAAs on their bioconcentration and toxicity under different water environmental conditions, such as temperature, should be considered for ecological risk assessment of PFAA mixtures.		C	С	,

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 対報 象抽 ① ラ	ン 文 ク 献 ② ラ
D1342	リスク評 価、複合 影響等	Goodrum, Philip E; Anderson, Janet K; Luz, Anthony L; Ansell, Graham K	Application of a Framework for Grouping and Mixtures Toxicity Assessment of PFAS: A Closer Examination of Dose-Additivity Approaches	2021	Toxicol Sci. 2021 Jan 28;179(2):262-278. doi: 10.1093/toxsci/kfaa123.	Environmental occurrence and biomonitoring data for per- and polyfluoroalkyl substances (PFAS) demonstrate that humans are exposed to mixtures of PFAS. This article presents a new and systematic analysis of available PFAS toxicity study data using a tiered mixtures risk assessment framework consistent with United States and international mixtures guidance. The lines of evidence presented herein include a critique of whole mixture toxicity studies and analysis of dose-response models based on data from subchronic oral toxicity studies in rats. Based on available data to-date, concentration addition and relative potency factor methods are found to be inappropriate due to differences among sensitive effects and target organ potencies and noncongruent dose-response curves for the same effect endpoints from studies using the same species and protocols. Perfluorooctanoic acid and perfluorooctane sulfonic acid lack a single mode of action or molecular initiating event and our evaluation herein shows they also have noncongruent dose-response curves. Dose-response curves for long-chain perfluoroalkyl sulfonic acids (PFSAs) also significantly differ in shapes of the curves from short-chain PFSAs and perfluoroalkyl carboxylic acids evaluated, and additional differences are apparent when curves are evaluated based on internal or administered dose. Following well-established guidance, the hazard index method applied to perfluoroalkyl carboxylic acids and PFSAs grouped separately is the most appropriate approach for conducting a screening level risk assessment for nonpolymeric PFAS mixtures, given the current state-of-the science. A clear presentation of assumptions, uncertainties, and data gaps is needed before dose-additivity methods, including hazard index , are used to support risk management decisions. Adverse outcome pathway(s) and mode(s) of action information for perfluorooctanoic acid and perfluorooctane sulfonic acid and for other nonpolymer PFAS are key data gaps precluding more robust mixtures methods. These find		В	A
D1343	リスク評 価、 後	Yang, Yun; Zhang, Xiangru; Jiang, Jingyi; Han, Jiarui; Li, Wanxin; Li, Xiaoyan; Yee Leung, Kenneth Mei; Snyder, Shane A; Alvarez, Pedro J J	Which Micropollutants in Water Environments Deserve More Attention Globally?	2022	Environ Sci Technol. 2022 Jan 4;56(1):13-29. doi: 10.1021/acs.est.1c04250. Epub 2021 Dec 21.	Increasing chemical pollution of aquatic environments is a growing concern with global relevance. A large number of organic chemicals are termed as "micropollutants" due to their low concentrations, and long-term exposure to micropollutants may pose considerable risks to aquatic organisms and human health. In recent decades, numerous treatment methods and technologies have been proposed to remove micropollutants in water, and typically several micropollutants were chosen as target pollutants to evaluate removal efficiencies. However, it is often unclear whether their toxicity and occurrence levels and frequencies enable them to contribute significantly to the overall chemical pollution in global aquatic environments. This review intends to answer an important lingering question: Which micropollutants or class of micropollutants deserve more attention globally and should be removed with higher priority? Different risk-based prioritization approaches were used to address this question. The risk quotient (RQ) method was found to be a feasible approach to prioritize micropollutants in a large scale due to its relatively simple assessment procedure and extensive use. A total of 83 prioritization case studies using the RQ method in the past decade were compiled, and 473 compounds that were selected by screening 3466 compounds of three broad classes (pharmaceuticals and personal care products (PPCPs), pesticides, and industrial chemicals) were found to have risks (RQ > 0.01). To determine the micropollutants of global importance, we propose an overall risk surrogate, that is, the weighted average risk quotient (WARQ). The WARQ integrates the risk intensity and frequency of micropollutants in global aquatic environments to achieve a more comprehensive priority determination. Through metadata analysis, we recommend a ranked list of 53 micropollutants, including 36 PPCPs (e.g., sulfamethoxazole and ibupofen), seven pesticides (e.g., heptachlor and diazinon), and 10 industrial chemicals (e.g., perfluorooctanesulfonic acid		C	С
D1344	リスク評 価、複合 影響等	Colnot, Thomas; Dekant, Wolfgang	Issues in the hazard and risk assessment of perfluoroalkyl substance mixtures	2021	Toxicol Lett. 2021 Dec 15;353:79-82. doi: 10.1016/j.toxlet.2021.10.005. Epub 2021 Oct 16.	In its 2020 Scientific Opinion on the Risk to human health related to the presence of per fluoroalkyl substances in food, EFSA had to tackle the challenging task to evaluate the risk(s) posed by the potential presence of per- and poly fluoroalkyl substances (PFAS). The assessment had to cover 27 per fluoroalkyl carboxylates (PFCAs) and sulfonates (PFSAs) of variable chain length (C4-C18). Grouping such a large number of structurally diverse compounds - many with a limited exposure and absent toxicity database - is a complex task. Our commentary summarizes some of the issues and pitfalls in this assessment.		A	В

No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出 情 対 報 象 抽	ン 文 ク 献 ① ラ	ンプ ク (2)	文献ラ
D1345	リスク評 価、複合 影響等	Lai, Thanh T; Kuntz, David; Wilson, Angela K	Molecular Screening and Toxicity Estimation of 260,000 Perfluoroalkyl and Polyfluoroalkyl Substances (PFASs) through Machine Learning	2022	J Chem Inf Model. 2022 Oct 10;62(19):4569-4578. doi: 10.1021/acs.jcim.2c00374. Epub 2022 Sep 26.	Perfluoroalkyl and polyfluoroalkyl substances (PFASs) are a class of chemicals widely used in industrial applications due to their exceptional properties and stability. However, they do not readily degrade in the environment and are linked to contamination and adverse health effects in humans and wildlife. To find alternatives for the most commonly used PFAS molecules that maintain their desirable chemical properties but are not adverse to biological lifeforms, a novel approach based upon machine learning is utilized. The machine learning model is trained on an existing set of PFAS molecules to generate over 260,000 novel PFAS molecules, which we dub PFAS-AI-Gen. Using molecular descriptors with known relationships to toxicity and industrial suitability followed by molecular docking and molecular dynamics simulations, this set of molecules is screened. In this manner, increasingly complex calculations are performed only for candidate molecules that are most likely to yield the desired properties of low binding affinity toward two selected protein receptors, the human pregnane x receptor (hPXR) and peroxisome proliferator-activated receptor γ (PPAR- γ), and high industrial suitability, defined by critical micelle concentration (CMC). The selection criteria of low binding affinity and high industrial suitability are relative to the popular PFAS alternative GenX. hPXR and PPAR- γ are selected as they are PFAS targets and facilitate a variety of functions, such as drug metabolism and glucose regulation, respectively. Through this approach, 22 promising new PFAS substitutes that may warrant experimental investigation are identified. This integrated approach of molecular screening and toxicity estimation may be applicable to other chemical classes.			в	В	
D1346	リスク評 価、複合 影響等	Feinstein, Jeremy; Sivaraman, Ganesh; Picel, Kurt; Peters, Brian; Vázquez- Mayagoitia, Á Ivaro; Ramanathan, Arvind; MacDonell, Margaret; Foster, Ian; Yan, Eugene	Uncertainty-Informed Deep Transfer Learning of Perfluoroalkyl and Polyfluoroalkyl Substance Toxicity	2021	J Chem Inf Model. 2021 Dec 27;61(12):5793-5803. doi: 10.1021/acs.jcim.1c01204. Epub 2021 Dec 14.	erfluoroalkyl and polyfluoroalkyl substances (PFAS) pose a significant hazard because of their widespread industrial uses, environmental persistence, and bioaccumulation. A growing, increasingly diverse inventory of PFAS, including 8163 chemicals, has recently been updated by the U.S. Environmental Protection Agency. However, with the exception of a handful of well-studied examples, little is known about their human toxicity potential because of the substantial resources required for in vivo toxicity experiments. We tackle the problem of expensive in vivo experiments by evaluating multiple machine learning (ML) methods, including random forests, deep neural networks (DNN), graph convolutional networks, and Gaussian processes, for predicting acute toxicity (e.g., median lethal dose, or LD50) of PFAS compounds. To address the scarcity of toxicity information for PFAS, publicly available datasets of oral rat LD50 for all organic compounds are aggregated and used to develop state-of-the-art ML source models for transfer learning. A total of 519 fluorinated compounds containing two or more C-F bonds with known toxicity are used for knowledge transfer to ensembles of the best-performing source model, DNN, to generate the target models for the PFAS domain with access to uncertainty. This study predicts toxicity for PFAS with a defined chemical structure. To further inform prediction confidence, the transfer-learned model is embedded within a SelectiveNet architecture, where the model is allowed to identify regions of prediction with greater confidence and abstain from those with high uncertainty using a calibrated cutoff rate.			В	С	
D1347	リスク評 価、複合 影響等	Azhagiya Singam, Ettayapuram Ramaprasad; Tachachartvanic h, Phum; Fourches, Denis; Soshilov, Anatoly; Hsieh, Jennifer C Y; La Merrill, Michele A; Smith, Martyn T; Durkin, Kathleen A	Structure-based virtual screening of perfluoroalkyl and polyfluoroalkyl substances (PFASs) as endocrine disruptors of androgen receptor activity using molecular docking and machine learning	2020	Environ Res. 2020 Nov;190:109920. doi: 10.1016/j.envres.2020.109920. Epub 2020 Jul 28.	Perfluoroalkyl and polyfluoroalkyl substances (PFASs) pose a substantial threat as endocrine disruptors, and thus early identification of those that may interact with steroid hormone receptors, such as the androgen receptor (AR), is critical. In this study we screened 5,206 PFASs from the CompTox database against the different binding sites on the AR using both molecular docking and machine learning techniques. We developed support vector machine models trained on Tox21 data to classify the active and inactive PFASs for AR using different chemical fingerprints as features. The maximum accuracy was 95.01% and Matthew's correlation coefficient (MCC) was 0.76 respectively, based on MACCS fingerprints (MACCSFP). The combination of docking-based screening and machine learning models identified 29 PFASs that have strong potential for activity against the AR and should be considered priority chemicals for biological toxicity testing.			В	В	

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No.	分野 (参考)	著者	タイトル	発行年	書誌情報	要旨 (原文)	備考	出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
D1348	リスク評 価、複合 影響等	McDougall, Mandy R R; Kalinovich, Indra	Developing Hazard Rating Calculation Methodologies for Per- and Polyfluoroalkyl Substances	2021	Environ Toxicol Chem. 2021 Mar;40(3):937-946. doi: 10.1002/etc.4981. Epub 2021 Feb 5.	Historical and present-day use of per- and polyfluoroalkyl substances (PFAS) have been linked to environmental and human health impacts that prove challenging to address. Therefore, prioritization of PFAS management based on observed or predicted toxicological properties and environmental fate is critical in the development of effective risk management practices. Hazard rating calculations use a range of literature-derived quantitative data to identify and rank the potential risk posed by a contaminant of concern associated with an activity or land use. The present study describes the use of hazard rating calculation methodologies to evaluate PFAS at federally owned properties across Canada. The hazard rating calculations assess potential site impacts from the use of PFAS, including application of PFAS-containing aqueous film-forming foam (AFFF) at fire-fighting training areas (FFTAs). Eleven PFAS were evaluated based on their prevalence or use in AFFFs and the availability of established chemical data. The hazard rating evaluated 4 properties: human health, environmental fate, deleterious quantity, and release and impact modifier. In the present study, hazard ratings calculated for perfluorohexane sulfonate, perfluoroheptanoate, and 8:2 fluorotelomer sulfonate were greater than for the remaining evaluated PFAS. This hazard rating system is beneficial for selecting and/or developing site management or remediation strategies. The methodology supports a comprehensive, site-scale approach for prioritizing PFAS management, and can be integrated into future regulatory framework and contaminant prioritization.		вС
D1349	リスク評 価	Colnot, Thomas; Dekant, Wolfgang	Commentary: cumulative risk assessment of perfluoroalkyl carboxylic acids and perfluoralkyl sulfonic acids: what is the scientific support for deriving tolerable exposures by assembling 27 PFAS into 1 common assessment group?	2022	Arch Toxicol. 2022 Nov;96(11):3127-3139. doi: 10.1007/s00204-022-03336-9. Epub 2022 Aug 17.	This commentary proposes an approach to risk assessment of mixtures of per- and polyfluorinated alkyl substances (PFAS) as EFSA was tasked to derive a tolerable intake for a group of 27 PFAS. The 27 PFAS to be considered contain different functional groups and have widely variable physicochemical (PC) properties and toxicokinetics and thus should not treated as one group based on regulatory guidance for risk assessment of mixtures. The proposed approach to grouping is to split the 27 PFAS into two groups, perfluoroalkyl carboxylates and perfluoroalkyl sulfonates, and apply a relative potency factor approach (as proposed by RIVM) to obtain two separate group TDIs based on liver toxicity in rodents since liver toxicity is a sensitive response of rodents to PFAS. Short chain PFAS and other PFAS structures should not be included in the groups due to their low potency and rapid elimination. This approach is in better agreement with scientific and regulatory guidance for mixture risk assessment.		1 A A
D1350	リスク評 価、複合 影響等	Kaiser, Andreas- Marius; Zare Jeddi, Maryam; Uhl, Maria; Jornod, Florence; Fernandez, Mariana F; Audouze, Karine	Characterization of Potential Adverse Outcome Pathways Related to Metabolic Outcomes and Exposure to Per- and Polyfluoroalkyl Substances Using Artificial Intelligence	2022	? Toxics. 2022 Aug 4;10(8):449. doi: 10.3390/toxics10080449.	Human exposure to per- and polyfluoroalkyl substances (PFAS) has been associated with numerous adverse health effects, depending on various factors such as the conditions of exposure (dose/concentration, duration, route of exposure, etc.) and characteristics associated with the exposed target (e.g., age, sex, ethnicity, health status, and genetic predisposition). The biological mechanisms by which PFAS might affect systems are largely unknown. To support the risk assessment process, AOP-helpFinder, a new artificial intelligence tool, was used to rapidly and systematically explore all available published information in the PubMed database. The aim was to identify existing associations between PFAS and metabolic health outcomes that may be relevant to support building adverse outcome pathways (AOPs). The collected information was manually organized to investigate linkages between PFAS exposure and events from the existing metabolic-related AOPs were also retrieved. In conclusion, by analyzing dispersed information from the literature, we could identify some associations between PFAS exposure and components of existing AOPs. Additionally, we identified some linkages between PFAS exposure and metabolic outcomes for which only sparse information is available or which are not yet present in the AOP-wiki database that could be addressed in future research.		ВВ
D1351	リスク評 価、複合 影響等	Lea, Isabel A; Pham, Ly Ly; Antonijevic, Todor; Thompson, Chad; Borghoff, Susan J	Assessment of the applicability of the threshold of toxicological concern for per- and polyfluoroalkyl substances	2022	Regul Toxicol Pharmacol. 2022 Aug;133:105190. doi: 10.1016/j.yrtph.2022.105190. Epub 2022 Jun 1.	While toxicity information is available for selected PFAS, little or no information is available for most, thereby necessitating a resource-effective approach to screen and prioritize those needing further safety assessment. The threshold of toxicological concern (TTC) approach proposes a de minimis exposure value based on chemical structure and toxicology of similar substances. The applicability of the TTC approach to PFAS was tested by incorporating a data set of no-observed-adverse-effect level (NOAEL) values for 27 PFAS into the Munro TTC data set. All substances were assigned into Cramer Class III and the cumulative distribution of the NOAELs evaluated. The TTC value for the PFAS-enriched data set was not statistically different compared to the Munro data set. Derived human exposure level for the PFAS-enriched data set was 1.3 μ g/kg/day. Structural chemical profiles showed the PFAS-enriched data set had distinct chemotypes with lack of similarity to substances in the Munro data set using Maximum Common Structures. The incorporation of these 27 PFAS did not significantly change TTC Cramer Class III distribution and expanded the chemical space, supporting the potential use of the TTC approach for PFAS chemicals.		ВВ
D1352	リスク評 価、複合 影響等	Bil, Wieneke; Zeilmaker, Marco; Fragki, Styliani; Lijzen, Johannes; Verbruggen, Eric; Bokkers, Bas	Response to Letter to the Editor on Bil et al. 2021 "Risk Assessment of Per- and Polyfluoroalkyl Substance Mixtures: A Relative Potency Factor Approach"	2022	Environ Toxicol Chem. 2022 Jan;41(1):13-18. doi: 10.1002/etc.5236.	No abstract available		D C

パーフルオロ化合物に係る国際機関等の評価及び科学的知見の情報収集並びに整理

No. 分 (参	♪野 診考)	著者	タイトル	発行年	書誌情報	要旨(原文)	備考	出情 ン文 ン文 対報 ク献 ク献 象抽 ① ラ ② ラ
リス D1353 価、 影響	、ク評 複合 等	Rietjens, Ivonne M C M; Schriks, Merijn; Houtman, Corine J; Dingemans, Milou M L; van Wezel, Annemarie P	Letter to the Editor on Bil et al. 2021 "Risk Assessment of Per- and Polyfluoroalkyl Substance Mixtures: A Relative Potency Factor Approach"	2022	Environ Toxicol Chem. 2022 Jan;41(1):7-12. doi: 10.1002/etc.5232.	No abstract available		D C
リス D1354 価、 影響	、ク評 複合	Dale, Karina; Yadetie, Fekadu; Müller, Mette Bjø rge; Pampanin, Daniela M; Gilabert, Alejandra; Zhang, Xiaokang; Tairova, Zhanna; Haarr, Ane; Lille- Langøy, Roger; Lyche, Jan Ludvig; Porte, Cinta; Karlsen, Odd André; Goks øyr, Anders	Proteomics and lipidomics analyses reveal modulation of lipid metabolism by perfluoroalkyl substances in liver of Atlantic cod (Gadus morhua)	2020	Aquat Toxicol. 2020 Oct;227:105590. doi: 10.1016/j.aquatox.2020.105590. Epub 2020 Aug 11.	The aim of the present study was to investigate effects of defined mixtures of polycyclic aromatic hydrocarbons (PAHs) and perfluoroalkyl substances (PFASs), at low, environmentally relevant ($1 \times = L$), or high ($20 \times = H$) doses, on biological responses in Atlantic cod (Gadus morhua). To this end, farmed juvenile cod were exposed at day 0 and day 7 via intraperitoneal (i.p.) injections, in a two-week in vivo experiment. In total, there were 10 groups of fish ($n = 21-22$): two control groups, four separate exposure groups of PAH and PFAS mixtures (L, H), and four groups combining PAH and PFAS mixtures (L/L, H/L, L/H, H/H). Body burden analyses confirmed a dose-dependent accumulation of PFASs in cod liver and PAH metabolites in bile. The hepatosomatic index (HSI) was significantly reduced for three of the combined PAH/PFAS exposure groups (L-PAH/H-PFAS, H-PAH/L-PFAS, H-PAH/H-PFAS). Analysis of the hepatic proteome identified that pathways related to lipid degradation were significantly affected by PFAS exposure, including upregulation of enzymes in fatty acid degradation pathways, such as fatty acid β -oxidation. The increased abundances of enzymes in lipid catabolic pathways paralleled with decreasing levels of triacylglycerols (TGs) in the H-PFAS exposure groups and control were also induced by PFAS exposure. Only minor and non-significant differences between exposure groups and control were found for cyp1a and acox1 gene expressions, vitellogenin concentrations in plasma, Cyp1a protein synthesis and DNA fragmentation. In summary, our combined proteomics and lipidomics analyses indicate that PFAS may		C C