（別紙）研究成果の概要（英文）

Title of research project	Assessment of inorganic arsenic exposure in Japan and development of its methodology
Research project number	1704
Research period	FY 2017 – 2018
Name of principal research investigator (PI)	Jun Yoshinaga

Abstract/Summary

Inorganic arsenic (iAs) is a carcinogenic metalloid for humans and its risk assessment in Japan is not yet fully done due to lack of fundamental information. Dose-effect (response) relationship must be established by epidemiologic studies for risk assessment, in which quantitative exposure assessment of the subject populations is essential. Although duplicated diet study is an established exposure assessment methodology, its cost- and labor-intensiveness often hampers application to a large scale epidemiologic studies. In this study, we evaluated the feasibility of biomarker approach and developed a short questionnaire for the estimation of iAs exposure level for use in future epidemiologic study. We collected 150 pairs of duplicated diet and spot urine samples, and iAs content (and monomethylarsonic acid, MMA, for urine as well) was measured by LC-ICP-MS. The median iAs intake was calculated to be 0.387 μg/kg/day, and median urinary iAs+MMA concentration was 5.58 ng As/mL (specific gravity correction) or 4.30 ng As/mg creatinine. A short questionnaire was developed to ask subject about approximate amount of boiled rice and hijiki seaweed (the major iAs sources of the Japanese) intakes of a specific day and it was administered to 71 of the 150 subjects. Daily intake of iAs was estimated from the questionnaire by using governmental surveillance data of iAs content of rice and hijiki. Positive correlation between iAs intake and urinary iAs+MMA levels, and that between measured iAs intake and estimated intake were significant. These results indicated that both biomarker approach and short questionnaire can be used for exposure assessment of iAs in Japan. In the biomarker approach, some uncertainty in the intake-urinary excretion relationship was found, probably due partly to physiologic variation in iAs metabolism. In the questionnaire approach, further refinement of the developed questionnaire and iAs content information in hijiki was warranted for more accurate iAs intake estimation by this approach.

１．List of papers published on the basis of this research

A. Hayashi, F. Sato, T. Imai, J. Yoshinaga (2018) Statistical approach to identify food categories that determine daily intake levels of total and inorganic arsenic, lead and aluminum of Japanese diet. Food Addit. Contam. 35: 1749-1754.

A. Hayashi, F. Sato, T. Imai, J. Yoshinaga (2019) Daily intake of total and inorganic arsenic, lead, and aluminum of the Japanese: Duplicated diet study. J. Food Comp. Anal 77: 77-83.

２．List of presentations based on this research

J. Yoshinaga and T. Narukawa: Development and evaluation of a simplified questionnaire for the assessment of inorganic arsenic intake. 77th Conference of the Japanese Society of Public Health. Koriyama, Oct 24-26, 2018.

T. Narukawa, J. Yoshinaga, and T. Oguri: Dietary intake and urinary excretion of inorganic arsenic. 114th Meeting of the Japanese Society of Food Hygiene and Safety. Hiroshima, Nov. 15-16, 2018.

A. Hayashi, F. Sato, T. Imai, and J. Yoshinaga: Daily intake of inorganic arsenic of the Japanese --- Analysis of duplicated diet samples collected by the Ministry of the Environment. 24th Symposium of Arsenic Society of Japan. Kumamoto, Nov. 24-25, 2018.

３．The number and summary of patents and patent applications

None

４．Others　(awards, press releases, software and database construction)

None