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Title of research project	Estimation of dietary exposure to acrylamide in the Japanese population
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【**Abstract**】

　　The goal of this study is to develop dietary exposure model to estimate dietary intake of acrylamide in Japanese population. Probabilistic estimation of the exposure was per-formed using the Monte Carlo simulation technique by combining the concentration of acrylamide in foods with the amount and frequency of food consumption in the population. Data included acrylamide concentrations in more than 2400 individual food samples from a national survey, the literature, and our own survey on acrylamide in potato and onion prepared at home. Data of the 2012 National Health and Nutrition Survey were used to analyse food consumption in the population. Also, current study preliminarily evaluated possible effects of individual's difference in food consumption frequency on acrylamide exposure by using a bootstrap-like resampling method. To analyze distribution of food consumption frequency among individuals, we used repeated 24-hour dietary records of 2,716 Japanese (age: 1 yr+) collected in dietary survey conducted between 2005 and 2007. We made resampling dataset from the individual frequency distribution and treated an average frequency of that dataset as pseudo-lifetime value. A pseudo-lifetime frequency distribution was obtained from 10,000 resampled datasets. We selected four food groups for this simulation; boiled rice, potato chips, coffee, and green/oolong tea.

　　Median long-term dietary exposure to acrylamide was estimated as 147–154 ng/kg body weight (bw)/day (95th percentile, 226–261 ng/kg bw/day). Beverages, cooked potato, and vegetables cooked at a high temperature were estimated as the major food groups contributing to long-term average dietary acrylamide exposure in the Japanese population overall. Effects of difference in individual food consumption frequency was estimated to differ according to food group. As for boiled rice, food consumption frequency was expected to have small impact on estimate of life-long dietary intake of acrylamide. Regarding to coffee and green/oolong tea, individual's difference in consumption frequency would have significant effect on estimate of dietary intake of acrylamide. In case of potato chips, it was expected to have more significant effect on acrylamide exposure than the other three food groups. However, we need bigger diet survey data for calculating the effect for potato chips because of a small number of consumers observed during period of the survey.

　　We investigated preparation method for potato and onion at home in the Japanese families,

by using self-administrated questionnaire, and also determined acrylamide concentration in potato and onion stir-fried prior to boiling for simmered dishes such as curry, stew, and Niku-jaga. Potato and onion were cooked at home by volunteers. The study showed that 63% or 82 % of the respondents stir-fry potato and onion for preparation of simmered dishes. Among 53 stir-fried potato samples, average and median values of acrylamide were found to be 11 ng/g and 5.0 ng/g, respectively (min - Max 2.5 to 120 ng/g). The average and median values in the stir-fried onion (total n=58) were 36 ng/g and 14 ng/g, respectively (min - Max 2.0 to 420 ng/g).

The present study also performed 24-h duplicate diet study for adults to obtain more accurate estimate of dietary exposure to acrylamide in Japanese. Estimated values of the dietary acrylamide exposure were also used to validate our probabilistic model of dietary acrylamide exposure in Japanese population.

Duplicate diet study was conducted between October 2015 and November 2016. Duplicate diet and dietary record during 24-hour were collected from 120 Japanese adults living in Kanagawa, Ibaraki, and the neighboring area of Japan. Diet samples in each individual were weighed and homogenized, then acrylamide contents in the homogenized samples were analyzed by using LC-MS/MS. For 110 of 120 participants of the duplicate diet study, median dietary exposure to acrylamide based on diet sample was at 144 ng/kg-bw/day in participants. The estimated median acrylamide exposure was similar to our previous estimate of long-term average acrylamide exposure of 154 ng/kg-bw/day based on probabilistic modeling approach. Statistical analysis showed that there is significant difference in acrylamide exposure among the group with and without consumption of coffee and vegetables heated in high temperature.