OCCURRENCE AND ASSESSMENT OF PERFLUOROALKYL ACIDS IN COMMONLY CONSUMED SEAFOOD FROM THE COASTAL AREA OF BANGLADESH

M Habibullah-Al-Mamun[1] and S Masunaga[2]

[1]Graduate School of Environment and Information Sciences, Yokohama National University, Yokohama, 240-8501 Japan

[2]Faculty of Environment and Information Sciences, Yokohama National University, Yokohama, 240-8501 Japan

This study reports the first evidence of the occurrence of perfluoroalkyl acids (PFAAs) in the seafood collected from the coastal area of Bangladesh (a tropical ecosystem). A total of 48 seafood samples (5 finfish and 2 shellfish species) were collected from four major coastal areas of Bangladesh (Cox's Bazar, Chittagong, Bhola, and Sundarbans) in winter and summer of 2015. Finfish and shellfish samples were digested with a basic solution of 10 mM sodium hydroxide in methanol before sonication and solid phase extraction through weak anion exchange followed by a dispersive carbon sorbent clean-up. Fifteen target PFAAs, including: $C_{4–14}$-perfluoroalkyl carboxylates (PFCAs), and C_4, C_6, C_8, and C_{10}-perfluoroalkyl sulfonates (PFSAs) were quantified by high performance liquid chromatography–tandem mass spectrometry (HPLC-MS/MS). The ΣPFAAs in finfish and shellfish samples were in the range of 0.32–14.58 ng/g wet weight and 1.31–8.34 ng/g ww, respectively. Perfluorooctanesulfonate (PFOS) was the dominant PFAA in both finfish and shellfish, whereas perfluorooctanoic acid (PFOA) was the predominant PFAA in shellfish, which were comparable with the most other values reported worldwide, particularly from China, Spain, Sweden, and USA. Concentrations of PFOS ranged from 0.1 to 3.86 and 0.1 to 1.99 ng/g ww in finfish and shellfish, respectively, with the highest concentration in Hilsa shad from Chittagong. Concentrations of PFOA in shellfish ranged from 0.07 to 2.39 ng/g ww, with the maximum concentration found in crab also from Chittagong. The monitoring results for the seafood samples showed no obvious seasonal variations. Spatial distribution revealed that the seafood of the southeast part (Cox's Bazar and Chittagong) of the Bangladeshi coastal area was more contaminated by PFAAs than the south (Bhola) and southwest part (Sundarbans). Furthermore, diet is an important source of PFAA exposure and seafood is the major dietary component for the coastal populations of Bangladesh. Therefore, it is an urgent need to assess the potential health risk that might be contributed from the dietary exposure of PFAAs through seafood consumption. The estimated dietary intakes (EDI, ng/kg body weight/day) of PFOA, PFOS and total PFAAs for the adult and children were calculated by multiplying the mean concentrations (ng/g ww) of PFOA, PFOS and total PFAAs in seafood with the daily consumption data (g/day). The body weight and seafood consumption data for the adult and children were derived from the dietary questionnaire survey carried out in the four studied coastal areas of Bangladesh. The highest EDI of PFOA and PFOS were found to be 0.73 ng/kg-bw/day and 1.89 ng/kg-bw/day for adult and 1.02 ng/kg-bw/day and 2.08 ng/kg-bw/day for children, respectively. However, the highest EDI of total PFAAs was found at 7.78 ng/kg-bw/day for adult and 9.01 ng/kg-bw/day for children, both of which were from Chittagong. The EDI from seafood is much lower than the tolerable daily intake (TDI) recommended by the European Food Safety Authority in 2008 (PFOA: 1500 ng/kg-bw/day; PFOS: 150 ng/kg-bw/day), indicating low health risk of PFAAs exposure via consumption of seafood among the coastal populations in Bangladesh.