Persistent Organic Pollutants
in Foodstuffs and Human Samples
from Hong Kong

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Abstract

This study aims to investigate the levels of Persistent Organic Pollutants (POPs) in different food items and human samples collected from Hong Kong and to determine the relationship between the levels of POPs in human samples with respect to their oral intake. The highest and lowest levels of PAHs were found in snubnose pompano (Trachinotus blochii) (61.26 ng/g wet wt) and white radish (Raphanus sativas) (4.86 ng/g wet wt), respectively. The results indicated that all Potency Equivalent Concentration (PEC) of total PAHs in all the food items (ranged from 0.008 to 0.085) were below the screening value of 0.67 ng/g (wet wt) for human consumption recommended by USEPA (2000). DDTs were mainly detected in freshwater fish (2.41 to 28.44 ng/g wet wt) and marine fish (1.43 to 193.29 ng/g wet wt.), with more than 26% freshwater fish and 73% marine fish exceeded the limit of 14.4 ng/g (wet wt.) for human consumption recommended by USEPA (2000). Low level of PCBs were detected in freshwater fish (0.14 to 0.16 ng/g wet wt.), marine fish (0.07 to 0.40 ng/g wet wt.), which were lower than the action level (2000ng/g wet wt) imposed by the USFDA. It can be concluded that fish remain the most important source of human intake of POPs in our region.

Higher levels of PAHs, DDTs and PCBs were detected in human milk (PAHs: 1981; DDTs: 3099; PCBs: 49 ng/g fat) when compared with maternal serum (1461, 1934, 41) and cord serum (1158, 1556, 40). LMW PAHs such as Naphthalene, Acenaphthylene,
Acenaphthene, Fluorene, Phenanthrene, Anthracene, Fluoranthene and Pyrene were detected in 100% of the three types of human samples. \( p,p' \)-DDE and \( p,p' \)-DDT were the only DDT metabolites detected in the human milk, maternal and cord serum with a detection frequency ranged from 92 to 100%. The estimated Toxic Equivalency Concentrations (TEQ) of dioxin-like PCBs detected was 2.44 pg/g fat. The estimated daily intake (EDI) of DDTs through intake of human milk ranged from 4.44 to 29.11 ng/g/day, with 7 out of 29 of the human milk samples exceeded the tolerable daily intake (TDI) (20 ng/g/day) proposed by the Health Canada Guideline. The EDI of PCBs ranged from 0.05 to 0.44 ng/g/day, and all were below the TDI (1 ng/g/day) proposed by Health Canada Guideline. The presence of PAHs, DDTs and PCBs in cord serum indicated that there is a prenatal exposure of the fetus to these contaminants.

Relatively higher dioxin levels (pg/g fat wt) were detected in fish (1.19) when compared with pork (0.136), chicken (0.018), eggs (0.053), vegetables (0.007 pg/g wet wt), flour (0.05 pg/g fresh wt) and rice (0.05 pg/g fresh wt) and were all below the guideline set by the European Union. The estimated average daily intake of dioxin was 2.04 pg EROD-TEQ/kg bw/day which was lower than that of WHO Tolerable Daily Intake (1- 4 pg WHO-TEQ/kg bw/day). Higher dioxin levels were observed in human milk (5.88 – 9.17 pg/g fat) when compared with maternal (3.13) and cord serum (2.97). EROD assay provides a fast and less expensive screening tool for testing the dioxin levels in the samples.
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