SUPPLEMENTARY INFORMATION

Text SI

Non-carcinogenic risk

Following USEPA[1] and recent reports [2,3], the non-carcinogenic health risk associated with fish consumption was assessed using the target hazard quotient (THQ) defined as follows;

$$THQ = \frac{Dig}{Rfd}$$

$$HI = \sum HQ$$

where D_{ig} = daily intake through ingestion, mg/kg.day and $R_f d$ = reference dose of PCBs (mg/kg day), HI = hazard index, and HQ = hazard Quotient for PAH. Accordingly, if the THQ > 1, there is the possibility of non-carcinogenic effects on human health. Conversely, if THQ ≤ 1, then exposure to PCBs through consumption of fish indicates no significant effect on consumers.[4,5]

Carcinogenic risk assessment

Following previous studies [6-9], the carcinogenic risk of PCBs was evaluated using toxic equivalency factors (TEFs) as follows;

TEQ = Σ [Concentration of each dioxin-like congener X 2,3,7,8-TCDD TEFi].

Where TEQ is the toxic equivalent quantity (TEQ) and TEFi is the corresponding toxic equivalency factor.

Exposure assessment

In this study, one important pathway was considered as major exposure routes for PCBs entry into the body from fish; i.e. direct ingestion. In this report, the exposure dosage via ingestion pathway was adapted from previous reports as follows [4,5];

$$D_{ig} = C_{fish} \times IR \times EF \times ED / (BW \times AT).$$

Where D_{ig} is the PCB daily intake through ingestion in mg/(kg day); C_{fish} is the concentration of PCB in fish (mg/kg), IR is the ingestion rate (0.0548 kg/capital/day), EF is the exposure frequency, ED is the exposure duration (year), BW is the body weight (kg), and AT is the averaging time (day). Details of other components and their corresponding values as obtained from literature and used in the study are presented in Table S2.

Toxicity assessment

The carcinogenic status of PCBs via fish consumption was evaluated. Following the Integrated Risk Information System (IRIS) of the USEPA, the ingestion slope factor (SF_{ig}) of PCB is 2.0 per mg/kg/day.[4,11] Thus, the cancer risk (CR) of the dietary exposure (dimensionless) associated with ingestion (CR_{ig}) exposure was estimated following USEPA[4];

$$CR_{ig} = D_{ig} \times SF_{ig}$$

where D_{ig} and SF_{ig} are as defined previously. In line with the Risk Assessment Guidance of USEPA[1], the assessment models provide a qualitative description of the CR as follows; a value which is $\leq 10^{-6}$ represents a very low cancer risk; values between 10^{-6} and 10^{-4} suggest low cancer risk; whereas values $> 10^{-4}$ imply high cancer risk.[3,10]

Table S1

Values and distributions of parameters used in ILCR exposure assessment

Parameters	Units	Values		
		Children	Adolescents	Adults
IR (Rate of direct ingestion)	mg/d	0.016	0.032	0.032
EF (Exposure frequency)	d/yr	365	365	365
ED (Exposure duration)	Yr	6	14	70
BW (Body weight)	kg	21	51	70
AT (average time for non-carcinogens and carcinogens)	D	2,190	5,110	25,550
R_fD	mg/kg/day	2×10^{-5}	2×10^{-5}	2×10^{-5}
SF	mg/kg/day	2	2	2

Source: USEPA[4,5,10]

Table S2: Summary of the hazard quotient (HQ) estimation for Children (CHD), Adolescents (ADL), and Adults (ADT)

Age Categories	Parameter	ASR	ONR	OGBR	OGR	IBR	TMBO
Children	Min	0.003	0.003	0.003	0.003	0.003	0.003
	Max	0.334	0.797	0.305	0.648	0.791	1.095
	Mean	0.098	0.184	0.076	0.184	0.251	0.341
Adolescents	Min	0.0024	0.0023	0.0024	0.0024	0.0026	0.0024
	Max	0.2755	0.6562	0.2507	0.5329	0.6506	0.9008
	Mean	0.0805	0.1386	0.0627	0.1515	0.1873	0.2805
Adults	Min	0.0018	0.0017	0.0018	0.0017	0.0019	0.0018
	Max	0.2008	0.4782	0.1827	0.3884	0.4742	0.6566
	Mean	0.0587	0.1102	0.0457	0.1104	0.1507	0.2044

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