

Appendix B

TABLE B-1. FISH CONSUMPTION PATHWAY EQUATIONS**Fish Consumption Exposure Scenario****Non-carcinogenic effects****Rhodia Martinez, Peyton Slough****Fish Ingestion Target Levels**

For exposure to an individual chemical, non-cancer hazard are defined as:

$$\text{HAZARD} = \text{CDI} / \text{RfD}$$

$$\text{CDI} = \text{IR} * \text{EF} * \text{ED} / (\text{ATnc} * \text{BW})$$

where:

IR Daily Intake Rate of chemical [mg/day]

EF Exposure Frequency [day/year]

ED Exposure Duration [years]

ATnc Averaging Time for non-cancer effects [days] = $\text{ED} * 365$

BW Body Weight [kg]

In the case of fish consumption the ingestion rate is:

$$\text{IR} = \text{Cfish} * \text{IRfish}$$

where:

Cfish Average fish concentration [mg/kg]

IRfish Average Daily Ingestion Rate of fish [kg/day]

The above relationships can also be expressed by defining non-chemical-specific Intake Factors:

$$\text{Ifnc_fish} = \text{IRfish} * \text{EF} * \text{ED} / (\text{ATnc} * \text{BW})$$

Therefore:

$$\text{CDI} = \text{Cfish} * \text{Ifnc}$$

$$\text{HAZARD} = \text{CDI} / \text{RfD}$$

$$\text{HAZARD} = \text{Cfish} * \text{Ifnc} / \text{RfD}$$

Fish concentration may be estimated as a function of sediment concentration.

Especially for metals the fish concentration is based on concentration in sediments by means of a BioConcentration Factor:

$$\text{Cfish (mg/kg)} = \text{Csedim (mg/kg)} * \text{BASF (kg/kg)}$$

Rearranging and combining the above relationships we can develop an equation for the RBSL,

$$\text{Csedim} = \text{Cfish} / \text{BASF}$$

$$\text{HAZARD} = \text{Cfish} * \text{Ifnc} / \text{RfD}$$

$$\text{SSTLnc_fish} = \text{TH} / (1/\text{RfD} * \text{Ifnc} * \text{BASF})$$

TABLE B-2. SSTLS DETAILED CALCULATIONS FOR SURFICIAL FISH CONSUMPTION-COPPER

Non-Carcinogenic Effects

Rhodia Martinez, Peyton Slough

Intake Factor and SSTLS for Ingestion of Fish - Non-Cancer Effects - Adults

$$\begin{aligned} \text{IF}_{\text{nc-fish}} [\text{L/day}] &= \text{IR}_{\text{fish}} * \text{EF} * \text{ED} / (\text{AT}_{\text{nc}} * \text{BW}) = \\ &= 0.025 * 150 * 24 / (24 * 365 * 70) \\ &= 4.89\text{E-5} \end{aligned}$$

Where

IR _{fish}	Daily Fish Ingestion Rate [kg/day]	0.03
EF	Exposure Frequency [yr]	150
ED	Exposure Duration [yr]	24
AT _{nc}	Averaging Time for Noncarcinogens [yr]	24
BW	Body Weight [kg]	70

$$\begin{aligned} \text{SSTL}_{\text{nc-fish}} [\text{mg/kg}] &= \text{TH} / (1/\text{RfDo} * \text{IF}_{\text{nc-fish}} * \text{BSAF}) \\ &= 1 / (1/0.0371 * 0.000049 * 0.0304) \\ &= 2.49\text{E+4} \end{aligned}$$

Where

TH	Target Hazard Quotient	1
RfDo	Oral Reference Dose [mg/kg-day]	0.0371
BSAF	Sediment to Fish Partitioning Coefficient [cm ³ /g]	0.0304

TABLE B-3. SSTLS DETAILED CALCULATIONS FOR SURFICIAL FISH CONSUMPTION-ZINC

Non-Carcinogenic Effects

Rhodia Martinez, Peyton Slough

Intake Factor and SSTLs for Ingestion of Fish - Non-Cancer Effects - Adults

$$\begin{aligned} \text{IF}_{\text{nc-fish}} [\text{L/day}] &= \text{IR}_{\text{fish}} * \text{EF} * \text{ED} / (\text{AT}_{\text{nc}} * \text{BW}) = \\ &= 0.025 * 150 * 24 / (24 * 365 * 70) = \\ &= 4.89\text{E-5} \end{aligned}$$

Where

IR _{fish}	Daily Fish Ingestion Rate [kg/day]	0.025
EF	Exposure Frequency [yr]	150
ED	Exposure Duration [yr]	24
AT _{nc}	Averaging Time for Noncarcinogens [yr]	24
BW	Body Weight [kg]	70

$$\begin{aligned} \text{SSTL}_{\text{nc-fish}} [\text{mg/kg}] &= \text{TH} * \text{foc} / (1/\text{RfDo1} * \text{IF}_{\text{nc-fish}} * \text{BSAF}) \\ &= 1 * / (1/0.3 * 0.000049 * 0.47) \\ &= 1.30\text{E+4} \end{aligned}$$

Where

TH	Target Hazard Quotient	1
RfDo	Oral Reference Dose [mg/kg-day]	0.3
BSAF	Sediment to Fish Partitioning Coefficient [cm ³ /g]	0.47