

Selenium in Fish Tissue



What is the difference between EPA levels and FDA recommendations?



EPA

Protects human health and the environment.



FDA

Protecting the safety and efficacy of food, drugs, and dietary supplements.



EPA

Toxicity values based on a mass of a contaminant per unit mass of the individual over a lifetime of exposure.

mg of contaminant/kg of mass per day
(**mg/kg-day**)

FDA

Variety of dietary reference intake levels for constituents that are safe for the majority of individuals for daily intake.

µg of constituent per day
(**µg/day**)



EPA

Reference Dose (**RfD**) is an estimate of a daily oral exposure for a given duration to the human population (including susceptible subgroups) that is likely to be without an appreciable risk of adverse health effects over a lifetime.

0.005 mg/kg a day for Selenium

FDA

No Observed Adverse Effects Level (**NOAEL**) is an estimated level based on human epidemiologic studies.

800 µg a day for Selenium



EPA

Risk Based Screening Level (**RBSL**) based on calculation using **RfD** for ingestion of fish is: **6.76 mg/kg for selenium.**

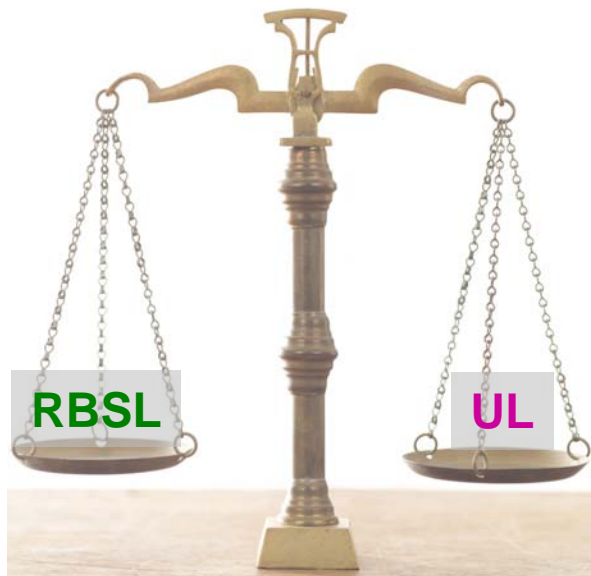
Assumes an individual eats 54 grams (1.9 oz) of fish each day for 350 days/year for 30 years.

Equivalent to two 8 ounce fish meals /week (typical home prepared fish fillets).

FDA

Tolerable Upper Intake Levels (**UL**) is the maximum daily intake unlikely to result in adverse health effects (**NOAEL**) with an uncertainty factor of 2 to account for sensitive individuals.

400 µg/day for Selenium



Risk Based Screening Level (EPA) converted to the same units as **Tolerable Upper Intake Levels (FDA)**:

$(6.76 \text{ mg selenium/kg fish}) \times (0.054 \text{ kg/day fish}^*) = 0.365 \text{ mg/day}^{**} \text{ selenium}$
 $365 \text{ } \mu\text{g/day}$ is less than $400 \text{ } \mu\text{g/day}$
Therefore, 6.76 mg/kg is less than $400 \text{ } \mu\text{g/day}$.

*1 g = 0.001 kg

RBSL assumes 54 g of fish/day or 0.054kg/day
See previous slide more details.

**1 mg = 1,000 μg

0.365 mg/day = 365 $\mu\text{g/day}$

Comparison Table

	mg/kg	mg/day	µg/day*
**Emory River (max.)	5.4	0.292	292
**Clinch River (max.)	4.5	0.243	243
**Emory River (avg.)	2.51	0.136	136
**Clinch River (avg.)	2.33	0.126	126
EPA RBSL (wet)	6.76	0.365	365
FDA UL (wet)	7.41	0.400	400

mg/kg (mg of Selenium/kg of fish)

mg/day (mg of Selenium/day)

µg/day (µg of Selenium/day)

kg/day (kg of fish/day)

lbs/day (lbs of fish/day)

*See RBSL conversion to UL slide for details of mg/kg to µg/day.

**Dry weight calculations result in higher concentrations than wet weight.

Reference Values

Summary Table

EPA	FDA
Protects human health and the environment.	Protects the safety/efficacy of food, drugs, and dietary supplements.
Toxicity values: mg/kg-day	Dietary reference intake levels: µg/day
Risk Based Screening Level (RBSL) for ingestion of fish: 6.76 mg/kg or 365 µg/day Equivalent to two 8 oz. fish meals/week	Tolerable Upper Intake Levels (UL) is the maximum daily intake unlikely to result in adverse health effects. UL is 400 µg/day
FDA UL: 400 µg/day EPA RBSL: 365 µg/day Emory River (max.): 292 µg/day Clinch River (max.): 243 µg/day Emory River (avg.): 136 µg/day Clinch River (avg.): 126 µg/day	

Non-Time Critical Work

- Phase 3 Emory River study
 - Risk assessment of entire river system.
 - All metals will be addressed.
 - All receptors (i.e. fish, plants, humans, etc.) and exposure routes (ingestion, dermal contact, etc.) will be assessed.

