Focus on **Mercury in Fish**

Study finds elevated levels in Washington fish

In 2002, the Department of Ecology's Environmental Assessment Program conducted a study (*Mercury in Edible Fish Tissue and Sediments from Selected Lakes and Rivers in Washington State*) of mercury concentrations in freshwater fish across Washington state. The statewide effort is a followup to a 2000 study that found elevated mercury levels in fish in Lake Whatcom (in Whatcom County).

Total mercury concentrations were measured in edible muscle tissue from 185 bass, collected from 18 lakes and two rivers in 13 counties across Washington (*see chart on next page*). Large-mouth bass and small-mouth bass were chosen as the target species due to their wide distribution, predatory nature (placing them higher on the food chain) and known tendency to accumulate mercury in their muscle tissue. Sediment and water samples also were collected from each of the water bodies to evaluate other factors that may influence how mercury gets into the fish.

Key findings

Twenty-three percent of the fish collected contained tissue-mercury concentrations at or above the *EPA Fish Tissue Residual Criterion (TRC)* for methylmercury of 300 parts per billion (ppb). These fish were collected from 70 percent of the water bodies sampled. The TRC is calculated based on national fish consumption information. The TRC describes the concentration of methylmercury in fish and shellfish tissue that should not be exceeded to protect consumers of fish and shellfish among the general population.

Fully 51 percent of the fish collected were found to contain mercury concentrations at or above a draft Washington State Department of Health (DOH) interim fish criterion of 150 ppb. In setting an interim fish criterion of 150 ppb, DOH employed a more stringent consumption rate that better reflects fish consumption patterns here in Washington state. These fish were collected from 95 percent of the water bodies sampled.

Just one of the 185 fish collected contained a tissue-mercury concentration that exceeded the *National Toxics Rule* of 825 ppb. The fish was collected in Samish Lake (Whatcom County) and had a mercury concentration of 1,280 ppb, exceeding the U.S. Food and Drug Administration's action level of 1,000 ppb, which is used for removing contaminated fish from the marketplace.

Concentrations of mercury in fish tissue were found to vary widely among waterbodies and individual fish. One consistent pattern observed was that mercury levels increased with fish age, weight and length. The older and larger the fish, the more mercury they contained. These findings are consistent with other studies, demonstrating that mercury increases over time in the muscle tissue of predatory species, such as bass, that are near the top of the food chain.

Public-health concerns

In humans, studies have shown that chronic mercury poisoning may occur when fish are frequently ingested that contain elevated levels of mercury. As this heavy metal accumulates in

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human tissue, metabolic and neurological damages may result. Humans of all ages are susceptible to chronic mercury poisoning. However, pregnant women and children under age six are especially susceptible to mercury poisoning, which may harm developing nervous systems in fetuses and young children, permanently affecting their ability to learn. Adults exposed to high levels of mercury also can suffer from central-nervous-system and cardiovascular problems.

The types of mercury commonly found in sediments and water include elemental mercury, ionic mercury (often bound to chloride, sulfide and organic acids), and organic mercury, such as methylmercury. Methylmercury is of special concern because it is easily absorbed into living tissues and is known to build up in animals and humans. Nearly all mercury that accumulates in tissue of fish at the top of the food chain is methylmercury. Eating fish is the primary source of human exposure to methylmercury.

Next steps

Based on this study, the Washington State Department of Health (DOH) is issuing a statewide fish-consumption advisory for bass in Washington state. The advisory states that women of child-bearing age, infants, and children under age 6 should consume no more than **two meals per month** of small-mouth and large-mouth bass caught in Washington state lakes and rivers.

The study recommends additional sediment sampling for Lake Meridian, American Lake, Offut Lake, Loomis Lake, Lake Terrell and Kitsap Lake, where sediment mercury concentrations indicate the potential for adverse impacts on sediment dwelling organisms. The study also recommends long-term monitoring of mercury in fish tissue and sediments across Washington to better understand the extent of the problem and to track the success of mercury-reduction measures. These actions depend on funding approval from the state legislature.

Water bodies sampled, by county

County	Water body, and # of fish collected	Range of Mercury levels
Clark	Vancouver Lake, 10	46.9-540 ppb
Grant	Banks Lake, 10	70-183 ppb
	Moses Lake, 10	26-81 ppb
Grays Harbor	Duck Lake, 10	84.7-736 ppb
King	Lake Meridian, 8	167-645 ppb
Kitsap	Kitsap Lake, 10	147-754 ppb
Okanogan	Palmer Lake, 10	78.3-250 ppb
	Bonaparte Lake, 3	425-484 ppb
	Okanogan River, 10	104-312 ppb
Pacific	Loomis Lake, 10	202-460 ppb
Pierce	American Lake, 4	253-673 ppb
Spokane	Newman Lake, 10	62.2-318 ppb
	Upper Long Lake, 10	22-181 ppb
Stevens	Deer Lake, 10	239-462 ppb
Thurston	Black Lake, 10	113-792 ppb
	Offut Lake, 10	46.5-112 ppb
Walla Walla	Walla Walla River, 10	58-269 ppb
Whatcom	Lake Terrell, 10	49.7-332 ppb
	Fazon Lake, 10	192-760 ppb
	Lake Samish, 10	90.3-1,280 ppb

ppb= parts per billion

Additional information

- The report entitled *Mercury in Edible Fish Tissue and Sediments from Selected Lakes and Rivers in Washington State* can be viewed on the Internet at http://www.ecy.wa.gov/biblio/0303026.html. For additional information about the study, contact Dale Norton at 360-407-6765 or dnor461@ecy.wa.gov.
- The Ecology/Health Mercury Chemical Action Plan and Ecology's PBT Strategy can be found at http://www.ecy.wa.gov/programs/eap/pbt/pbtfaq.html or obtained by contacting Mike Gallagher, Ecology PBT Coordinator, at 360-407-6868 or mgal461@ecy.wa.gov.
- Information about fish-consumptions advisories in Washington state can be found at http://www.doh.wa.gov/ehp/oehas/EHA_fish_adv.htm or by contacting David McBride, Department of Health, at 360-236-3176.

If you require this publication in an alternative format, please contact Joan LeTourneau at (360) 407-6764 (Voice) or (TTY) at 711 or 1-800-833-6388.