EPA’s Assessment of Mercury in Fish from U.S. Rivers

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Background

EPA’s National Rivers and Streams Assessment (NRSA) is one of a series of probability-based surveys designed to assess the condition of U.S. waters. The Office of Water (OW) is responsible for planning and implementing the NRSA with support from the Office of Research and development (ORD). Fish tissue is a human health indicator included in the NRSA. The Office of Science and Technology (OST) within OW is leading the effort to study contamination in fish from U.S. rivers, including mercury and a number of other target chemicals.

Why Is It Important to Monitor Mercury in Fish?

Mercury is a metal that is persistent, bioaccumulative, and toxic in the environment. It enters the atmosphere by the natural degassing of the earth’s crust and by human activity, such as emissions from coal-fired power plants and medical waste incineration. When mercury is deposited in water, a large portion is converted from inorganic mercury to toxic methylmercury that bioaccumulates in fish muscle. Consuming fish with high levels of methylmercury can cause harmful human health effects, including impaired neurological development for children that impacts cognitive thinking, memory, attention, and language. Methylmercury poisoning in humans may also cause muscle weakness, lack of coordination, and impairment of speech, hearing, and walking. The majority of fish advisories issued in the U.S. involve mercury.

Study Design

Assessment of mercury in fish from U.S. rivers included:

- Sampling 566 randomly selected river sites (± 5th order based on 1,000,000-scale Strahler order) in the lower 48 states during 2008 and 2009.
- Collecting one fish composite sample (i.e., 5 similarly sized adult fish of the same species that are consumed by humans) from each site.
- Analyzing fish fillet samples for total mercury using a Direct Mercury Analyzer that achieved method detection limits ranging from about 0.5 – 1.5 ng/g or ppb.

Total Mercury versus MethylMercury Analysis

Most mercury in adult fish tissue is in the form of methylmercury (which is toxic to humans). EPA’s Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories: Volume 1, Third Edition recommends monitoring for total mercury concentrations (rather than methylmercury) in screening-level fish contaminant studies.

Results

- 100% of the 566 fish samples analyzed for this national study contained quantifiable levels of mercury.
- Mercury concentrations measured in the fillet samples ranged from 24 ppb to 1419 ppb.
- The national mean mercury concentration for fillets in fish from U.S. rivers is 231 ppb compared to a mean mercury concentration of 250 ppb for fillet samples from only urban rivers.
- 25.6% of the 69,432 river miles included in this survey had fish samples whose mercury concentrations exceeded EPA’s 380 ppb human health screening value (which represents a total of 17,775 river miles).
- Elevated mercury concentrations are more prevalent in fish from U.S. lakes than in fish from U.S. rivers.

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For more information visit: http://water.epa.gov/scitech/swguidance/fishstudies/