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Water Quality Criterion for the Protection of Human Health: Methylmercury

Summary

The U.S. Environmental Protection Agency (EPA) is announcing the availability of a recommended fish tissue residue criterion for methylmercury to protect human health. This water quality criterion describes the maximum advisable concentration of methylmercury in freshwater and estuarine fish and shellfish tissue to protect consumers of fish and shellfish among the general population. EPA expects the criterion recommendation to be used as guidance by States, authorized Tribes, and EPA in establishing or updating water quality standards for waters of the United States and in issuing fish and shellfish consumption advisories. Because consumption of contaminated fish and shellfish is the primary route of human exposure to methylmercury, EPA is expressing this water quality criterion as a fish and shellfish tissue value rather than as a water column value. EPA is providing suggested approaches for relating this criterion to water column concentrations, and also plans to develop more detailed guidance to help water quality managers implement the methylmercury criterion in water pollution control programs.

What are human health water quality criteria?

Human health water quality criteria are numeric values we believe will protect human health for pollutant concentrations in aquatic media, such as ambient waters and edible tissue. EPA publishes water quality criteria under the authority of Section 304(a) of the Clean Water Act (CWA) based solely on data and scientific judgments about the relationship between pollutant concentrations and environmental and human health effects. CWA Section 303(c) and its implementing regulations require states and authorized tribes to adopt water quality criteria to protect designated uses in their water quality standards. EPA's recommended section 304(a) water quality criteria may guide States and authorized Tribes in establishing water quality standards. The resulting standards may serve as a basis for controlling discharges or releases of pollutants. EPA's recommended human health water quality criteria are not regulations themselves, and do not impose legally binding requirements. EPA may change the section 304(a) water quality criteria in the future.

How does mercury accumulate in fish and shellfish?

Mercury is found in the environment as a result of natural and human activities. The amount of mercury that cycles in the environment has increased since the industrial age. The main source of mercury is air emissions from power generation and other industrial and waste disposal activities. During its movement among the atmosphere, land, and water, mercury undergoes a series of complex chemical transformations. One of the products of these transformations is an organic form called methylmercury. Methylmercury is easily absorbed into the living tissue of aquatic organisms and is not easily eliminated. Therefore, it accumulates in predators. The degree to which mercury is transformed into methylmercury and transferred up the food chain through bioaccumulation depends on many site-specific factors (such as water chemistry and the complexity of the food web) through processes that are not completely understood.

What adverse effects on human health are related to mercury?

Methylmercury is highly toxic to mammals, including people, and causes a number of adverse effects. Health studies and information showing neurotoxicity, particularly in developing organisms, are most abundant. The brain is the most sensitive organ for which suitable data are available to quantify a dose-response relationship. A recent study by the National Academy of Science concluded that the population at highest risk is the children of women who consume large amounts of fish and seafood during pregnancy, and that the risk to that population is likely to be sufficient to result in an increase in the number of children who have to struggle to keep up in school and who might require remedial classes or special education.

What actions reduce health risks?

States, Tribes, and Territories have primary responsibility for protecting their residents from the risks of eating contaminated noncommercially-caught fish and wildlife. They do this by issuing fish consumption advisories for the general population (including recreational and subsistence fishers) and for sensitive subpopulations (such as pregnant women, nursing mothers, and children). These advisories inform the public that unacceptable concentrations of chemical contaminants have been found in local fish and wildlife. They also recommend limiting or avoiding consumption of certain fish and wildlife species from specific waterbodies or, in some cases, from specific waterbody types (e.g., all lakes). Given the ongoing atmospheric sources of mercury and the long-term presence of mercury in the environment, the most effective way to protect public health for the next few decades will be issuing fish consumption advisories to ensure the public knows what level of fish from specific waters is safe to eat.

How is the methylmercury criterion derived?

To assess health risks, EPA developed a reference dose that is a scientifically justifiable maximum level of exposure to protect public health from all toxic effects. EPA based the methylmercury criterion on a new reference dose that protects all exposed populations. EPA also updated the exposure assessment and relative source contribution following the recently published 2000 Human Health Methodology. The resulting criterion of 0.3 mg methylmercury/kg in fish tissue should not be exceeded to protect the health of consumers of noncommercial freshwater/estuarine fish. EPA

has taken into account the fact that consumers of freshwater/estuarine fish are also consumers of marine fish

EPA suggests three approaches that can be used to translate fish tissue methylmercury concentrations into concentrations of methylmercury found in the water column:

- Calculate site-specific bioaccumulation factors based on data collected from a specific waterbody;
- Calculate site-specific bioaccumulation factors based on computer models, and
- Use experimentally-derived bioaccumulation factors that are based on field data published in the criteria.

EPA developed a set of empirically- derived bioaccumulation factors in the initial efforts to derive a revised ambient water quality criteria for methylmercury. EPA has also derived factors to translate methylmercury in water to its total mercury equivalent.

How can this criterion help control mercury pollution?

The United States needs to establish effective source control and management programs in the coming years to begin to recover from the widespread mercury contamination in our aquatic environments. Such actions will hopefully reduce mercury contamination so that fish consumption advisories can be removed. EPA expects the criterion recommendation to be used as a guide by States, authorized Tribes, and EPA in establishing or updating water quality standards that may serve as a basis for pollutant source control and for fish and shellfish consumption advisories.

What future activities are related to this criterion?

EPA recognizes and emphasizes that States and authorized Tribes will need additional specific procedures and water quality program guidance to implement the water quality criteria they adopt based on this guidance. These procedures include, but are not limited to, procedures for translating methylmercury concentrations in fish to total mercury concentrations in ambient surface water or effluent, and procedures for setting permit limits and calculating Total Maximum Daily Loads. EPA is developing these procedures and guidance documents for this water quality criterion.

How do I obtain a copy of the criteria document?

You can get copies of the criterion document titled *Water Quality Criterion for the Protection of Human Health: Methylmercury* from EPA's National Service Center for Environmental Publications (NSCEP) by calling 1-800-490-9198. Or you can get the document and related fact sheet from EPA's web site at <http://www.epa.gov/waterscience/standards/methylmercury/>.

Where can I get more information?

For general questions about the criterion. contact Mary Manibusan, USEPA, Health and Ecological Criteria Division, (Mail Code 4304), Office of Science and Technology, 1200 Pennsylvania Avenue, NW, Washington, DC 20460, (202) 260-3688, fax (202) 260-1036, e-mail manibusan_mary@epa.gov.

For specific issues about mercury bioaccumulation , contact. Erik Winchester, Health and Ecological Criteria Division, (Mail Code 4304), Office of Science and Technology, 1200 Pennsylvania Avenue, NW, Washington, DC 20460, (202) 260-6107

For questions about implementing the criterion contact William Morrow, USEPA, Standards and Health Protection Division, (Mail Code 4305), Office of Science and Technology, 1200 Pennsylvania Avenue, NW, Washington, DC 20460, (202) 260-3657

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