



The Problem with Mercury

What is Mercury?

Mercury (Hg), a toxic element, is a trace metal found in the earth's crust. It enters our environment through three means:

Natural Sources - weathering of rocks, volcanic eruptions and deep-sea vents;

Man-made Sources - combustion of fossil fuels (like oil and coal), incineration of mercury-containing products (such as batteries and fluorescent light bulbs), and manufacturing processes; and

Existing Reservoirs - man-made and natural sources of mercury already deposited into the environment are re-released and evaporate into the atmosphere.

What are the Different Forms of Mercury?

Mercury pollution is both a local, regional and global problem. Wind can carry airborne mercury great distances before it is deposited on land and water, primarily by rain and other types of precipitation (e.g. through wind and snow). In addition, mercury exists in three forms in the environment:

Elemental Mercury (pure mercury) - the most volatile and dominant form of mercury in the atmosphere; released by combustion sources, like coal-fired power plants and incinerators burning mercury-containing products; some elemental mercury adheres to dust and ash particles and deposits onto the earth without traveling great distances; most elemental mercury is released as a vapor and remains in the atmosphere, sometimes for up to a year, until it reacts with ozone, or other oxidants, to form ionic mercury

Ionic Mercury - formed in the atmosphere from elemental mercury vapor; also directly emitted through combustion of coal and mercury-bearing waste; highly soluble form; returns to earth's surface with rain and snow; converted by bacteria to organic mercury.

Organic Mercury (methylmercury) - most toxic form humans are usually exposed to; builds up (or bioaccumulates) in the food chain, from algae to microscopic animals (zooplankton), to forage fish and then predator fish such as large-mouth bass or swordfish, eventually making its way to our tables.

Why is Mercury a Cause for Concern?

Because airborne mercury can be carried by wind for great distances, mercury is an extremely widespread pollutant, contaminating remote lakes once thought to be pristine hundreds of miles from the nearest mercury source. Mercury in the air can eventually end up in waterbodies where it can be taken up into the food chain and ultimately the fish we eat. Mercury is so efficiently bioaccumulated in the aquatic food chain that fish at the top of the food chain may have levels of mercury in their muscle tissue that is one million times higher than the mercury concentration in the water. Because of this extreme bioaccumulation, it takes very little mercury to contaminate a lake and the fish in it. Some scientists estimate that if all the mercury that deposited on a lake over an entire year was combined it would only amount to about 1/70th of a teaspoon. Yet, this small amount, under the right conditions, could contaminate a 25-acre lake to the point where fish are unsafe to eat.

How Does Mercury End Up in our Food?

Plants, small animals, and fish are exposed to methylmercury found in water. Methylmercury levels in fish increase as you move up the food chain. How does it work?

Depositing- Rain or snow washes mercury out of the atmosphere and deposits it on the land or in lakes and rivers.

Cycling Back or Re-emission- Some of this mercury cycles back into the atmosphere from waterbodies through processes similar to evaporation. Forest fires can also release the mercury that has deposited on foliage, and storms can stir up river and lake sediments, releasing buried mercury back in to the water column. Once in the water column it can either cycle back to the atmosphere or be converted to methylmercury and taken up into the food chain.

Increased Toxicity- In waterbodies like lakes, ponds and even the ocean, bacteria convert mercury to methylmercury, an organic form that is toxic to living beings, including humans. Lakes that are highly acidic, warmer and lower in dissolved organic carbon seem to produce more methylmercury, although all of the reasons and chemical mechanisms for this conversion are not well characterized.

Enters Food Chain- Methylmercury enters the food chain, primarily through fish consuming bacteria or plankton. As these tiny organisms are eaten by larger ones, the methylmercury bioaccumulates, or becomes more concentrated. The levels increase with each step up the food chain, from plankton, amphibians, fish, wildlife that eat fish, and ultimately humans.

Who is at Risk from Mercury Exposure?

Eating contaminated fish is the major source of human exposure to methylmercury. The population most at risk are fetuses, infants, and young children. Consequently, fish consumption by pregnant women, young children, and women of childbearing age (ages 15-44) is cause for concern because of the likelihood of mercury exposure. In addition, people who eat a lot of commercial fish or seafood, and people who rely on self-caught fish such as Native Americans and other subsistence fishers can also be highly exposed.

Methylmercury poses a threat to ecosystems as well. In addition to fish and shellfish, state and federal wildlife managers have found alarmingly high levels of mercury in some fish-eating birds and mammals like loons, minks, and otters. Mercury poisoning has also contributed to the death of one of the endangered Florida panthers that scientists believe was feeding on fish-eating racoons. Recent studies have found that high blood mercury levels in loons are affecting their ability to successfully nest and raise their young.

Health Effects from Eating Mercury Contaminated Fish

Mercury is a potent neurotoxin. Mercury is particularly hazardous to developing fetuses, infants and young children, with resulting effects including delays in learning motor functions (walking, talking and speaking).

Mercury transfers from women to fetuses across the placenta and to infants through breastfeeding, resulting in exposure at critical times of development.

Mercury builds up in the body over time, causing impaired peripheral vision, disturbances in sensations (tingling, numbness) usually in the hands and feet and sometimes around the mouth, impaired speech, hearing, walking, writing, as well as mental disturbances. If additional exposure does not occur, it can be excreted from the body over a period of four to five months.

Fast Facts about Mercury Exposure

- Fish at the top of the food chain—for example, shark, swordfish, and tuna—have the highest levels of mercury.
- About half of the people who eat fish daily, or 1-2% of the U.S. population, are eating mercury-contaminated fish at or above the level the EPA considers safe.
- About 4 million, or 7%, of all women of child-bearing age are eating mercury-contaminated fish at or above the level the EPA considers safe.
- About 3 million children ages 3 to 6 are eating mercury-contaminated fish at or above the level the EPA considers safe.