



Mercury Control in North America

Significant reductions in mercury use and emissions are anticipated in North America under an agreement reached by Canada, Mexico, and the United States.

The North American Regional Action Plan (NARAP) on mercury, adopted by the three countries through the Commission for Environmental Cooperation (CEC) of North America, provides a strategic framework, specific actions, targets and timeframes to reduce the uses and releases of mercury in North America.

What is mercury?

Mercury occurs naturally in the environment. It can exist in several forms, either as an element or in a chemical compound. Most familiarly, elemental mercury is a shiny, silvery liquid at room temperature, and can commonly be found in fever thermometers. Organic mercury, known as methylmercury, is the most toxic form of mercury. Releases of mercury to the environment occur from natural sources and processes such as volcanic eruptions, forest fires, and erosion. Releases occurring through human activities, known as “anthropogenic releases,” include fuel combustion, the production of electricity from coal-fired power plants, waste incineration, breakage of mercury-containing products, discharges of wastewater and sludge, mining, smelting, and other industrial processes.

Although there is some debate among scientists, these anthropogenic mercury releases globally are believed to roughly equal, or exceed, emissions from natural sources. In some areas, anthropogenic releases substantially exceed those from natural sources, while in other areas the opposite is true. Mercury deposition rates to most water bodies studied to date are many times greater now than during pre-industrial times. Because mercury is a naturally occurring substance, it can never be completely eliminated from the environment, but concentrations in the biosphere can be reduced by limiting releases and, potentially, by treating contaminated materials to reduce mercury’s ability to enter the environment.

The mercury NARAP

The mercury NARAP developed by Canada, Mexico, and the United States is a comprehensive action plan that addresses the reduction of emissions of mercury from human activities throughout North America. Its goal is to significantly reduce North American levels of mercury in the environment to those attributable solely to naturally occurring sources. It contains some 85 individual action items grouped under six major categories:

- Management of atmospheric emissions of mercury. This includes a goal of a 50-percent reduction in national mercury emissions by 2006 from existing major stationary sources, based on 1990 emissions. This includes the electric power generating sector and industrial and commercial sources.
- Mercury management in processes, operations and products. This includes adopting lifecycle management practices, substitution options, and specific actions in the automotive, electrical and dental care sectors, as well as in several other sectors.
- Mercury waste management approaches. This includes action on waste from combustion and industrial processes, incinerator waste streams and wastewater treatment.
- Research, monitoring, modeling, assessment and inventories. This includes the development of consistent and comparable data from Canada, Mexico and the United States.
- Communication activities. This includes a North American educational awareness program, and communication of best practices.
- Implementation and compliance. This requires each country to develop an implementation plan to address how and when the actions in the NARAP will be undertaken.

Several successes have already been achieved under the NARAP, including:

- Completion of projects to identify and quantify North American sites where mercury may be a significant concern; and
- An atmospheric emissions inventory for major stationary sources of mercury in Mexico to complement similar inventories that have been prepared for Canada and the United States.

More information is available at: http://www.cec.org/programs_projects/pollutants_health/smoc/

When mercury is deposited into water, microorganisms help convert it to methylmercury, a highly toxic form of mercury. Small organisms, fish and plants ingest the mercury as they feed. Concentrations of methylmercury increase as it is transferred up the food chain to fish, birds, animals, marine mammals and humans in a process known as biomagnification. Larger and older fish, and fish higher in the food chain, such as sharks, swordfish and some freshwater species, have much higher

in some instances, other sources of exposure, such as inhalation following spills or intentional uses of elemental mercury at work, in homes or schools, can potentially be significant.

Mercury can be deposited locally to aquatic or terrestrial ecosystems or be carried long distances in the atmosphere from one country to another. It vaporizes and condenses, touching down on oceans and freshwater bodies, where the cycle begins again. This is known as the "grasshopper effect." When mercury reaches

Effects of mercury

The health effects of mercury depend on its chemical form, the route of exposure and the quantity received. Exposure to high levels of mercury can cause immediate and severe health problems, including tremors, convulsions, and even death in adults, but it is prenatal exposure that is the greatest risk to unborn infants due to their sensitivity to mercury. In adults, long-term consumption of methylmercury can lead to personality change, tremors, impaired vision, deafness, loss of muscle coordination and sensation, and memory loss. This is because the general sites mercury attacks are the brain, central nervous system, kidneys and lungs.

In a pregnant woman, mercury can cross the placenta, entering the fetus and accumulating in the fetal brain and other tissues, where it can cause brain damage and other serious health effects. Nursing children can also receive mercury through breast milk. In children who suffer from mercury poisoning, the effects can range from a decrease in intelligence to delays in walking and talking, mental retardation, lack of coordination, blindness and seizure.

People whose diet relies heavily on fish, marine mammals and wild game are known to have elevated concentrations of mercury in their blood and hair. Northern aboriginal populations are particularly at risk. Five percent of women and children in the eastern Arctic have mercury levels in blood above World Health Organization safe limits. Exposure data from women in the US indicate that as many as eight percent, or 4 million women of childbearing age, may be exposed to mercury at levels that exceed USEPA recommendations. This means that approximately 300,000 babies are borne each year in the United States with mercury exposure levels above those recommended by the US EPA.



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When mercury reaches polar regions it undergoes transformation processes that cause it to deposit to snow during arctic sunrises

mercury concentrations than those lower on the food chain. Eating contaminated fish is the main source of human exposure to methylmercury. Mercury levels in water, even where fish are unsafe to eat, generally do not present a significant risk. Concentrations in ambient air are also usually not of concern. However,

polar regions, it undergoes transformation processes that cause it to deposit to snow during Arctic sunrise; some of the mercury enters the biotic and abiotic environment; the rest re-enters the atmosphere at snow melt. Thus contamination in the Arctic regions is of particular international concern.



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