Mercury and Health

Issue

Mercury is a heavy metal that is released naturally from rocks, soil and volcanoes, as well as from industrial activities. Exposure to mercury is linked to respiratory complications, intellectual impairment and other health effects.

Background

Mercury is toxic, persistent (does not break down in the environment) and bioaccumulative (builds up in living things). In its vapour form, mercury can be carried long distances on wind currents.

Mercury exists in three different forms:

- Elemental mercury – This silvery, shiny, volatile liquid gives off a colourless, odourless vapour at room temperature (e.g., in thermometers and button batteries).
- Organic mercury – This includes compounds, such as methyl mercury, formed when elemental mercury combines with carbon.
- Inorganic mercury – This includes compounds formed when elemental mercury combines with other elements such as sulphur, chlorine or oxygen to create compounds known as mercury salts. Bacteria can convert inorganic mercury in the environment to methyl mercury.

Sources

Mercury is used in, and released from, a variety of industrial processes and commercial products, including through coal-fired power generation, metal mining and smelting and waste incineration. Mercury also originates from a range of natural sources, such as volcanoes, soils, undersea vents, mercury-rich geological zones and forest fires, as well as from freshwater lakes, rivers and the oceans.

In Canada, mercury releases from human sources have declined since the 1970s due to pollution control and other measures, particularly in the base metal smelting and mercury-cell chlor-alkali sectors. Although Canada and many other industrialized countries continue to reduce their use and release of mercury, these reductions are not generally reflected in lower environmental concentrations. This is mainly due to the persistent nature of mercury and increasing global industrialization.

Everyone is exposed to some level of mercury in air, water and food. In the general population, exposure to hazardous levels of mercury is most likely to occur through the consumption of fish contaminated with methyl mercury.

Exposure can also occur when mercury-containing products are broken and mercury is released or spilled at home or in the workplace. Products such as button-cell batteries, fluorescent tube lights, fever thermometers, thermostats, switches and relays, barometers and dental fillings may contain mercury; however, mercury-free alternatives exist in most cases. The inappropriate disposal of products containing mercury can cause mercury to leach from landfills or be emitted from burning waste, adding to the amount of mercury in the environment. Municipalities often will collect these products to ensure they are properly managed.

Mercury is also used as a preservative in some products like cosmetics and vaccines. When used according to regulated restrictions, mercury is considered safe.

Health Risks

In general, Canadians are not at risk of adverse health effects from mercury. However, in the event that people are exposed to elevated levels of mercury, they may experience health problems ranging from rashes to effects on the central nervous system and birth defects, and even death in cases of extreme poisoning. The health effects of mercury exposure depend on its chemical form (elemental, inorganic or organic), the route of exposure (inhalation, ingestion or skin contact), and the level of exposure. Vapour from liquid elemental mercury and methyl mercury are more easily absorbed than inorganic mercury salts and can, therefore, cause more harm.

Organic Mercury Compounds (Methyl mercury)

Methyl mercury tends to accumulate to some degree in all fish, but especially in large predatory fish including shark, marlin, swordfish and fresh and frozen tuna, as well as marine mammals and certain species of freshwater fish. Methyl mercury is absorbed through the intestines of humans and distributed throughout the body. It readily enters the brain,

where it may remain for a long period of time. In a pregnant woman, it can cross the placenta into the fetus, building up in the fetal brain and other tissues. Methyl mercury can also be passed to the infant through breast milk. Scientific evidence indicates that exposure to methyl mercury is more dangerous for young children than for adults. Aside from differential behaviours and a higher proportion of air, food and water intake relative to body size, the immature or developing organs and systems of children are less able to eliminate mercury. Cellular repair mechanisms are similarly underdeveloped, providing a diminished capacity to repair damage caused by mercury. Depending on the level of exposure in children, effects can include a decrease in I.Q., delays in walking and talking, lack of coordination, blindness and seizures. In adults, extreme exposure can lead to health effects such as personality changes, tremors, changes in vision (tunnel vision), deafness, loss of muscle coordination and sensation, memory loss, intellectual impairment, and even death.

Elemental Mercury

The health effects of elemental mercury depend on the length and type of exposure. For example, by accidentally swallowing liquid elemental mercury from a broken fever thermometer, relatively little mercury is absorbed; however, inhaling the vapour from that mercury spill would allow it to be more easily absorbed into the body, potentially causing health problems. At higher concentrations, mercury vapour can cause damage to the mouth, respiratory tract and lungs, and can lead to death from respiratory failure. Long-term exposure to low concentrations causes symptoms similar to those which follow exposure to methyl mercury.

Inorganic Mercury Compounds

Inorganic mercury can cause kidney failure and gastrointestinal damage. Mercury salts are irritating, and can cause blisters and ulcers on the lips and tongue. Rashes, excessive sweating, irritability, muscle twitching, weakness and high blood pressure are other symptoms of elevated exposures.

Minimizing Your Risk

Although Canadians are generally not at risk of health effects from mercury, there are precautions you can take to minimize your and your family's risk.

Elemental mercury from dental fillings does not generally pose a health risk. There are, however, a fairly small number of people who are hypersensitive to mercury. While Health Canada does not recommend that you replace existing mercury dental fillings, it does suggest that when the fillings need to be repaired, you may want to consider using a product that does not contain mercury. As current research is raising questions regarding the use of some of the alternative materials to mercury dental fillings, you should discuss your options with your dental provider. A very small number of people (pregnant women, people allergic to mercury and those with impaired kidney function) should avoid mercury fillings. Do not have mercury fillings removed when you are pregnant because the removal may expose you to mercury vapour. If appropriate, the primary teeth of children could be filled with non-mercury materials.

Predatory fish such as shark, swordfish, fresh and frozen tuna (not canned), have higher levels of mercury and should be consumed only occasionally. The health benefits of eating fish outweigh the risk of exposure to mercury if Health Canada consumption guidelines are followed. Pregnant women, women of child-bearing age and young children should be especially careful, as babies born to women who have been exposed to elevated levels of mercury may exhibit developmental delays, intellectual impairment and other health effects. If you are concerned about mercury exposure, samples of hair, blood and urine can be taken in a doctor's office or health clinic and tested.

Sport fish caught in local waters can sometimes accumulate high concentrations of mercury. For information on these fish, check with your provincial or territorial authority on any advisory that may have been issued for that area.

Contact your local public health office for information on how to clean up small liquid mercury spills.

Role of Governments

Mercury is listed as a toxic substance under the *Canadian Environmental Protection Act, 1999* (CEPA 1999), the primary federal legislation that deals with toxic substances in the environment, which allows the federal government to control mercury emissions and the importation, manufacture, distribution and use of mercury in Canada.

The Government of Canada is working in a number of areas to reduce the use and release of mercury into the environment. The Federal Government has helped set up the Northern Contaminants Program and the National First Nations Environmental Contaminants Program. Canada also has cosmetic regulations, which only permit mercury to be used as a preservative ingredient in cosmetics intended for use in the area of the eye.

The Government of Canada monitors retail fish, while provincial and territorial agencies issue advisories on sport fish. The Canadian Food Inspection Agency enforces a guideline for mercury in commercial fish, which applies to all fish except shark, swordfish, and fresh and frozen tuna, for which meal limits are recommended.

In addition to fish-related guidelines, the provinces and territories of Canada have legislation, regulations and guidelines for mercury covering liquid effluent, drinking water and emissions from industrial sources. As a result of Canada's differing geographic elements, the provincial and territorial regulations surrounding mercury tend to differ slightly between jurisdictions.

In 2000, the Canadian Council of Ministers of the Environment developed several Canada-wide standards to reduce mercury release to the environment. Standards have been, or are being, developed for certain mercury-containing products and for mercury emissions from selected industries.

Canada is taking an active role in regional and international efforts to reduce mercury in the environment globally, as much of the mercury deposited on our lakes and soil comes from other countries. Canada participates in the following international fora to encourage other countries to take actions to reduce mercury pollution:

- Great Lakes Binational Toxics Strategy **www.epa.gov/glnpo/bns/index.html**
- Arctic Council Action Plan Mercury Project **www.acap.arctic-council.org**
- North American Regional Action Plan on Mercury **www.cec.org**
- United Nations Economic Commission for Europe Convention on Long-Range Transboundary Air Pollution **www.unece.org/env/lrtap/**
- United Nations Environment Program, Global Mercury Program **www.chem.unep.ch/mercury**

Need More Info?

More information can be found at
www.chemicalsubstances.gc.ca

Health Canada's "It's Your Health" information sheet on "Mercury and Human Health"
www.hc-sc.gc.ca/iyh-vsv/environ/merc_e.html

Heath Canada's Questions and Answers on "Mercury – Your Health and the Environment"
www.hc-sc.gc.ca/ewh-semt/pubs/contaminants/mercur/index_e.html

Cosmetics regulations under the *Food and Drugs Act*
Available at: www.justice.gc.ca

For information on mercury and the environment, including fish consumption advice
www.ec.gc.ca/MERCURY/

For work related to mercury under the auspices of the Canadian Council of Ministers of the Environment
www.ccme.ca/ourwork/air.html

The Northern Contaminants Program
www.ainc-inac.gc.ca/ncp

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