

Mercury use from health care system

Factsheet, April 2011

Toxic Mercury



Mercury is a naturally occurring metal whose primary store is within the planet. It comes in different forms, most of which are toxic to humans, ecosystems and wild-life. High doses can be fatal to humans, but even relatively low doses of mercury containing compounds can have serious adverse neurodevelopmental impacts, and have recently been linked with possible harmful effects on the cardiovascular, immune and reproductive systems.

Mercury and its compounds affect the central nervous system, kidneys, and liver and can disturb autoimmune processes; cause tremors, impaired vision and hearing, paralysis, insomnia, and emotional instability. Mercury compounds cross the placental barrier and can cause developmental deficits during fetal development, and attention deficit and developmental delays during childhood. Mercury is used in a variety of consumer, industrial and medical products and processes.

Product examples are fluorescent light bulbs and batteries, medical devices (e.g. thermometers, blood pressure instruments), laboratory chemicals, pharmaceutical and dental products, and various temperature and moisture measurement and

sensing devices (barometers, hygrometers, flame sensors). Mercury emissions come from a range of human activities, primarily coal burning, but also from incineration or disposal of mercury-containing products, cremation, and from natural sources.

When mercury is released into the surface environment from whatever source, it is highly mobile, cycling between the atmosphere, and the earth's surface, where it is deposited in soils, water bodies and bottom sediments. In soil and water, microorganisms convert elemental mercury into compounds which aquatic plants and animals, including the fish we eat, ingest or absorb. These compound then bioaccumulate, because living organisms, including humans, take the compounds up more quickly than they can eliminate them. The compounds also biomagnify, as the concentrations increase up each level of the food chain.

Different forms of mercury

There are three main forms of mercury: **elemental, inorganic, and organic compounds (methyl and ethyl mercury)**. Humans are exposed to all forms of mercury through different pathways. We are affected by each form in different ways, due to their different toxicity profiles. While the greatest exposure to most humans comes from the elemental metallic compound, it is the least toxic on a kilogram for kilogram basis. People in Indian states like Uttar Pradesh have

significant exposure from the mercury vapor in their dental fillings.

The toxicity of organic mercury (primarily methyl mercury) is of primary concern as it contaminates the fishes and has neurotoxic effects at low levels – levels which are commonly exceeded in the diet of pregnant women. So in terms of human health protection, exposure to methyl mercury via fish consumption is the main problem.

Different form of mercury exposure

The developing fetus, infants and young children are most susceptible to damage from **ORGANIC MERCURY** exposure. This is because the human brain develops at a dramatic rate during the first few years of life. In addition, infants and young children may have higher exposures, because they consume more food in relation to their body weight than older children and adults.

Mercury exposure for the developing fetus and nursing infants comes both from mercury stored in the woman's body prior to pregnancy, and from mercury to which the woman is exposed during pregnancy and breast feeding. This is because mercury readily crosses the placenta, and can be found in breast milk.

"Even a small quantity of mercury can lead to mercury poisoning, particularly in children."

METHYLMERCURY affects the development of the brain and central nervous system. It can alter nerve cell migration in the fetal brain, and interferes with nerve cell differentiation and division – preventing the development of normal brain structure. Even at low levels of prenatal exposure, subtle symptoms of neurological effects have been seen, including poor performance on neurobehavioral tests, particularly on tests of attention, fine motor function, language, visual-spatial abilities, and memory. Methyl mercury is also a possible carcinogen, and the continuous exposure at low levels which can be found in the general population is worth noting. Importantly, it is likely that the carcinogenic and neurotoxic effects have no low-dose threshold. This suggests that there is no safe level of mercury exposure.

ETHYLMERCURY, another organic mercury compound, is used as a preservative. Thimerosal, a common vaccine preservative, uses ethylmercury. While ethylmercury remains in the human body for a shorter period of time, its toxicity is probably similar to methylmercury. Thimerosal, however, deposits twice as much inorganic mercury in

the brain as does the same dose of methylmercury.

While there is debate as to the clinical implications of exposure from dental amalgams, there is evidence that hot foods and liquids, as well as chewing, release mercury vapors from fillings. The human body then excretes the mercury and it enters the waste water systems, eventually making

its way into fish in the form of methylmercury.

The Indian Standard for code of safety for mercury, published by the Indian Standards Institute (ISI)

- ✓ **Section 0.2.1** of this standard says that mercury and its compounds are toxic. A code of safety for mercury will be helpful in taking preventive measures for protection of health of persons exposed to this material in industry.
- ✓ **Section 0.5** – Mercury poisoning is included in the schedule of Notifiable diseases under the Factories Act, 1948. It is a compensable disease under the Workmen's Compensation Act, 1923
- ✓ **Section 4.1.4** gives the threshold limit value in air for mercury as 0.05mg/m³ of air for repeated exposure for 8 hours workday and 40 hours work week.
- ✓ **Section 5** deals with storage and handling and states that since spillage of mercury is practically unavoidable, the spilled material should be washed away to drains and collected in water sealedtraps. Lime sulphur may be sprinkled over the surface to get rid of finer particles, which may be left behind
- ✓ **Section 7** talks about the preventive measures- protective gear mentioned include overalls, respirator with a desired filter; emphasises on training of staff and monitoring of ventilation and working conditions, mercury vapour concentration (to be measured with electrically operated mercury vapour meters or chemical based methods)

The standard code for mercury should apply to any place, which uses mercury including the hospitals. Their implementation in the hospital setting would mean that the hospital would need to have a mercury policy and training on aspects of mercury exposure and spill management. It would also entail occupational safety through the use of protective gear; monitoring exposure limits; and ensuring water-sealed traps for mercury collection in drains. This code needs to suggest better ways for spill handling rather than suggesting washing of mercury in drains.

ELEMENTAL MERCURY:

The most common route of exposure of humans to elemental mercury is through the lungs because the metal volatilises at room temperature. This vapour irritates the lung, affects the kidneys, easily penetrates the blood-brain barrier and is neurotoxic. In addition, exposure can cause spontaneous abortion and other pregnancy complications. Exposure occurs in various ways: accidentally when there is a mercury spill (such as a broken thermometer); occupationally (manufacture of mercury containing products; in dental offices to mercury dental amalgams; or from using mercury containing products (dental amalgams, certain folk health remedies).

Indian laws and guidelines on mercury

The two rules that deal with hazardous substances are: The Hazardous Waste Management and Handling Rules (1989), which list mercury and mercury containing waste as hazardous waste. Another rule is the Manufacture, Storage and Import of Hazardous Chemicals Rules, 1989, which covers a few mercury compounds Mercury use and release from the healthcare sector. By the definition and categories mentioned in the Hazardous Waste Rules, mercury release from products or instruments of mercury (used in healthcare) would be covered under this rule. However, the authorities admit that mercury used in healthcare was not considered significant enough to draft any individual policy for this sector or take it into account within the existing framework.

Use and release of mercury from health care sector

A severe health hazards caused by use and subsequent release of mercury and the population groups who are at risk. Mercury

from health care industry is released through various sources. Which includes Medical waste incineration, open burning, burning in barrels, gasification, pyrolysis etc, and it is present in various devices and products such as Thermometers, Sphygmomanometers, Dental amalgam, Gastrointestinal tubes, Laboratory chemicals, Pharmaceutical products, Electrical appliances. Because of these uses it is also a serious occupational

hazard. Around the world a significant number of health care workers has poor risk perception on mercury hazard. This low risk perception coupled with high spill rates and in-house calibration is a significant risk to health care givers. Large numbers of health care facilities are using mercury-containing devices with no accident/incident reporting mechanisms and proper protection measures.

Advocacy need of mercury free devices in health care

Mercury-containing devices have long been used in hospitals and health care settings. These include fever thermometers, blood pressure measuring devices (sphygmomanometers), and esophageal dilators.

When such devices break, the mercury they contain can vaporize and expose health care workers and patients. Mercury from breakages can contaminate the immediate area of the spill as well as the facility's wastewater discharges. Such equipment breakages are common. Hospitals using mercury fever thermometers frequently report that they replace multiple thermometers per year for each hospital bed. A survey reported that the breakage rate of thermometers in a medium size hospital is 70 per month.

Each mercury fever thermometer contains between 0.5 g and 3 g of mercury while a mercury blood pressure device generally

contains between 100g and 200g of mercury. An esophageal dilator is a long, flexible tube that is slipped down a patient's throat into the esophagus for certain medical procedures. Although they are not as common as fever thermometers and blood pressure measuring devices, each dilator can contain as much as a kilogram of mercury. According to Toxics Link report- "Estimation of mercury usage and release from healthcare instruments in India" mercury captured in health care instruments are about 26 Tons whereas its release can be about 8 Tons if not handled properly.

Good and affordable alternatives to mercury-containing fever thermometers, blood pressure measuring devices, and esophageal dilators are now available in India, and efforts are underway to phase out mercury-containing health care devices.

Barriers for phasing out mercury equipment

1. Lack of confidence on mercury free alternatives among health professionals.
2. Supply of accurate and affordable mercury free devices is not available in the market.
3. Lack of knowledge of health hazards related to the breakage of mercury based devices.
4. Lack of skills regarding the storage of discarded mercury instruments

Dental amalgam and mercury

Dental amalgam is a compound of mercury (43-54%) combined with other metals including silver, copper and tin. These fillings give off mercury vapor. The amount depends

on how many fillings you have and activities such as chewing, grinding of teeth, and drinking hot liquids. Mercury vapor can be inhaled and enter the bloodstream. It can then be carried throughout the body. For people with a number of fillings, this can be

the main way that mercury gets into the body. Any mercury from amalgam fillings we swallow is very poorly absorbed and most does not enter our bloodstream.

Amalgam filling use is beginning to decline, due to better decay prevention and

substitution with other restorative filling materials in its place. Dental amalgam is one of the major product uses for mercury. It is a major contributor of mercury in municipal wastewater.

Risk due to Mercury Amalgam dental fillings

- Mercury amalgam in dental filling poses a real threat of chronic mercury poisoning.
- Blood mercury levels have reported as high as 20 µg/dl. in humans with dental amalgam filling.
- The alternatives are not yet deemed fully capable of

substituting amalgam in all types of dental filling.

- Lack of awareness of health hazards of mercury amalgam dental fillings in pregnant women and their precautionary measures.
- The base silver alloy is mostly imported from USA, Switzerland, France, UK and Australia and is cheaper compared to other permanent restorative materials.

Alternate to mercury-instruments and dental restoration material

- ✓ **Alternatives for Mercury-containing Thermometers**
 - Electronic (digital)
 - Infrared
 - Chemical Strip
 - Glass filled with gallium, indium or tin
- ✓ **Alternatives for Mercury-containing Sphygmomanometers**
 - Aneroid
 - Electronic
- ✓ **Alternatives for Mercury-containing Gastrointestinal Tubes**
 - Bougie tubes (tungsten)
 - Cantor Tubes (tungsten)
 - Miller Abbott tubes (tungsten)
 - Feeding tubes (tungsten)

Alternatives for Mercury-containing Laboratory Chemicals

The mercury compound in a chemical formulation may be an active ingredient, a preservative, or a contaminant introduced during manufacturing. Identify why mercury is present and a replacement may be able to be identified. Hospital purchasing agents should contact suppliers and request mercury-free reagents.

Alternatives for Mercury-containing Pharmaceutical Products

In many cases mercury-free preservatives are available. Purchasers should request that suppliers provide mercury-free alternatives whenever possible.

Dental Amalgam

Metal, ceramic, crown, glass, inomer, synthetic, polymer, gold, alloy etc. these alternatives are however available but they are beyond the reach of common people.

What can we do?

- ✓ Avoid where possible direct personal contact with all kinds of mercury.
- ✓ Buy fever thermometers and other blood pressure gauges without mercury, and dispose the Mercury - containing ones properly.
- ✓ Ask your dentist about non-mercury alternatives.
- ✓ Use alternative products that do not contain mercury whenever possible.
- ✓ Remove mercury-containing products or spill waste before they enter the incineration waste stream, so that it can be placed into permanent storage.
- ✓ At a minimum, until permanent safe storage of disposed mercury has been achieved, recycle Mercury - containing products as much as possible to keep mercury out of the environment.

In Case of a Mercury Spill

- ✓ Keep all people, especially children, away from the spill area.
- ✓ To minimize the mercury that vaporizes, turn off any heaters and turn up any air conditioners.
- ✓ Ventilate the area by opening windows, and keep open as long as possible.

- ✓ Do not touch the mercury.

Suggestion and recommendation

- a. Mercury Management Policy**
If you are still using mercury, ensure that there is a mercury management policy and a spill response plan for emergencies.

- b. Mercury-Free Purchasing Policy**
Establish a “mercury-free purchasing policy” which is communicated to suppliers, staff to find non-mercury alternatives.

Contents of a Spill Management Kit

1. *Four to five ziplock-type bags*
2. *Waste bags (2 to 6 mm thick)*
3. *Plastic container with lid that seals.(35 mm film canister for example)*
4. *Nitrile or latex gloves*
5. *Paper towels*
6. *Cardboard strips (index cards for example)*
7. *Eyedropper or syringe (without needle)*
8. *Face mask*
9. *Duct or other sticky tape (30 cm or so)*
10. *Flashlight*
11. *Powdered sulphur or zinc (this can easily be obtained at a pharmacy)*
12. *Set of instructions with waste collection and disposal protocols.*

- ✓ Obtain instructions on how to clean up a spill at home, or in public facilities by calling your local authorities.
- ✓ Use mercury spill management kit
- c. Information and Training**
Educate and train your employees about facility protocols, and provide information about mercury and its effects on human health and the environment.
- d. Replace Mercury-Containing Products**
Commit to eliminating mercury by phasing out mercury-containing items where immediate steps can be taken.

For example, replace

- Mercury-filled patient thermometers with digital or electronic thermometers;
 - Mercury containing bougies or esophageal dilators with silicon ones;
 - Mercury-filled blood pressure gauges (sphygmomanometers) with aneroid units.
- e. **Mercury Thermometer Exchange**
A mercury fever thermometer exchange is an event at which participants turn in mercury fever thermometers from their homes and, in return, receive a non-mercury fever thermometer or a voucher for an alternative thermometer.

Resources

- ✓ International POPs Elimination Network <http://www.ipen.org/hgfree/>
- ✓ Health Care Without Harm: www.noharm.org/us/mercury/resources
- ✓ Health and Environment Alliance (HEAL): www.env-health.org
- ✓ Zero Mercury Global Campaign: www.zeromercury.org
- ✓ Toxics link www.toxicslink.org
- ✓ Toxics Link reports:
 - Lurking Menace: Mercury in the healthcare sector, 2004
 - Estimation of mercury usage and release from healthcare instruments in India, 2010
- ✓ Health and Environment Alliance (HEAL) and Health Care Without Harm Factsheets:
 - Mercury in Healthcare
 - Mercury and Dental Amalgams
 - Mercury and Vaccinations



Youth Round Table Society



International POPs Elimination Network



IPEN - Mercury Free Campaign



Toxics Link

“Youth Round Table Society (YRT), a grassroots civil society organization working for raising awareness on the risk of mercury exposure in health care sector. YRT gratefully acknowledge the financial support from the IPEN under International SAICM Implementation Project (ISIP) “

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