

MERCURY & HEALTH

JUNE 2006.

STAY HEALTHY!
STOP MERCURY



How Toxic is 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.¹

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 compounds 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.

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"Stay Healthy, Stop Mercury" campaign.

EPHA Environment Network (EEN) and Health Care Without Harm Europe (HCWH) are joining forces to mobilise the health community in Europe for a global ban on mercury. The activities are focused on raising awareness of the risks to health, especially for babies and pregnant women, and on working with women and health care professionals on how they can protect themselves and the environment from mercury exposure.

The 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 developed countries have significant exposure from the mercury vapor in their dental fillings.²

But the toxicity of organic mercury (primarily methylmercury) is of primary concern as it contaminates the world's 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 methylmercury via fish and shellfish consumption is the main problem.³ (Please see our factsheet on Mercury and Fish Consumption for further information). The table below shows the uses, exposure routes, and toxicity of each form of mercury.⁴

USE, EXPOSURE ROUTES AND TOXICITY OF MERCURY AND ITS COMPOUNDS

MERCURY Hg	ELEMENTAL (vapourises at room temperature)	INORGANIC (mercury salts)	ORGANIC Methyl mercury (transformed by bacteria in contact with water)	ORGANIC Ethyl mercury
Main Use / Pathway	Dental fillings, Hospital spills – e.g. broken thermometers (Amalgam is a mix of mercury and other metals like Ag, Sn, Cu, In, Zn)	Medicines, cosmetics (used as a preservative)	Fish consumption (the fish have ingested mercury and it is in their muscle tissue)	Vaccines (the preservative Thimerosal is 49% ethyl mercury)
Other uses	Goldmining Chloralkali plants Products (batteries, switches, fluorescent bulbs; measuring and control devices (eg. thermostats) Medical devices (thermometers, gastrointestinal tubes, etc.)	Disinfectants and anti-microbials Electrical equipment Photography		Fungicides (e.g. in paints) and bactericides (phenylmercury)
Route of exposure	Inhalation Ingestion Transplacental bioconcentrated (mother's dental during pregnancy & breastfeeding)	Epidermal Inhalation – unusual Ingestion	Ingestion Gastrointestinal Inhalation Transplacental bioconcentrated	Parenteral (outside the alimentary canal) directly to mother; infant/child Transplacental bioconcentrated (mother's vaccine prior to pregnancy, during pregnancy or during breastfeeding).
Absorption rate	Inhalation 75-85% Ingestion – poor absorption	Inhalation 10% Ingestion – slightly if swallowed.	Gastrointestinal 100% Inhalation – some via lungs Skin – some	Parenteral (outside the alimentary canal) 100%
Toxicity	Primary: lungs, eyes, gingival, skin Secondary: central nervous system, kidneys, immune system	Primary: kidneys and gastrointestinal tract Secondary: central nervous system (deposits from ethyl and methyl on brain)	Primary: central nervous system Secondary: cardiovascular	Primary: central nervous system Secondary: cardiovascular
Transport in body	Crosses the placenta Enters the brain Found in breastmilk	Does not easily enter the brain or cross the placenta	Crosses the placenta Enters the brain Found in breastmilk	Crosses the placenta Enters the brain Found in breastmilk

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.⁵

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.

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.⁶ Methylmercury is also a possible carcinogen, and the continuous exposure at low levels which can be found in the general population is worth noting.⁷ 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.⁸ (Please see our Factsheet on Mercury and Vaccines for further information).

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.⁹

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; and during gold mining in developing countries); or from using mercury-containing products (dental amalgams, certain folk health remedies). 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. (Please see our Factsheet on Mercury and Dental Amalgams for further information). 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 (see above).

EU Policy and Actions

The Commission of the European Union has proposed a European Community Strategy on Mercury. This Strategy is currently being deliberated upon by the Council and the European Parliament, and various parts of it are in the process of being transformed into actions and legislative steps.

EEN/HCWH Recommendations

Ultimately, the solution is to globally eliminate all uses of mercury, collect and safely store the remaining mercury permanently, and clean up mercury pollution.

The EU should enact a general ban on all remaining uses of mercury in products as soon as possible and permit exemptions only in cases where no mercury-free alternatives exist.

In the meantime, the EU should educate the public, especially vulnerable groups, about how to limit their exposure. The EU should also establish precautionary standards for dental amalgams, fish consumption guidelines and vaccinations. Finally, the EU should also prioritise completing the picture about our current levels of exposure, through biomonitoring work and the compilation of Member State data on biomonitoring of mercury, so as to inform public education campaigns on exposure reduction measures.

What Can You Do?

- ☞ Avoid where possible direct personal contact with all kinds of mercury.
- ☞ Inform yourself about mercury levels in seafood, and follow national/international advisories (read our Mercury and Fish Consumption Factsheet).
- ☞ Buy fever thermometers and other blood pressure gauges without mercury, and dispose the mercury-containing ones properly (see local municipal guidelines; Health Care Without Harm resources).
- ☞ Ask your dentist about non-mercury alternatives.
- ☞ Contact your Member of Parliament, and your national Environment Ministers who represent your country in the EU Council. Ask for a strict general EU ban on mercury uses as soon as possible (contact EEN, HCWH and Zero Mercury Global Campaign for more details on the current status of legislative issues).

Resources

European Union Mercury Strategy

<http://europa.eu.int/comm/environment/chemicals/mercury/index.htm>

EPHA Environment Network (EEN) and Health Care Without Harm Factsheets:

- Mercury in Healthcare
- Mercury and Dental Amalgams
- Mercury and Fish Consumption
- Mercury and Vaccinations

Health Care Without Harm: www.noharm.org/us/mercury/resources

EPHA Environment Network (EEN): www.env-health.org

Zero Mercury Global Campaign: www.zeromercury.org

Mercury: Your Environment, Your Food, Your Health (pdf), Physicians for Social Responsibility, Los Angeles, July 2001. Available at www.noharm.org/library/docs

Mercury in the Environment by Pollution Probe (Canada), June 2003
www.pollutionprobe.org/Reports/mercuryprimer.pdf

1. European Commission. SEC (2005)101 Communication from the Commission to the Council and the European Parliament on Community Strategy Concerning Mercury EXTENDED IMPACT ASSESSMENT (COM(2005)20 final) 28.1.2005, p. 12
2. European Commission (2005). p. 12
3. European Commission (2005). p. 6
4. Sources for table are: World Health Organization. Training for Health Care Providers: MERCURY. 27 June 2005. p. 14-20. Schettler, T. et al. (1999) Generations at Risk, MIT Press, Cambridge, pp. 57-62.
5. Physicians for Social Responsibility (2004) Health Effects of Methylmercury, Factsheet No. 4.
6. Grandjean P, et al. (1997) Cognitive deficits in 7-year-old children with prenatal exposure to methylmercury. Neurotoxicology and Teratology 19(6):417- 428; Steuerwald U, et al. (2000) Maternal seafood diet, methylmercury exposure, and neonatal neurologic function. The Journal of Pediatrics 136(5): 599-605.
7. International Agency for Research on Cancer (1993); in UNEP Global Mercury Assessment, December 2002.
8. DeNoon, D.J. (2005) Debate Over Autism-Vaccine Link Intensifies, WebMD, July 13, 2005. <http://www.foxnews.com/story/0,2933,162314,00.html>
 The author goes on to note that there is troubling evidence that inorganic mercury may have some adverse effects.
9. Schettler, T, et al. (1999). pp. 57-62.



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