# CAUT Health and Safety Fact Sheet

## Mercury

ISSUE 23

Mercury is found naturally in the ore cinnabar, and is usually found in rocks near recent volcanic activity or hot springs, and in mineral veins. A silver-white, heavy, mobile, odourless liquid that does not burn, it is very toxic and may be fatal if inhaled and harmful if absorbed through skin contact.

It has been mined since at least the time of the Romans. Criminals sentenced to work in those mines had a life expectancy of three years from exposure to the metal.

Mercury is known as elemental (liquid or gaseous state and released naturally into the air), and as organic and inorganic compounds.

### Uses

Environment Canada notes that because of mercury's properties as both a metal and a liquid at room temperature, it is a good conductor of electricity and reacts precisely to temperature and pressure changes.[1]

- barometers and vacuum gauges
- dental amalgams
- flame sensors
- flowmeters and hydrometers
- hygrometers/psychometers
- compact fluorescent, fluorescent U-Tube, fluomeric, linear and mercury vapour lamps
- metal halide and sodium vapour lamps
- manometers and pyrometers
- esophageal dilators, gastrointestinal tubes, syphygmo-manometers
- mercury compounds
- displacement and contractor, and wetted reed relays
- float, pressure, temperature and tilt switches
- thermometers and thermostat probes

Known as "quick silver" and a myriad of other names, mercury has given rise to several diseases

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The use of mercury as a seed and food crop disinfectant, as a biocide in paints, a coating for mirrors, certain types of glass, treatment of felt and as a fungicide in paper has been banned.

## Hazards

Almost all of mercury's hazardous effects have become anthropogenic in nature – generated by human activity through production and waste.

Broken or improperly applied mercury products disperse in the atmosphere through drains and landfills, contaminating the land, air and water.

The deaths of five academics and a computer assistant who worked in the same building at Manchester University[2] in the UK are being investigated for a possible link to mercury and/or radiation exposure from experiments or through the by-stander effect.

## Dental Amalgams

Mercury was first used for dental fillings in France in the early 1800's, and introduced in the United States in 1833 even though there were concerns for its safe use in humans. In 1848, eleven members of the American society of Dental Surgeons of New York (today's American Dental Association) were found guilty of malpractice for using mercury amalgam and had their licenses suspended.

The World Health Organization[3] notes that "Dental amalgam is a potentially significant source of exposure since it can contain up to 50% of elemental mercury." Dentists and their staff are at risk of exposure and have been known to experience mercury poisoning and its effects.

Leaching from mercury fillings caused from chewing, corrosion, and heat and galvanic currents during the insertion of fillings cause dark discolorations known as "tattoos" on gum tissues.

Material Safety Data Sheets (MSDS) from manufacturers of dental amalgams indicate that "This product contains mercury, a chemical known to the State of California to cause birth defects or other reproductive harm" and that "Mercury may be deposited in the lens of the eye, causing visual disturbances" as well as "…tremors, salivation, stomatitis, loosening of teeth, blue lines on gums, pain & numbness in extremities" among other things.

Two videos – "Smoking Teeth, Poison Gas" and "How Mercury Causes Brain Neuron Degeneration"[4] – document the escape of mercury from dental amalgams in the mouth and are available online at www.iamot.org.

## Mercury Induced Diseases

Known as "quick silver" and a myriad of other names, mercury has given rise to several diseases,

### Campus Exposures

Common sites of potential exposure to mercury in campus worksites are typically in laboratory (mercury compounds) and in older healthcare equipment (blood pressure cuffs). Certain types of light bulbs, especially the newer power-saving light bulbs, may also contain mercury.

Check your workplace devices for mercury, and seek assistance from your JHSC or supplier for a safer substitute.

Many of the items listed under "uses" may be in your workplace.

including metal fume fever – an occupational disease found particularly in welders.[5]

"Mad Hatter" disease was caused by felt hat workers who used mercuric nitrate to improve the felting process. It is also known as the "Danbury Shakes" after Danbury, Connecticut where five million hats a year were produced. In both cases workers were exposed through skin contact and mercury vapour induced through heat in the production process.

In the 1950's, local townspeople in Minimata, Japan suffered the effects of over 27 tons of mercury dumped into Minimata Bay in the 1950's. As well as exhibiting classic mercury poisoning symptoms, many children were born with severe physical deformities and mental retardation. This has become known as Minimata Disease.

## Routes of Entry

Erethism – abnormal irritability or sensitivity of an organ or body part to stimulation – is a term typically used when referring to the health effects of mercury through exposure caused by:

- inhalation (vapour)
- skin absorption (vapour or liquid)
- ingestion (accidental or contaminated food/drink)

## Short-term Exposure

Exposure to high concentrations of mercury is usually caused by inhalation of heated mercury. A classic sign is stomatitis – an inflammation of the inside of the mouth with a metallic taste, salivation and difficulty in swallowing.

The nervous, digestive and respiratory systems are affected. Kidney damage, increased blood pressure and heart rate are common.

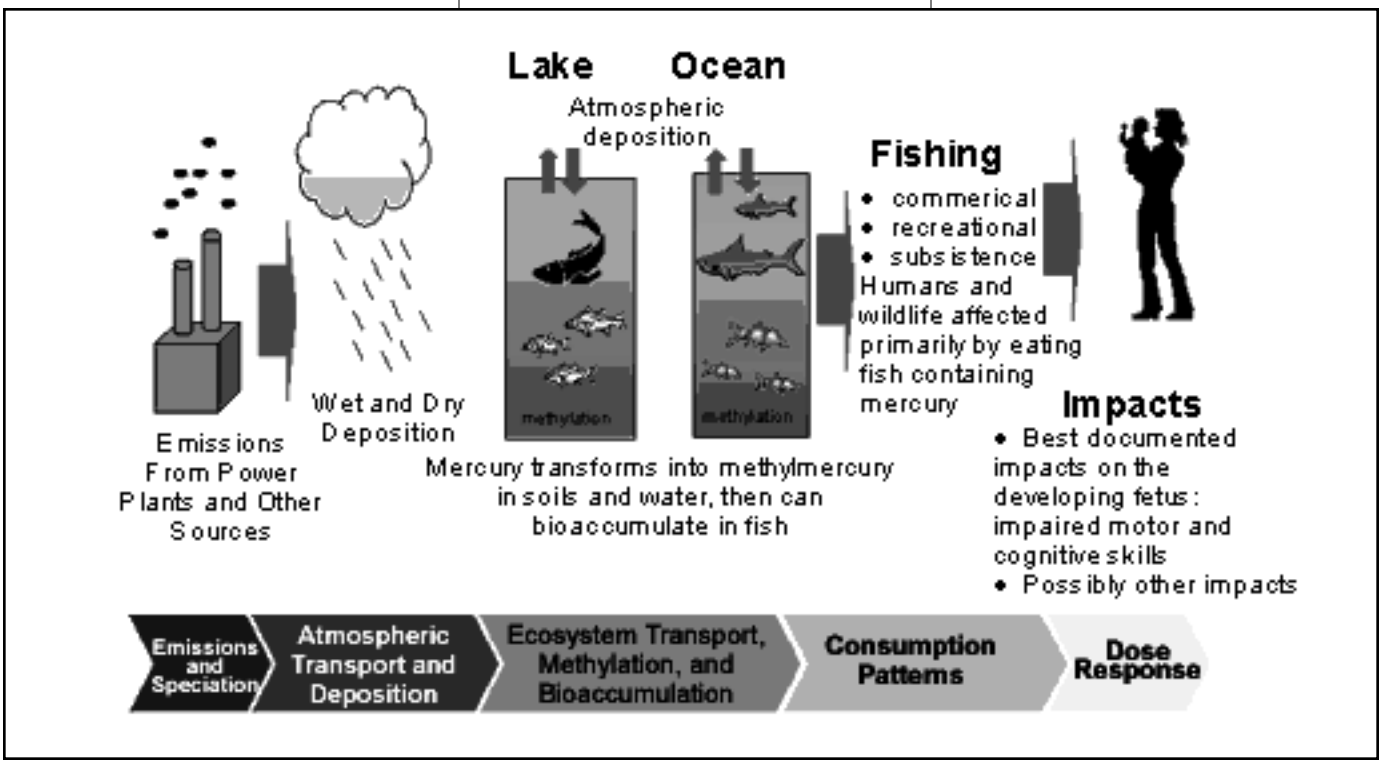
- tremors of hands and other parts of the body
- irritability, shyness, nervousness, sleeplessness, memory loss
- muscle weakness, headaches, slow reflexes, numbness
- abdominal pain, nausea, vomiting and diarrhea.

## Long-term Exposure

Although most long-term exposure is believed to be caused by inhalation, liquid mercury and its vapours can be absorbed through the skin with the same effect.

Urine mercury levels are usually used as a general indicator of how much exposure has occurred, and are calibrated in micrograms/gram of creatinine.

- classic sign of toxicity is a fine tremor, usually of the fingers, hands or arms, and sometimes eyelid, lip, tongue and whole body tremors.



- irritability, excitation, shyness, delirium, hallucinations, loss of appetite, fatigue, insomnia, short-term memory loss and impaired nerve conduction
- polyneuropathy, muscle cramps and decreased nerve conduction
- proteinuria and changes to kidney structure
- dermatitis

## Legislation and Regulations

Mercury is a designated substance and is regulated under the following pieces of legislation:

- CEPA (Canadian Environmental Protection Agency) 1999 Schedule 1 – List of Toxic Substances
- EPA (Environmental Protection Agency), USA
- European Union – Toxic; Danger of cumulative effects [T;R:33]
- OSHA (Occupational Safety and Health Agency), USA – 29 CFR 1910.1200
- WHMIS (Workplace Hazardous Materials Information System) - D1A, D2A, D2B, E

## Prevention

The most effective way to avoid exposure to the harmful effects of mercury is to:

- Eliminate its use wherever possible
- Reduce exposure through engineering controls, including the wearing of Personal Protective Equipment
- Use alternatives

The University of Calgary has implemented excellent model for mercury abatement and alternatives programs (www.ucalgary.ca/safety/mercury).

Hospitals in both Canada and the United States have been implementing mercury reduction programs for the past decade.

The Canadian Labour Congress is pressing the Canadian government to support the United Nations Environment Program (UNEP) on a globally binding convention on the reduction of mercury in the workplace and the environment.[6]

## Spill Protocol

As a designated substance, there are regulated protocols in the clean-up of mercury spills. Small spills can be cleaned up on-site with workers trained in proper spill clean-up techniques. Larger spills may require the use of contractors who specialize in toxic waste contamination. Check with your Joint Health and Safety Committee to see if your workplace has a mercury spill protocol and how it is implemented.

## References

CCOHS www.ccohs.ca

NIOSH www.cdc.gov/niosh

Workers Health and Safety Centre – Mercury: When a little goes a long way, Winter 2002

WHO – Elemental Mercury and Inorganic Mercury Compounds, CIDAC 50

## Notes

**1** Mercury-containing Products, Mercury and the Environment, Environment Canada www.ec.gc.ca

**2** Risks Magazine, Volume 405 – 9 May 2009, Trades Union Congress, UK

**3** Exposure to Mercury: A Major Public Health Concern, Preventing Disease Through Healthy Environments; Mercury in Health Care Policy Paper, WHO www.who.org

**4** International Academy of Oral Medicine & Toxicology; Lorscheider, Vimy et.al., University of Calgary

**5** Safety and Health Fact Sheet No. 25 Metal Fume Fever, January 2002, American Welding Society

**6** Letter to Hon. Jim Prentice, Minister of the Environment, February 18, 2009, Canadian Labour Congress

Illustration: USA Environmental Protection Agency, Mercury – Human Exposure (page 3)

Photos: USA Environmental Protection Agency, Mercury – Human Exposure (page 2), © Jupiterimages Corporation (page 1)