

Pollution Prevention in Schools - Mercury

What is mercury?

Mercury is a naturally occurring trace element found in rocks, soil, water, and air. At room temperature, the element appears as an extremely heavy, silvery liquid, hence its older common name, 'quicksilver'. It is the only common metal that exists as a liquid at room temperature. Mercury occurs in nature both as the free element and in the mineral cinnabar. About two-thirds of the mercury in the atmosphere comes from man-made sources such as coal-burning power plants and incinerators. The rest is a result of natural processes such as volcanoes, airborne transport of soils, and forest fires. Mercury contamination of rivers, lakes and coastal areas can result from the discharge of mercury-containing industrial or municipal wastes.



Because of its unique chemical and physical properties, mercury has been used in thousands of consumer and industrial products and processes.

Where do we find mercury?

Mercury or mercury-containing compounds may be found in a number of areas in the school environment.

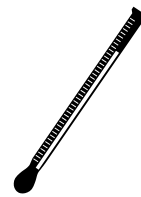
Heating, lighting, and other electrical equipment .

Mercury-containing tilt-switches have been used in thermostats for over 50 years. Tilt-switches are also found in the lids of clothes washers, chest freezers, and automobile hoods and trunks; and sometimes in steam irons, space heaters, and sump pumps. All fluorescent, neon, and high intensity discharge lamps (i.e., mercury vapor, metal halide, high pressure sodium, etc.) contain mercury, although newer, reduced mercury fluorescent lamps are available. Some older 'silent' light switches contain mercury, as do electrical relays that activate airbags, anti-lock brakes, and some automobile seat belt systems. Mercury-containing flame sensors can be found in some gas-fired appliances that have pilot lights,



such as ranges, ovens, clothes dryers, water heaters, furnaces, and space heaters. Some types of button batteries still contain mercury.

Scientific, medical, or other instruments. Many barometers, manometers, and vacuum gauges used in laboratories or found on machinery contain elemental mercury. Many fever and laboratory thermometers contain mercury. In addition, thermometers used to measure air and water temperature may also contain mercury. Older types of sphygmomanometers (blood pressure measuring devices) usually contain large amounts (up to several pounds) of mercury and can create serious problems if broken.



Mercury-containing consumer and laboratory chemicals. A variety of older consumer chemicals intentionally contained mercury. Latex paints produced before 1991 sometimes contained mercury as a fungicide. Some pesticides produced before 1994 contained mercury compounds. Newer paints and pesticides produced in the United States no longer contain mercury. In physics and chemistry laboratories, a variety of mercury-containing chemicals may be used in demonstrations and for laboratory experiments. In many cases, the chemicals are no longer used, but may be stored in such a way that contamination of the laboratory area is possible.



Finally, mercury sometimes occurs as an unintentional trace contaminant in some cleaning supplies such as bleach and drain cleaner.

Why do we need to be concerned about mercury?

Long-term exposure to mercury or mercury vapors can result in damage to the nervous system, kidneys, and liver. Fetuses, infants, and children are the most vulnerable to mercury poisoning, although any school employee who routinely works in a mercury-contaminated environment may be more at risk. Short-term exposure to high concentrations of mercury

can also cause a variety of acute symptoms, but this type of poisoning is more common in industrial, than academic, settings.

The chief hazard in working with **elemental** mercury is not in handling it (essentially harmless for brief exposures) or even ingesting it in small amounts (it has been used as a laxative). Inhalation of mercury vapors is the primary danger. Mercury vapor is colorless, odorless, and tasteless. Airborne concentrations of vapor from spilled mercury can rise to unacceptable levels in small enclosed spaces, or in poorly ventilated areas such as closets, storerooms, or stockrooms. Harmful amounts of mercury can be absorbed through the skin after a lengthy exposure. Most mercury **compounds** are toxic, sometimes virulently so. Poisoning can occur by ingestion of mercury-containing compounds used in science laboratories if students or staff do not wash their hands after handling these compounds.



Mercury acts as a **'bioaccumulative'** poison, i.e., it can build up in the body faster than the body's normal excretory processes can eliminate it. This is particularly important where people may be continuously exposed to low levels of mercury over a lengthy period of time.

In addition to the obvious potential health effects, there can be very serious **liability** and **cleanup costs** associated with improper handling or spillage of mercury. For large spills, school may have to be closed for several days. In at least one case, where students removed mercury from the classroom and contaminated not only the school, but also a school bus and several residences and businesses, cleanup costs exceeded \$250,000. Where health impacts are real or can be claimed, lawsuits may also be expected.



Unfortunately, in a school environment, elemental mercury should be viewed as an 'attractive nuisance' (like a backyard swimming pool), and appropriate precautions taken to eliminate or restrict students' access to the element. The majority of all serious mercury contamination incidents in schools have resulted from students illegally or inappropriately obtaining the element to play with and then contaminating themselves, the school, and other areas.

Finally, mercury is also a concern in the **environment**. Improperly disposed-of mercury eventually finds its way into lakes and streams and is converted by bacteria into an organic chemical called **methylmercury**. This chemical is extremely neurotoxic and, like mercury itself, is also bioaccumulative. Tiny aquatic organisms absorb the methylmercury and pass it on to fish which eat them. As these fish are eaten in turn by even larger fish or other wildlife, the concentration of methyl mercury can build up to very high levels at the top of the food chain. It is not unusual for the top predator fish in a waterway to have methylmercury levels more than 200,000 times that in the water surrounding them. Since the methylmercury is distributed throughout the tissues, there is no method of cooking or cleaning the fish that will remove the mercury. For this reason, at least 37 states have issued 'Fish Consumption Advisories' for mercury. In some areas, even store-bought fish may be affected.

What Can You Do?

If you are an administrator...

- ensure that you and your staff are adequately educated about mercury issues and hazards.
- establish and enforce practical policies that encourage the purchase of reduced mercury or mercury-free products for use in schools.
- establish and enforce appropriate policies regarding the disposal of mercury-containing products at the end of their normal life cycle.
- conduct a mercury audit of your school or system... find out where the mercury-containing equipment or chemicals are!
- ensure that there is at least one individual at each school site that is familiar with appropriate spill cleanup procedures.



If you are a teacher who works with mercury...

- ensure that you have the facts concerning mercury hazards and exposure.
- minimize the use of mercury and mercury-containing products in your area of control (labs, shop and vocational classes, etc.)
- learn appropriate cleanup techniques and acquire appropriate spill kits.
- where appropriate (science, shop & vocational, etc.) include a 'mercury appreciation' component into the normal classroom presentations.



If you are on the maintenance or custodial staff...

- a. ensure that you have the facts concerning mercury exposure and hazards in your workplace(s).
- b. become aware of the hardware, equipment, or chemicals you use that may contain mercury.
- c. learn about the proper disposal of mercury-containing equipment and ensure that it is disposed of properly at the end of its life cycle (i.e., don't throw old thermostats in the trash when they're replaced).
- d. pay attention to the cleanup and disposal of broken fluorescent and HID lamps (i.e., don't let broken fluorescent lamps remain in unventilated storage rooms, to prevent the buildup of mercury vapor).



How Do You Clean Up a Mercury Spill?

If the mercury spill is small, it can be easily cleaned up. Mercury spills are considered small if there are less than 10 grams of mercury present (a pool about the size of a quarter). Small mercury spills resulting from broken thermometers and thermostats generally pose no immediate health hazard, but they should be cleaned up to prevent mercury vapors from building up over time.

If the spill is much larger than about 10 grams, you can use a commercially available mercury spill kit (\$15 to \$300) to clean it up. Alternatively, you can simply contain the spill, ensure that the area is adequately ventilated, and call your local health department and a contractor who specializes in mercury cleanup.

If more than a pound (34 milliliters) is spilled, you are legally required to report the spill to the National Response Center (800-424-8802), and should



also contact your local Emergency Planning Committee. A database of these committees is maintained at <http://www.epa.gov/ceppo/lepclist.htm>. Mercury spills of a pound or more are best cleaned up by a contractor specifically trained and equipped to do so.

To contain the mercury spill, you should dam up the mercury using disposable rags or other items to prevent it from spreading. Keep mercury away from drains, cracks, and crevices. Keep people who are not involved in the cleanup away from the area to limit exposures and prevent unnecessary contamination. Ventilate the area; open doors and windows which lead to the outdoors. Exhaust fans that lead to the outdoors are also helpful. Close doors which lead to other areas of the building and turn off air-conditioning or heating systems if they are circulating air from the spill area to other areas of the building.



To clean up a mercury spill, you can use a commercially available spill kit and follow the instructions carefully. If a spill kit is not available, you can follow this general procedure.

Make sure you have determined the maximum extent of the spill. Because of their high density and liquidity, mercury drops can roll many feet from their original point of impact, splitting into much smaller droplets as they impact other objects. Working from the outside of the spill area toward the center, push small mercury beads together with a playing card, stiff paper, or squeegee to form larger droplets. Then push these into a plastic dust pan or use an eye dropper to pick them up. Use a flashlight to look around in the areas of the spill. The light will reflect off the shiny mercury beads and make them easier to see.



Collect all mercury and all mercury-contaminated items in a leak-tight plastic bag or wide-mouth sealable plastic container. Save the container to take to a household hazardous waste site or to a mercury recycling center.

If mercury is spilled onto a rug, it may be best to remove and dispose of that section of the rug because it is very difficult to remove small mercury droplets from this type of material. As an alternative, contractors properly equipped for mercury cleanup will have a specially designed vacuum cleaner that can be used to clean the rug.

If You Are Cleaning Up A Mercury Spill...

- a. **Never use a brush or broom** to clean up mercury. The bristles will just break the mercury beads into even smaller droplets which will be much more difficult to clean up. In addition, very small droplets will contribute more to airborne mercury vapor levels than larger ones.

- b. **Never use an ordinary vacuum cleaner** or shop vacuum to clean up the mercury. Use of the vacuum cleaner will generate large amounts of mercury vapor and blow it out into the room in which it is used. In addition, the vacuum will become contaminated and will have to be disposed of along with the spilled mercury.
- c. **Never use household cleaning products**, particularly those containing ammonia or chlorine, to clean up the mercury. These chemicals will react quickly with the mercury to produce a toxic gas more harmful than the small amount of mercury vapor generated by the spill.
- d. **Never pour the mercury down a drain.** In addition to the general negative environmental impact, the mercury can remain in the trap for months or years, and release mercury vapor into the room if the water in the trap evaporates. Also, when maintenance staff must perform work on that plumbing system in the future, they may also become exposed to the mercury and its vapors.
- e. **Never allow people whose shoes or clothing** may be contaminated with mercury to walk around or leave the spill area until mercury-contaminated items have been removed.

For More Information

U.S. Environmental Protection Agency,
<http://www.epa.gov/mercury/index.html>

Agency for Toxic Substances and Disease Registry,
<http://www.atsdr.cdc.gov/ToxProfiles/phs8916.html>

Minnesota Pollution Control Agency,
<http://www.pca.state.mn.us/air/mercury.html>

University of Wisconsin's Solid and Hazardous Waste
Education Center,
<http://www.mercury-k12.org>

This project was funded, in part, by the U.S. Environmental Protection Agency, and Legacy, Inc.



The Waste Reduction & Technology Transfer Foundation

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