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Basic Information about Mercury

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What is Mercury?

Mercury is a naturally-occurring chemical element found in rock in the earth's crust, including in deposits of coal. On the periodic table, it has the symbol "Hg" and its atomic number is 80. It exists in several forms:

- Elemental (metallic) mercury
- Inorganic mercury compounds
- Methylmercury and other organic compounds

Elemental (Metallic) Mercury

Elemental or metallic mercury is a shiny, silver-white metal, historically referred to as quicksilver, and is liquid at room temperature. It is used in older thermometers, fluorescent light bulbs and some electrical switches. When dropped, elemental mercury breaks into smaller droplets which can go through small cracks or become strongly attached to certain materials. At room temperature, exposed elemental mercury can evaporate to become an invisible, odorless toxic vapor. If heated, it is a colorless, odorless gas. [Learn about how people are most often exposed to elemental mercury](#) and about the [adverse health effects that exposures to elemental mercury can produce](#).

Elemental mercury is an element that has not reacted with another substance. When mercury reacts with another substance, it forms a compound, such as inorganic mercury salts or methylmercury.

Inorganic Mercury

In its inorganic form, mercury occurs abundantly in the environment, primarily as the minerals cinnabar and metacinnabar, and as impurities in other minerals. Mercury can readily combine with chlorine, sulfur, and other elements, and subsequently weather to form inorganic salts. Inorganic mercury salts can be

transported in water and occur in soil. Dust containing these salts can enter the air from mining deposits of ores that contain mercury. Emissions of both elemental or inorganic mercury can occur from coal-fired power plants, burning of municipal and medical waste, and from factories that use mercury. Inorganic mercury can also enter water or soil from the weathering of rocks that contain inorganic mercury salts, and from factories or water treatment facilities that release water contaminated with mercury.

Although the use of mercury salts in consumer products, such as medicinal products, have been discontinued, inorganic mercury compounds are still being widely used in skin lightening soaps and creams. Mercuric chloride is used in photography and as a topical antiseptic and disinfectant, wood preservative, and fungicide. In the past, mercurous chloride was widely used in medicinal products, including laxatives, worming medications, and teething powders. It has since been replaced by safer and more effective agents. Mercuric sulfide is used to color paints and is one of the red coloring agents used in tattoo dyes.

Human exposure to inorganic mercury salts can occur both in occupational and environmental settings. Occupations with higher risk of exposure to mercury and its salts include mining, electrical equipment manufacturing, and chemical and metal processing in which mercury is used. In the general population, exposure to mercuric chloride can occur through the dermal route from the use of soaps and creams or topical antiseptics and disinfectants. Another, less well-documented, source of exposure to inorganic mercury salts among the general population is from their use in ethnic religious, magical, and ritualistic practices and in herbal remedies.

Methylmercury

When inorganic mercury salts can become attached to airborne particles. Rain and snow deposit these particles on land. Even after mercury gets deposited on land, it often returns to the atmosphere, as a gas or associated with particles, and then redeposits elsewhere.

As it cycles between the atmosphere, land, and water, mercury undergoes a series of complex chemical and physical transformations, many of which are not completely understood. Microscopic organisms can combine mercury with carbon, thus converting it from an inorganic to organic form. Methylmercury is the most common organic mercury compound found in the environment, and is highly toxic. [Learn about how people are most often exposed to methylmercury](#) and about the [adverse health effects that exposures to methylmercury can produce](#).

Emissions of Mercury into the Air

Mercury becomes a problem for the environment when it is released from rock and ends up in the atmosphere and in water. These releases can happen naturally. Both volcanoes and forest fires send mercury into the atmosphere.

Human activities, however, are responsible for much of the mercury that is released into the environment. The burning of coal, oil and wood as fuel can cause mercury to become airborne, as can burning wastes that contain mercury.

This airborne mercury can fall to the ground in raindrops, in dust, or simply due to gravity (known as “air deposition”). The amount of mercury deposited in a given area depends on how much mercury is released from local, regional, national, and international sources.

Emissions from Power Plants

Since mercury occurs naturally in coal and other fossil fuels, when people burn these fuels for energy, the mercury becomes airborne and goes into the atmosphere. In the United States, power plants that burn coal to create electricity are the largest source of emissions; they account for about 44 percent of all manmade mercury emissions (*Source: 2014 National Emissions Inventory, version 2, Technical Support Document (July 2018)* (414 pp, 10 MB, [About PDF](#); discussion starts on page 2-23 of the PDF document).

- [Learn more about mercury from power plants](#)

Other Causes of Mercury Air Emissions

- Burning oil that contains mercury
- Burning wood that contains mercury
- Burning mercury-containing wastes, including
 - Wastes from the manufacture of Portland cement
 - Consumer products that contain mercury, like electronic devices, batteries, light bulbs and thermometers, that are thrown into garbage that is incinerated
- Using certain technologies to produce chlorine
- Breaking products that contain mercury
- Burning iron ore, coke and limestone in electric arc furnaces used to produce steel
- Using coal-fired boilers in many industries to generate forms of thermal heat like steam

The burning of municipal and medical waste was once a major source of mercury emissions. A reduction in the use of mercury along with state and federal regulations, however, has led to a decrease in emissions from this source by over 95%.

Trends in Air Emissions

Every year, industrial and commercial facilities are required to report their releases of chemicals through EPA's [Toxics Release Inventory \(TRI\) Program](#). You can view a [chart showing the annual amount of emissions of mercury and mercury compounds into the air from facilities throughout the United States from 2007 to 2017](#). The *2014 National Emissions Inventory, version 2, Technical Support Document (July*

2018). (414 pp, 10 MB, [About PDF](#)) also describes trends in mercury emissions since 1990 in Table 2-14 (see pages 2-28 - 2-29 of the PDF document) and in Figure 2-4 (see page 2-30 of the PDF document).

Mercury Emissions around the Globe

What happens to mercury after it is emitted depends on several factors:

- The form of mercury emitted
- The location of the emission source
- How high above the landscape the mercury is released (for example, the height of a power-plant stack)
- The surrounding terrain
- The weather

Depending on these factors, mercury in the atmosphere can be transported over a range of distances -- anywhere from a few feet from its source, to halfway around the globe -- before it is deposited in soil or water. Mercury that remains in the air for prolonged periods of time and travels across continents is said to be in the "global cycle."

One major source of mercury emissions outside of the U.S. is [small-scale gold mining that occurs in many countries](#).

Additional Resources

- [EPA's Report on the Environment – Mercury Emissions](#)
- [Mercury Study Report to Congress, Volume II: An Inventory of Anthropogenic \[Human-Caused\] Mercury Emissions in the United States](#)
- [Mercury Emissions: The Global Context](#)
- [Global Mercury Assessment 2018](#) EXIT
 - [Technical Background Report for the Assessment](#) EXIT
- [Report: Children's Exposure to Elemental Mercury \(Agency for Toxic Substances & Disease Registry\) \(2009\)](#)

Common Exposures to Mercury

The main way that people are exposed to mercury is by eating fish and shellfish that have high levels of methylmercury, a highly toxic form of mercury, in their tissues. A less common way people are exposed to mercury is breathing mercury vapor. This can happen when mercury is released from a container, or from a product or device that breaks. If the mercury is not immediately contained or cleaned up, it can evaporate, becoming an invisible, odorless, toxic vapor.

Learn more:

- [How people are commonly exposed to mercury](#).
- [How to choose fish and shellfish wisely](#).

Health Effects Associated with Exposures to Mercury

Mercury exposure at high levels can harm the brain, heart, kidneys, lungs, and immune system of people of all ages. High levels of methylmercury in the bloodstream of babies developing in the womb and young children may harm their developing nervous systems, affecting their ability to think and learn.

[Learn more about health effects that can result from exposures to mercury.](#)

Ecological Effects of Mercury Exposure

Birds and mammals that eat fish have more exposures to methylmercury than other animals in water ecosystems. Predators that eat these birds and mammals are also at risk. Methylmercury has been found in eagles, otters, and endangered Florida panthers. At high levels of exposure, methylmercury's harmful effects on these animals include:

- Death
- Reduced reproduction
- Slower growth and development
- Abnormal behavior

Additional Resources

- [National Park Service \(NPS\): Effects of Air Toxics/Mercury on Ecosystems](#)
- [U.S. Geological Survey \(USGS\): Mercury in the Environment](#)
- [Volume VI, Ecological Assessment, and Volume VII, Characterization of Human Health and Wildlife Risks, of the 1997 Mercury Study Report to Congress.](#)

Consumer Products that Traditionally Contain Mercury

- [Some batteries](#)
- [Fluorescent light bulbs, including compact fluorescents \(CFLs\)](#)
- [Many types of thermometers](#)
- [Thermostats](#)
- [Amalgam in dental fillings](#)
- [Thimerosal in vaccines](#)
- [Automotive switches](#)

[Learn more about consumer products that contain mercury.](#)

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