

A STUDY ON MERCURY

Overview

There are two forms of mercury: inorganic mercury and organic methylmercury (MeHg). When inorganic mercury evaporates, it is biotransformed into methylmercury through microbial methylation in saltwater and freshwater sediments. Methylmercury is a persistent environmental contaminant and it bioaccumulates once it enters the food chain, building up in larger organisms that eat smaller, contaminated organisms. This is why large predatory fish such as tuna and shark have notoriously high mercury levels. The process, known as Biomagnification, occurs with many hydrophobic toxins.

Mercury causes nervous system defects in children and impedes fetal development. Numerous poisonings have highlighted the harmful effects of mercury use and mercury pollution.

The neuropsychiatric effects of mercury (and lead) exposure are discussed by Mark Filidei, of the San Francisco Preventive Medical Group, in an article, *Toxic Metals and Mental Health*.

Chemical Description

Inorganic mercury, also known as quicksilver or metallic mercury, is a silvery liquid at room temperature. It is the only metal that is liquid at room temperature, and it has a low boiling point, a high vapor pressure (it evaporates at room temperature), and a high density. It weighs 13.6 times as much as water, and stone and iron can float on its surface.

While all rocks contain some mercury, cinnabar (mercuric sulfide) contains the greatest amount of inorganic mercury (>80%). Elemental mercury is produced from cinnabar by condensing the vapor of heated ores. In the United States elemental mercury is produced primarily as a byproduct of mining.

Inorganic mercury can also combine with elements like chlorine, sulfur, or oxygen to form mercury salts. Mercury ions in the salts are either monovalent (Hg⁺, mercuric) or divalent (Hg²⁺, mercurous).

Mercury Cycle

Main

Article: Mercury

Cycle

The mercury cycle begins with the evaporation of mercury from land and sea sources. Volcanoes and the burning of fossil fuels, especially coal and wastes, account for a large

proportion of mercury released. The vapor is absorbed and distributed evenly throughout the higher levels of the atmosphere, where it is oxidized to water-soluble ionic mercury and returned to the earth's surface in rain (#Clarkson, 2002). Because of this cycle, mercury is a worldwide pollutant and its levels do not vary from unpopulated regions to populated ones.

History of Use

Mercury's useful yet potentially harmful qualities were recognized thousands of years ago by the Ancient Romans, who made the winged messenger Mercury the god of merchants and commerce, as well as of thieves and vagabonds (#Gilbert, 2004). Its toxicity was recognized when Roman slaves mined it in Almaden, Spain; this mine remains a major mercury source to this day.

Mercury use is ubiquitous. The Chinese used cinnabar before 1000 BCE to make products as diverse as red ink, cosmetics, soaps, and laxatives before. The Peruvian Incas first used elemental mercury in gold mines in the 16th century. The mercury was used to bind to gold during sifting and over a period of days, the mercury would evaporate, leaving only the gold behind. This practice still occurs today in Central and South America, Africa, and the Philippines. It is estimated that it takes 3-5 kg of mercury to extract 1 kg of gold (#Gilbert, 2004). A large portion of the mercury contaminates the local area, but much of it evaporates, only to be rained down many miles or countries away.

Organic mercury has antifungal properties that make it beneficial when applied to grain seed, but people become very ill if they consume treated seeds. Throughout much of the twentieth century, seeds were coated with organomercury compounds to reduce destruction by certain fungi (#Gilbert, 2004). During the 1970s, a severe drought rocked Iraq, and a large amount of mercury-treated grain seed was donated as aid. These seeds were often colored pink to warn that they were for planting use only and should not be ground into flour for direct human consumption. However, the Iraqis did not know this, nor could they read the warnings written in English, and many Iraqis made flour and bread out of the seeds. Many people died and many more were disabled for life because of the mercury.

As recently as 1990, mercury compounds were added to interior and exterior paints to prevent bacterial and fungal growth. This practice was halted after adverse effects were seen in a four-year old boy whose unventilated bedroom had been painted with mercury-laden latex paint. The boy contracted acrodynia, a rare disease caused by mercury exposure and characterized by flushed cheeks, pink, scaling palms and toes, profuse sweating, insomnia, and irritability (#Gilbert, 2004).

In the 1800s, mercury was used in the development of photographs called daguerrotypes. Unfortunately, some people experienced mercury poisoning from using this process (Roberts, 1989).

Health Effects

Inorganic mercury causes the most harmful effects when its vapor is inhaled (#Gilbert, 2004). When elemental mercury vapor enters the body, it is readily absorbed into the bloodstream and easily crosses the blood-brain barrier and the placenta. After entering the brain, mercury is oxidized and will not transfer back across the blood-brain barrier. When continuous exposure occurs, mercury accumulates in the nervous system, leading to potentially debilitating nervous system afflictions. Health effects include tremors, drowsiness, depression, and decreased performance on memory and verbal tests.

Adverse health effects from overexposure to methylmercury are much more common and have been observed through several tragic case studies (highlighted below in the #History of Use section). The first case of widespread methylmercury poisoning was in Minamata, Japan, where an abnormally high number of children experienced symptoms similar to cerebral palsy.

Mercury is a known human developmental toxicant. The U.S. National Research Council states, "60,000 newborns annually may be at risk for adverse neurodevelopmental effects from *in utero* exposure to methylmercury (MeHg)" (#Gilbert, 2004). Autopsies of the developing brains of those affected in the Minamata, Japan mercury tragedy show widespread damage to all areas of the brain. Tissues from fetuses killed in the Iraq Mercury Poisoning episode showed disrupted cellular patterns and underdeveloped tissues (#Clarkson, 2002).

Symptoms of exposure arise only after a latency period during which no effects are observed. The length of the latency is indirectly proportional to the level of exposure: the higher the exposure, the less time it takes for the symptoms to be observed.

Source : <http://www.toxipedia.org/display/toxipedia/Mercury>