

Article 4: Mercury in our Surroundings -- Industrial and Institutional Uses

It was just a shiny drop of liquid, just a tiny, glistening drop. It glided over her glove like a jewel. Dr. Karen Wetterhahn, professor of chemistry at Dartmouth College, NH, noticed she had spilled a drop of this substance during a 1995 lab experiment, but gave it no further thought. She had already taken all the standard precautions for working with mercury: she wore protective gloves and eye goggles and worked in a well-ventilated fume hood, which sweeps away chemical vapors. She then washed her hands, cleaned her instruments, and went home.

It was only gradually within the next 5 months that her well-controlled life began to slide off balance. Initially, those around her thought she was suffering left-over effects from a virus she may have contracted on a recent trip to Malaysia. When, at times, she lost her focus and began bumping into doors or suddenly falling down, her family began to worry. Words seemed to be getting stuck in her throat. Her hands tingled. She felt as if her whole body were moving in slow motion. Finally, after numerous tests at the hospital, came the diagnosis, "It's mercury poisoning."

At that time, unfortunately, little was known about the extraordinary dangers of dimethylmercury, the rare man-made chemical compound Dr. Wetterhahn had spilled. Scientists didn't know it could seep through a latex glove like a drop of water through a Kleenex. Doctors didn't know it could break down the body over the course of a few months, slowly, insidiously, irreversibly. No one knew how to stop its deadly progress, as it cut off her hearing, her speech, and her vision, reducing her body to a withered shell. Six months after her accident, she fell into a coma, and 4 months after that she died. A most distinguished and respected scientist had died just 10 months after dimethylmercury had permeated her gloves and was absorbed through her skin into the bloodstream.

An intensive search of the medical literature had turned up only one other case of dimethylmercury poisoning in this century. A Czech chemist in 1972 had suffered the same symptoms and died. More well-known mercury poisoning epidemics, like those in Japan in the 1950s and 1960s were caused by methylmercury exposure. Those in Iraq in the 1970s resulted from eating mercury-poisoned bread. By the time the symptoms of mercury poisoning occur, it is too late to do anything about it.

Mercury -- both alluring and alarming

Mercury is one of the oldest and deadliest poisons, a highly toxic metal mined from a brilliant red ore, with powers that have enticed scientists for centuries. It can cure and it can kill. There are three main forms:

- Elemental mercury is the silvery liquid used in thermostats, barometers and batteries -- and by experimenting students in chemistry class. It is also used in folk medicine and in some religious practices. It vaporizes quickly when heated and is toxic only in its vaporized form. Mercury has a high vapor pressure and can be transported long distances before being deposited back to Earth. Mercury has become a truly global pollutant.

- Inorganic mercury salts are used as antiseptic creams and ointments. One of the most commonly used mercury salts is calomel, a white powder employed in electrochemistry.
- Organic mercury compounds, such as methylmercury and dimethylmercury, are sometimes used as fungicides and herbicides, and are by far the most dangerous forms. Unlike elemental mercury, they can readily be absorbed by the body, and signs of poisoning take a misleadingly long time to appear.

Sources of mercury pollution

Human activity accounts for about 60% of the mercury releases to the atmosphere. In the U.S., major combustion processes, such as fossil fuel-burning power plants, and incineration processes, such as municipal and medical waste incinerators, contribute most of the mercury emissions from unnatural sources. Additional smaller sources of air pollution from mercury include manufacturing processes and scattered, diffuse discharges. Natural sources such as volcanoes and wind-blown dust contribute the remaining 40% of mercury emissions.

Current Reduction Efforts

In most applications, manufacturers are attempting to use less mercury. Increased environmental regulations direct industries toward mercury-free processes and products. Mercury use in the U.S. has plummeted from 2,000 tons annually in the early 1980s to less than 500 tons today. The EPA will soon require power plants with a capacity of 25 megawatts or more to test and report mercury levels in coal feed stocks. Certain plants will be required to measure the level of mercury in their smokestacks. Furthermore, U.S. chlor-alkali plants, which produce chlorine and caustic soda, are converting from mercury-cell technologies to other, more modern methods, which do not pollute the environment. The European chlorine industry is tackling the same problem and gradually converting or closing its mercury-cell plants.

Elimination of health threats from mercury-containing products

The US has for a number of years prohibited further manufacture of former mercury-containing products, such as skin-bleaching cosmetics, dubious "snake oil" medicines, batteries, and pesticides. All of these precautions are necessary, since mercury has been shown to be a neurotoxin with damaging health effects on humans and animals, most critically on the developing fetus. Exposure to elemental mercury vapors can cause acute respiratory problems, followed by neurological disturbances and general systemic effects.

In the next article, we will describe a number of mercury-containing devices and appliances found in both the home and in industry. A list of those to be turned in on Mercury Collection Day, Saturday, May 19, will be issued by the town.