



EARTHWORKS

MERCURY AIR POLLUTION AT GOLD MINES

Gold mines can be a significant source of mercury air pollution

Although considerable attention has focused on coal-fired power plants as a source of mercury air pollution, gold mines can also be a source of mercury air pollution. Not all mines release mercury. The amount depends on the amount of mercury contained in the ore and the type of processing that occurs at the mine.



Processing facilities at a Nevada Gold mine.

Some mines can be very large individual sources. For example, the Twin Creeks Mine, located in northern Nevada, is the 9th largest source of mercury air emissions in the U.S. It emitted 850 pounds of mercury in 2012.¹

Most mercury is released into the air during the stages of mining that involve heat, such as ore roasters, autoclaves, and retorts. The mercury in the ore is released into the air when the ore is heated to extract the gold. New research has also found that heap leach piles and tailings ponds may also be a source of mercury air

pollution, where the mercury can volatilize, or “off-gas” into the air.²

Impacts to Fish and Wildlife

When mercury is released into the air, it can travel large distances before it eventually falls back onto the land and into rivers, streams, wetlands and lakes. Scientists have reported that air currents likely carry mercury downwind from Nevada mines to Idaho, Utah and perhaps other states. This has raised concerns from down-wind states about the impacts of these emissions to water, fish and wildlife resources. For example, researchers at Salmon Falls Creek Reservoir in southern Idaho, have recently detected mercury levels far higher than those found in lakes in the northeast U.S.³ Mike Abbott, an atmospheric scientist with the Idaho National Laboratory (INL), found that mercury levels in the region increased as much as 70 percent when winds blew from the Northern Nevada direction. 'The mines are the only sources big enough to cause those peaks,' Abbott told the *Idaho Statesman* newspaper in November 2005.⁴



When mercury enters water, it is taken up by bacteria, which convert it into another type of mercury called “methylmercury” that fish, wildlife and people can readily absorb. Fish absorb mercury as it passes over their gills and as they feed on plants and small organisms. When larger fish eat smaller fish, mercury can build up to high levels in the tissues of the big fish. So fish at the top of the food chain -- large predatory fish -- can contain mercury in their muscle tissue that is much higher than the mercury concentration in the surrounding water.

¹ U.S. Environmental Protection Agency, Toxic Release Inventory, 2012.

² Eckley C.S., et. al., “Measurement of surface mercury fluxes at active industrial gold mines in Nevada (USA),” *Science of the Total Environment* 409 (2011) 514-522.

³ “Mercury rising? Studies reveal high mercury levels at Salmon Falls Reservoir,” *The Times News*, November 6, 2005.

⁴ Salt Lake Tribune, “Mines may be adding mercury to reservoir,” November 10, 2005. http://www.sltrib.com/utah/ci_3200170



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In the United States, over 750,000 river miles and 13 million acres of freshwater lakes in the U.S. are under a fish consumption advisory, warning the public to limit the amount of fish they eat. High mercury levels have also recently been found in brine shrimp and the ducks that feed on them in the Salt Lake region of Utah. As a result, the State of Utah recently issued the first waterfowl consumption advisory in the U.S.⁵

Serious Public Health Effects

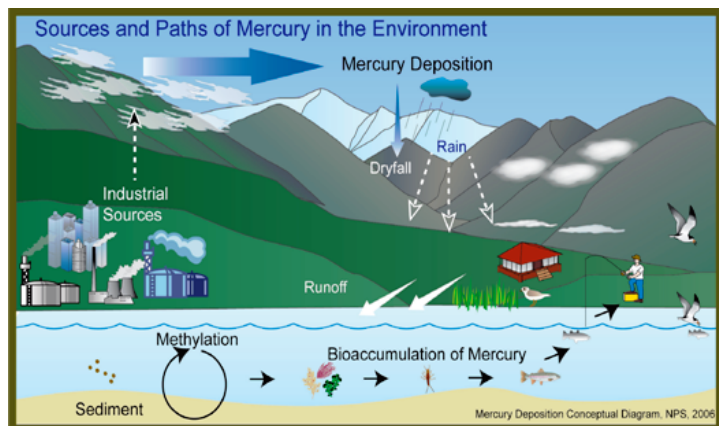
Mercury can cause health effects in people of all ages. The most common way for people to be exposed to mercury is by eating fish that have accumulated mercury in their bodies. Since mercury accumulates in the muscle and tissue of organisms, exposure to this heavy metal cannot be limited through cooking or removal of fat.⁶ The more mercury that gets into a person's body, the longer the exposure time, and the younger the person, the more severe the effects are likely to be.

Mercury is most harmful to the developing brains of unborn children and young children. Prenatal exposure to mercury can affect the way children think, learn, and problem-solve later in life. Children of women exposed to relatively high levels of methylmercury during pregnancy show delayed onset of walking and talking, reduced neurological test scores, and delays and deficits in learning ability.

Effects can also occur in adults at much higher doses. The earliest obvious signs of mercury poisoning in adults are tingling or numbness of the lips, tongue, fingers, or toes; fatigue; and blurred vision. EPA officials also say there is growing evidence that methylmercury exposure can have adverse cardiovascular effects for adults, resulting in elevated blood pressure and incidence of heart attack.

Worker Health Risks

For those who work at mines, exposure may include inhalation of mercury vapor and the absorption of mercury through the skin. According to the U.S. Mine Safety and Health Administration (MSHA), mercury continues to pose hazards to present day miners. A 1997 MSHA report documented frequent incidences of worker overexposure.⁷



Mercury Regulations

In 2006, Nevada was the first state to enact regulations that require gold mines to control their mercury air emissions. This was followed in 2010 by federal regulations enacted by the Environmental Protection Agency (EPA), that require gold mines throughout the U.S. to put in place pollution control devices and meet specific emission limits. These regulations have reduced mercury air emissions nation-wide, however, they still allow a significant amount of mercury to be released at large mines with high mercury concentrations.

⁵ Mercury, A Worry for Duck Hunters, Salt Lake Tribune, June 6, 2005.

⁶ <http://www.usgs.gov/themes/factsheet/146-00/>

⁷ U.S. Mine Safety and Health Administration (MSHA). 1997. "Controlling Mercury Hazards in Gold Mining: A Best Practices Toolbox". Draft, September. <http://www.msha.gov/S&HInfo/mercury/HGTB.pdf>