

Montana Mercury Facts

What Is Mercury and Where Does It Come From?

Mercury is a dense, highly toxic metallic mineral that enters the air from the mining of ore deposits, the burning of coal, and the incineration of waste.¹

According to the EPA, coal-fired power plants are the largest source of human caused mercury pollution in the country.² According to the EPA's Toxic Release Inventory these plants emit more than 40% of the mercury emission nationwide.³

In recent years, coal-fired power plants reported that they were responsible for 95% of all industrial mercury air emissions in Montana and 75% of air and water mercury emissions.⁴

The amount of emissions from coal-fired power plants is expected to increase in the coming years due to an estimated 26% increase in coal consumption by 2020.⁵

In Montana alone, six new coal fired power plants have been proposed. Two have already agreed to install equipment to control mercury. Very few states have proposals for more new plants than Montana.⁶

How Does Mercury Pollution Effect Public Health?

Mercury is a potent neurotoxin. Its levels magnify, or bioconcentrate, as they move up the food chain. A very low concentration of mercury in a water body can still lead to very high levels in fish and even higher in animals or humans that consume fish. Organic mercury or methylmercury (MeHG) is the most toxic form of mercury. It is taken up by plant and aquatic life and accumulates in fish.⁷

Effects of Mercury on Women and Children

- Young children and women of childbearing age are at greatest risk of adverse health effects from consuming mercury-laden fish.
- Mercury has been proven to be toxic to the embryo and causes developmental malformations. Mercury readily crosses the placenta and accumulates in human fetal tissues.⁸ Because mercury bioconcentrates as it moves up the food chain, infants are born with higher blood mercury levels than their mothers.⁹

¹ Department of Health and Human Services, Center for Disease Control and Prevention. "Second National Report on Human Exposure to Environmental Chemicals." January, 2003.

² U.S. EPA. *Propose Rules of the Federal Register Notice*. Vol. 69, No. 20, Part IV. January 30, 2004.

³ U.S. EPA. *An Inventory of Anthropogenic Mercury Emissions in the United States Volume II of Mercury Study Report to Congress*. 1997.

⁴ This figure excludes emissions from ASARCO's East Helena lead smelter which closed that year. Toxic Release Inventory, EPA, 2001. <http://www.epa.gov/tri>

⁵ U.S. EPA, Mercury Update: Impact on Fish Advisories (fact sheet), June 2001.

⁶ [http://www.netl.doe.gov/coal/refshelf/New%20Coal%20Plants%20\(7-25-05\).pdf](http://www.netl.doe.gov/coal/refshelf/New%20Coal%20Plants%20(7-25-05).pdf)

⁷ EPA web site: <http://www.epa.gov/waterscience/criteria/methylmercury/factsheet.html#adv>

⁸ Foster, G.F., Jarrell, J.F., Younglai, E.V., Wade, M.G., Arnold, D.L., and Jordan, S. "An overview of some reproductive toxicology studies conducted at Health Canada." *Toxicology and Industrial Health* 12:447-457(1996).

⁹ Galster, W.A. "Mercury in Alaskan Eskimo Mothers and Infants." *Environmental Health Perspective*. 15:135-140(1976).

- Chronic exposure to mercury can lead to visual impairments, hearing deficits, motor and mental disturbances.¹⁰
- 1 in 6 women of childbearing age have elevated levels of mercury in their blood, putting more than 600,000 newborns at risk each year.¹¹
- A recent study by the University of Texas found that autism rates in Texas counties increased as mercury emissions rose. For every thousand pounds of mercury released per county, autism rates in children rose 17 percent and special education cases rose 43 percent.¹²
- A study published in the *Journal of Pediatrics* in February 2004 tracked the health of children who were exposed to mercury because their mothers ate contaminated fish. Over the first 14-years of their life, doctors found mental delays and hearing problems among other problems. The doctors concluded that the neurotoxic effects from their exposure to mercury in the womb were irreversible.¹³
- The National Academy of Science concluded that the neurological damage to children exposed to mercury consumption of fish during their mother's pregnancy, will result in an increase in the number of children who have to struggle to keep up in school and who might require remedial classes or special education.¹⁴
- Mercury has profound, toxic effects upon the immune system as it inhibits most lymphocyte functions that are essential to a functioning immune system. Mercury has also been linked to an increase in allergic reactions.¹⁵
- Recent studies also indicate that fetal exposure to methylmercury is associated with cardiac abnormalities in children as well as men.¹⁶

Effects of Mercury on Men

- Men suffer the same neurological effects and immune deficiencies from prolonged exposure to mercury as women; however, studies have also shown that men that are exposed to mercury suffer cardiovascular problems as well. The *New England Journal of Medicine* found in a case study done on over 400 men from eight European countries and Israel, that mercury levels were directly associated with increased risk of heart attacks.¹⁷
- A study published by the American Heart Association found a 50-70% greater risk of heart attacks, heart disease, and cardiovascular disease in men ages 42 to 60 who had elevated levels of mercury in their body. The study found that the men with the highest mercury levels ate twice as much fish as the rest of the men in the study. The study concluded that the health benefits of Omega 3 fatty acids

¹⁰ Rice, D.C. "Neurotoxicity of Lead, Methylmercury, and PCB's in Relation to the Great Lakes." *Environmental Health Perspectives*. 103(supplement 9):71-81 (1995).

¹¹ The National Academy of Sciences. "Toxicological Effects of Methylmercury." National Academy Press. 2000. p. 325. <http://www.nap.edu/openbook/0309071402/html>,

¹² Palmer, R.F., et al. , "Environmental mercury release, special education rates, and autism disorder; an ecological study of Texas." *Health and Place*, doi:10.1016/j.healthplace.2004.11.005

¹³ Katsuyuki Murata, et. al. "Delayed brainstem auditory evoked potential latencies in 14-year-old children exposed to methylmercury." *Journal of Pediatrics*. 144 (2):177-183 (2004).

¹⁴ The National Academy of Sciences. Ibid. p. 9

¹⁵ Moszczyński P. "Mercury Compounds and the Immune System: A Review." *Int J Occup Med Environ. Health*;10:247-258 (1997).

¹⁶ Grandjean et al. "Cardiac Autonomic Activity in Methylmercury Neurotoxicity: 14-year follow-up of a Faroese Birth Cohort." *Journal of Pediatrics* 144:169-176. (2004).

¹⁷ Guallar, Eliseo. et al. "Mercury, Fish Oils, and the Risk of Myocardial Infarction." *The New England Journal of Medicine*. 347(22): 1747-1754. (2002).

found in fish appeared to be more than offset by the disadvantages of high levels of mercury in the these men.¹⁸

How Does Mercury Pollution Effect Montana's World-Class Fisheries & Wildlife?

- After mercury is emitted into the air, it falls back to the earth in rain or snow and accumulates in microorganisms that live in the water. These microorganisms transform mercury into methylmercury, a form of mercury that is severely toxic to humans.
- According to the State, Montana already has 418,836.80 acres of lakes and 1,280 miles of streams that are impaired due to mercury contamination.¹⁹
- As mercury moves up the food chain, it concentrates or bioaccumulates. For example, the amount of mercury in the predator fish in the top of the aquatic food chain can be 1 million to 10 million times greater than the concentration of mercury in the surrounding water.²⁰
- In 2003, the Montana Department of Public Health and Human Services issued a statewide mercury advisory for northern pike, lake trout, and walleye in all of Montana's rivers and streams.²¹ Bighorn Lake, Flathead Lake, Lake Frances, and the Tiber Reservoir all have walleye with over 0.78 micrograms (μg) of mercury per gram of fish. In addition, the cutthroat trout in Silver Creek near Helena have tested to show over 3.0 $\mu\text{g}/\text{g}$ of mercury in trout and for this reason it is closed to harvest, meaning fishing is restricted to catch and release only.²²
- The Montana Department of Health and Human Services (MDHHS) recommends that men and adult women past childbearing age who eat local fish regularly should only eat fish with mercury levels greater than 0.66 $\mu\text{g}/\text{g}$ once a month. For women of childbearing age and children, MDHHS recommends not eating fish with this high of a mercury level at all.²³
- It has been known for years that mercury threatens wildlife in aquatic ecosystems (from fish and waterbirds, to fish-eating mammals such as mink and otter). However, a recent study in the Journal of Ecotoxicology found that forest songbirds in northeastern North America have high levels of methylmercury as well.²⁴ The scientist theorize that the emissions from up-wind coal-fired power plants deposit mercury on leaves, which in turn are consumed by the food source for the songbirds. Science has not yet focused on other species that may be equally impaired.

Is the Technology to Control Mercury Commercially Available?

Yes. Activated Carbon Injection (ACI) is one of several mercury removal technologies and it is commercially available for all coal types. ACI has been used commercially to reduce mercury emissions from municipal solid waste incinerators for over twenty years. The systems are simple and readily available. Already full-scale ACI systems have been installed on about 40 U.S. coal-fired boilers in temporary ACI trials. Two coal-fired power plants in Montana have agreed to install ACI technology.

¹⁸ Virtanen et al. "Mercury, Fish Oils, and Risk of Acute Coronary Events and Cardiovascular Disease, Coronary Heart Disease, and All-Cause Mortality in Men in Eastern Finland." *Arteriosclerosis, Thrombosis, and Vascular Biology*. American Heart Association. 2005: 25:228.

¹⁹ Montana Department of Environmental Quality. EnviroNet. Watershed Information.

<http://maps2.nris.state.mt.us/wis/tmdlapp/SummaryForm2002.asp?Cau=Mercury&Inst=10945&Cnt=51>

²⁰ Figdor, Emily. Ibid.

²¹ See, *National Listing of Fish and Wildlife Advisories*: <http://map1.epa.gov>

²² MT Dept. of Public Health and Human Services. Communicable Disease Control and Prevention Bureau Food and Consumer Safety Section. "2002 Montana Sport Fish Consumption Guidelines." June, 2002.

²³ Ibid.

²⁴ Rimmer, C., et al. "Mercury Concentrations in Bicknell's Thrush and Other Insectivorous Passerines in Montane Forests of Northeastern North American." *Ecotoxicology*, 14, 223-240, 2005.