

Wisconsin Environmental Health Network

Health Effects of Metallic Sulfide Mining

BACKGROUND

WHAT IS METALLIC SULFIDE MINING?

Metallic sulfide mining is the mining of metals like copper, nickel, zinc and gold that are naturally bound to sulfur in rock. Metallic sulfide mining produces acid wastes that mobilize the release of heavy metals and other toxic chemicals into the environment.

EXAMPLE OF A WISCONSIN METALLIC SULFIDE MINE

A small sulfide mineral deposit was mined near Ladysmith along the Flambeau River in the mid-1990's. The Flambeau Mine severely contaminated groundwater with high levels of manganese, zinc, copper and sulfates, picked up by monitoring the backfilled pit. It also violated the Clean Water Act polluting a tributary called "Stream C". Larger Wisconsin sulfide ore deposits create significantly more risk to ground and surface waters.

ACID MINE DRAINAGE

Metallic sulfide mining removes millions of tons of rock, which is then processed to extract the small fraction of desired metals. When the sulfide mineral ore and wastes come into contact with air and water, chemical reactions produce sulfuric acid, sulfate and toxic metals, which seep into surface and ground water. This is an ongoing process for centuries to come even after the mine is closed. In wetter climates like Wisconsin, our surface water and shallow ground waters are at particular risk for contamination.

TOXIC METALS AND COMPOUNDS

Heavy metals and other toxic compounds that are associated with metallic sulfide mining include arsenic, asbestos, benzene, cadmium, copper, cyanide, dioxin, lead, mercury, manganese, nickel, selenium, sulfuric acid, thallium and zinc. Additionally, particulates from fossil fuels and airborne fibers are created from mining activities.

HEALTH EFFECTS OF HEAVY METALS OVERVIEW

Heavy metals most associated with poisoning are arsenic, cadmium, lead, and mercury. Other metals that are essential to body functions in very small amounts in humans can also be toxic in larger exposures. These include copper, zinc, and manganese. Heavy metals bioaccumulate and biomagnify as they move up the food chain starting with microbes and small animal, then moving up and accumulating in larger animals.

- Arsenic affects the brain (seizures, coma), GI system (diarrhea, flu-like symptoms), heart (failure, abnormal rhythm), kidneys, and causes anemia.
- Cadmium can accumulate in fish and in agricultural soils. Long term human exposures to contaminated food sources can cause cadmium to persist in the human body, most commonly causing kidney failure.
- Lead is a well-known heavy metal in human environments (e.g. lead paint, lead pipes). It is stored in the bone but affects any organ system causing nausea, vomiting, headaches, clumsiness, anemia and many toxic brain effects.

WHAT IS METHYLMERCURY?

Acid mine drainage causes non-toxic inorganic mercury release into the environment. Methylmercury is the form of mercury that causes toxicity. It is formed from the action of microbes in surface waters and soils on inorganic mercury, turning non-toxic inorganic mercury into toxic methylmercury.

Acid mine drainage is not the only source for mercury release into the environment. When gold is excavated and heated during processing, mercury can be released into the air. Dr. David Chambers has noted that mercury will be emitted in dust particles and as gaseous emissions from the Back Forty's processing plant. Mercury is also released as fugitive dust and gaseous emissions from the tailings pond and tailings beach.

The Back Forty mine site is especially vulnerable to methylmercury contamination because of the extensive wetlands around the mine that can accumulate mercury in higher concentrations and for longer periods. According to scientists at Michigan Technological University and the EPA, "One of the worst landscapes for mining mercury releases is into a wetland environment."

Pregnant women exposed to methylmercury from eating contaminated fish, expose the unborn child. If exposure occurs early in pregnancy, severe immediate effects can be seen. If later in pregnancy, effects may be evident later as the child's brain develops causing effects on language and speech development, memory, and even on visual and motor function. Attention deficit hyperactivity disorder is also linked to increased blood levels of mercury. These effects are likely underestimated.

Methylmercury affects adults too, and is associated with heart disease and psychiatric symptoms like hallucinations.

FISH AND MERCURY

Mercury contamination of fish is already a significant public health concern in Wisconsin due to both naturally occurring mercury and human industrial activity (e.g. coal-fired electric plants, smelting and incineration of waste). Mercury toxicity is especially of concern in populations that consume more fish such as

recreational anglers, members of some ethnic or cultural groups such as members of some Native American tribes. Five Northern Wisconsin Chippewa tribes participated in a study showing a much higher consumption of fish, about 62 meals/year.

HEALTH EFFECTS OF OTHER TOXIC COMPOUNDS

FUGITIVE DUST

Fugitive dust is dust generated during transport of the mining ore, as well as dust from unpaved mining roads. These dust particles of all sizes become airborne creating a health hazard to both mine workers and residents living near the mine.

ELONGATED MINERAL PARTICLES

Elongated mineral particles (EMP's) are non-asbestos mineral fibers that cause uncertain risk to human health. Unlike asbestos, these particles have not been as well studied for their effects on mine workers and other exposed people.

FOSSIL FUELS

Fossil fuels are used in all aspects of mining production. Particulates are released when fuels are burned affect asthma, heart disease, diabetes, and many other health conditions.

LONG TERM EFFECTS AND MONITORING

Health problems resulting from these exposures are not curable, causing pain and suffering for individuals, families, and populations. Furthermore, some Native American peoples in Wisconsin are threatened by proposed mining affecting their fishing and wild rice harvesting traditions due to irreversible surface water contamination.

Many medical consensus groups have called for better monitoring and reduced exposures to toxic chemicals. Though the Mine Safety and Health Administration (MSHA), the National Institute of Occupational Health and Safety (NIOSH), and the Occupational Safety and Health Administration (OSHA) oversee and regulate mining safety, there is no comprehensive long-range medical surveillance for sulfide mining.

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