MAJOR PUBLIC HEALTH RISKS OF METALLIC SULFIDE MINING

The following report is being used as a (very successful) handout at various public events. Information for the report was compiled by NMW members Jonathon Green and Joy Schochet, with additional contributions by Elanne Palcich and Brad Sagen. We consider the report, "a work in progress." Member suggestions are welcome.

Basic Health Dangers of Sulfide Mining

Metallic sulfide mining (MSM) is an extractive and minerals processing activity that has proven extremely dangerous to public health and safety. According to the Environmental Protection Agency, mining accounts for 40 percent of all toxic waste produced in the U.S. The most basic danger to public health from MSM is organ and body systems damage caused by mercury (methylmercury) released from acid mine waste drainage and by small amounts of metals released in processing and from mine waste. Children and pregnant women are at special risk.

Sources of Toxic Waste

The process by which heavy metals can be obtained from low-grade sulfide bearing ores is known as metallic sulfide mining (MSM). But this technology comes with its own price - the release of sulfuric acid and metals during processing and in waste which can then leach into wetlands and groundwater in toxic concentrations. The proposed NorthMet site of the PolyMet Corporation (near Babbitt, MN) is estimated to create almost 500 million tons of unprocessed ore and waste rock during its projected 20 Year lifespan. Copper and Nickel are the major heavy metals sought in most of the proposed Minnesota mining projects. The health effects of copper-nickel mining will be the focus of this report.

Toxic substances are most often found in the water used in minerals processing and in water after contact with unprocessed ore and waste rock. During the mining process, formerly inert sulfide rock is exposed to air and water and a chemical reaction occurs during which sulfuric acid is formed. This very strong acid, dissolved in water, contaminates both ground and surface waters in the area beneath and surrounding the mine. Sulfuric acid also releases from the rock, trace metals, detrimental to humans as well as wildlife. The toxic waterborne brew likewise contaminates soil, surface and ground waters. Unfortunately,
Acid mine waste may continue to disperse from the mine and waste for unforeseen periods of time. Leakage is still occurring from Roman mines inactive for more than 2000 years!
Water-borne contaminants can also be transported over long distances, even 100 miles or more. No metallic sulfide mining operation in the world has avoided releasing a significant amount of acid mine drainage. Many of these mines are now EPA Superfund sites.

Health Consequences of Contact with Metallic Sulfide Waste

Humans can be affected by acid mine drainage in several ways:
by drinking contaminated water,
in food (principally fish living in contaminated water),
by contact with contaminated soil.

In the case of NorthMet, most people will encounter toxic compounds in the flesh of fish caught in water contaminated by acid mine drainage. Assays demonstrate that aluminum, beryllium, chromium, cobalt, copper, lead, nickel and manganese all exceed surface and/or ground water standards at the NorthMet site, even before the commencement of mining operations. Mercury and ammonia are also present in the water. And this is the water that is to be used in the mining process and then released into the environment, enhanced by the toxic by-products of the mining processes. The most dangerous substances likely to be found at the NorthMet site as a result of mining are mercury (methylmercury), sulfuric acid, and the heavy metals of arsenic, copper, lead, and manganese.

Methylmercury: MSM greatly increases the amount of available (naturally-occurring low level) mercury because the sulfuric acid produced during MSM releases it from the rock and because the land disturbance of mining also releases mercury stored in soil, peat, and wetlands. Water leaving the mining site is thus

contaminated with both mercury and sulfuric acid, a deadly combination, since the sulfur allows bacteria to convert metallic mercury to methylmercury.

Methylmercury, initially taken up by aquatic plants and animals, builds up in the flesh of the fish which eat them. Consumption of mercury affected fish absorbs much higher than normal levels of mercury. Methylmercury can remain in soil and water for a very long time and its toxic effects are cumulative.

The most serious effects of methylmercury poisoning are on the nervous system. Relatively low amounts of mercury can cause permanent damage, especially to the fetus. Mental retardation, blindness and cerebral palsy are potential conditions affecting children of women who have eaten food containing high levels of methylmercury. Increases in the number of spontaneous abortions and stillbirths have been reported after exposure to methylmercury.

Methylmercury is known to cause many neurological and behavioral changes, such as blindness, deafness, and speech difficulties. Internal organs such as the kidneys, stomach and large intestine can also be affected. In some cases the male reproductive system is affected, and recent studies have reported increased heart disease among males exposed to methylmercury.

Sulfuric Acid: Acid mine drainage is water contaminated when pyrite, an iron sulfide, is exposed and reacts with air and water to form sulfuric acid and dissolved iron. Some or all of this iron can precipitate to form the red, orange, or yellow sediments in the bottom of streams into which mine drainage flows. Acid runoff further dissolves heavy metals such as copper, lead, and mercury which then contaminate ground and surface waters and soils, including drinking supplies and recreational sites. Sulfuric acid mist can be released into the air from waterbased minerals processing, and then return as acid rain.

Arsenic: Arsenic is one of the most poisonous substances in existence. Arsenic can sometimes be found in the pit walls of MSM mines and can be increased by the lime used to neutralize acid mine waste. Small amounts in drinking water have been linked to cognitive and motor impairment in children and larger amounts to skin damage and circulatory problems in adults.

Copper: Copper can enter the environment from mining waste. One of the most common adverse effects of copper is gastrointestinal distress. Nausea, vomiting, and/or abdominal pain have been reported. Copper is also irritating to the respiratory tract. Coughing, sneezing, runny nose, and pulmonary fibrosis have been reported in workers exposed to copper dust.

Lead: Lead is extremely persistent in both water and soil. It is found in soil and in sediments in aquatic systems. Lead contamination occurs as a result of the mining and processing of ores in which lead is found. During mining operations, lead may be released to land, water, and air. Lead becomes more soluble and therefore more available in acidic water, such as the effluent from MSM. Because lead does not degrade, MSM leaves higher concentrations of lead in the environment, virtually forever.

Lead adversely affects numerous body systems and impairs health after periods of exposure of only days (acute exposure) or of years (chronic exposure). The severity of symptoms increases with the concentration of lead in the blood. Common symptoms of acute lead poisoning are loss of appetite, nausea, vomiting, stomach cramps, constipation, difficulty in sleeping, fatigue, moodiness, headache, joint or muscle aches, anemia, and decreased sexual drive. Acute lead poisoning from uncontrolled occupational exposures has resulted in fatalities. Long term overexposure to lead may result in severe damage to the blood-forming, nervous, urinary, and reproductive systems.

Manganese: Manganese is another heavy metal typically released in water as a result of minerals processing. Small amounts in drinking water have been linked to cognitive (general IQ and memory) and motor impairment in children, and larger amounts to Parkinson ’s disease.

All of the health problems mentioned above increase over time as water and mine effluents continuously flow over old and new mine tailings, acid rock waste, and other wastes from the mining process.

The Safety Record of Metallic Sulfide Mining

From a health and environmental safety perspective there has never been a successful MSM mining operation in North America. Not one! The State of Wisconsin now has a law that no new MSM operation may be approved until there is evidence that a mine has operated safely in North America for a period of ten years and that a mine has been closed successfully (no release of toxic materials) for a similar period of time. No MSM mine has met these criteria.

Who Pays?

Who pays when MSM operations and waste treatment and control turn sour as they inevitably do? Most often not the mining companies that have removed their considerable profits and then declared bankruptcy. The largest human costs occur in the health, life span, and quality of life of those directly affected by MSM contamination. These health and health related costs are often difficult to quantify and are seldom reimbursed to any degree.

Fortunately, advances in health knowledge and in government/public awareness of MSM dangers (typically once a disaster inevitably occurs) have lowered to some degree the direct MSM health effects on citizens. Such awareness after the fact however, has only increased the costs associated with relocation of residents from contaminated areas, reclamation of affected areas, loss of property values in affected areas, and waste and waste water treatment and control for perhaps 'perpetuity. Bankrupt mining companies contribute little if anything to such efforts. Relocation, reclamation, treatment and control costs are paid overwhelmingly by the American taxpayer. WHO PAYS? YOU DO!