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Review: Water Quality and Mining Impacts with health

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Abstract

The use of water in mining has the potential to affect the quality of surrounding surface water and groundwater. In response to environmental concerns and government regulations, the mining industry worldwide increasingly monitors water discharged from mine sites, and has implemented a number of management strategies to prevent water pollution. Water issues and management vary from site to site and must be addressed locally, but in general, the mining industry seeks to minimize its impact on water quality and availability. Mining operations use water for mineral processing and metal recovery, controlling dust, and meeting the needs of workers on site. The amount of water required by a mine varies depending on its size, the mineral being extracted, and the extraction process used. For instance, metal mines that chemically process ore to concentrate metals such as copper and gold use much more water than non-metal mines such as coal, salt, or gravel mines.

Keywords:-Copper, Nitrate, Fluoride, Zinc ,lead and water quality

Introduction

Water is the most vital resource for life. Approximately 97.2% water lies in oceans as salt water. While 2.15% in frozen ice from and the remaining 0.65% remain as fresh either on surface or ground water. Available fresh water resources are very limited. The demand for fresh water has increased day by day and will increase with the rapid growth of population, agriculture and industry. As a result the fresh water reserve depletes day by day too. The requirement of clean water per person is about 2.7 lit per day, thus the global requirement is about 5 billion cu. m. only for drinking purpose. In societies like our India with developing economics, the optimum development, efficient utilization and effective management of their water resources should be the dominant strategy for economic growth. But in recent years unscientific management and use of this resources for various purpose almost invariably has created undesirable problems in its wake, water logging and salinity in the case of agriculture use and environment pollution of various limits as a result of mining, industries and municipal use (Kumar et al., 2008).

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"Mine water is produced when the water table is higher than the underground mine workings or the depth of an open pit surface mine. When this occurs, the water must be pumped out of the mine. Alternatively, water may be pumped from wells surrounding the mine to create a cone of depression in the ground water table, thereby reducing infiltration. When the mine is operational, mine water must be continually removed from the mine to facilitate the removal of the ore. However, once mining operations end, the removal and management of mine water often end, resulting in possible accumulation in rock fractures, shafts, tunnels, and open pits and uncontrolled releases to the environment. "Ground water drawdown and associated impacts to surface waters and nearby wetlands can be a serious concern in some areas. "Impacts from ground water drawdown may include reduction or elimination of surface water flows; degradation of surface water quality and beneficial uses; degradation of habitat (not only riparian zones, springs, and other wetland habitats, but also upland habitats such as greasewood as ground water levels decline below the deep root zone); reduced or eliminated production in domestic supply wells; water quality/quantity problems associated with discharge of the pumped ground water back into surface waters downstream from the dewatered area.

Zinc:

Usually zinc is found in abundance in earth crust in the ore form (sphalerite – ZnS) with the associates of lead element. It is found in soil, water, air and in all food items. The process by which zinc comes in environment includes the human activity as well as natural phenomenon. The various human activities which led to entrance of zinc elements in the surrounding environment are mining, purifying of zinc, cadmium, and lead ores, coal burning, steel production, and burning of wastes. Most of the zinc in water bodies, such as lakes or rivers, settles on the bottom. However, a small quantity may remain either dissolved in water or as fine suspended particles. As the acidity of water rises the level of dissolved zinc in water may enhance. Most of the zinc in soil is bound to the soil and does not dissolve in water. However, depending on the characteristics of the soil, some zinc may reach groundwater. Zinc is an essential element in human nutrition. The daily requirement is 4-10 mg depending on age and sex. Food provides the most important sources of zinc. Zinc is a vital element in all living organisms. Almost 200 zinc-containing enzymes have been recognized, including many dehydrogenases, aldolases, peptidases, polymerases, and phosphatases14. Nutritional zinc deficiency in humans has been found in a number of countries . Drinking-water usually makes a insignificant input to zinc intake unless high concentrations of zinc occur as a consequence of corrosion of piping and fittings. Under assured conditions, tap water can give up to 10% of the daily intake.

Manganese:

In our earth crust manganese metal is found in plenty with iron ore therefore it is not found in pure form but as constituent of more than 100 minerals.

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It is a necessary element for the appropriate working of both animals and human beings because it is an important mineral for the functioning of different types of cellular enzymes. The existence of manganese is generally found in 11 oxidative states. Mn2+, Mn4+ or Mn7+ are the most environmentally and biologically significant compound of manganese. In surface and ground water manganese are found naturally. Presence of manganese in soil can leach in water sources. At various region contamination of manganese in water sources are International Science Congress Association 5 attributed by human actions The hazard produced by overexposure to manganese must be weighed beside the necessity for some minimum quantity of manganese in the diet, since manganese is an essential nutrient, performing as a component of numerous enzymes and a contributor in a number of significant physiological processes. Manganese intake from drinking-water is normally substantially lower than intake from food. Manganese lack in humans appears to be rare, because manganese is found in many general foods.

Animals experimentally maintained on manganese-deficient diets exhibit impaired growth, skeletal abnormalities, reproductive deficits, ataxia of the newborn and defects in lipid and carbohydrate metabolism. The greatest exposure to manganese is generally by the food. Adult persons take manganese between 0.7 and 10.9 mg/day in the diet. The higher intake reported being associated with some vegetarian diets .

Copper:

Copper is a vital trace element with a maximum daily oral intake of 1-2 mg per individual. Naturally occurring copper concentrations in groundwater are without any health significance and scatter mostly around 20 µg/l. If drinking-water drawn from groundwater contains elevated levels, in most situations corrosion of copper pipes is the primary source. Liver cirrhosis occurs in babies when average concentration exceeds the limits of 2 mg/l in drinking water. The prevalent endpoint of acute copper toxicity by time, concentration and dose is nausea. The health based guideline value for copper in drinking water is 2 mg/l . In the human metabolism copper is also a vital element and is generally considered to be non- toxic for man at the levels encountered in drinking water. The occurrence of Cu in a water supply, even though not considered as a health hazard, may obstruct with the intended domestic uses of the water. Copper in public water supplies add to the corrosion of galvanized iron and steel fittings. At levels above 5 mg/l, if also imparts a colour and an undesirable bitter taste to water. Staining of plumbing fixtures and laundry occurs at Cu concentration above 1.0 mg/l.

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Copper is extensively used in domestic plumbing systems, and levels in taped-water can therefore be considerably higher than the level present in water entering the distribution system. The guideline value of 1.0 mg/l 4 is recommended for drinking water quality based on its laundry and other staining properties.

Fluoride:

Ingestion of excess fluoride, most commonly in drinking-water, can cause fluorosis which affects the teeth and bones. Moderate amounts lead to dental effects, but long-term ingestion of large amounts can lead to potentially severe skeletal problems. Paradoxically, low levels of fluoride intake help to prevent dental caries. The control of drinking-water quality is therefore critical in preventing fluorosis. The condition and its effect on people Fluorosis is caused by excessive intake of fluoride. The dental effects of fluorosis develop much earlier than the skeletal effects in people exposed to large amounts of fluoride. Clinical dental fluorosis is characterized by staining and pitting of the teeth. In more severe cases all the enamel may be damaged. However, fluoride may not be the only cause of dental enamel defects. Enamel opacities similar to dental fluorosis are associated with other conditions, such as malnutrition with deficiency of vitamins D and A or a low protein-energy diet. Ingestion of fluoride after six years of age will not cause dental fluorosis.Chronic high-level exposure to fluoride can lead to skeletal fluorosis. In skeletal fluorosis, fluoride accumulates in the bone progressively over many years. The early symptoms of skeletal fluorosis, include stiffness and pain in the joints. In severe cases, the bone structure may change and ligaments may calcify, with resulting impairment of muscles and pain.

Nitrate

Nitrate is a compound that naturally occurs and has many human-made sources. Nitrate is in some lakes, rivers, and groundwater in Minnesota. You cannot taste, smell, or see nitrate in water. Consuming too much nitrate can be harmful—especially for babies. Consuming too much nitrate can affect how blood carries oxygen and can cause methemoglobinemia (also known as blue baby syndrome). Bottle-fed babies under six months old are at the highest risk of getting methemoglobinemia. Methemoglobinemia can cause skin to turn a bluish color and can result in serious illness or death. Other symptoms connected to methemoglobinemia include decreased blood pressure, increased heart rate, headaches, stomach cramps, and vomiting.The following conditions may also put people at higher risk of developing nitrate-induced methemoglobinemia: anemia, cardiovascular disease, lung disease, sepsis, glucose-6-phosphate-dehydrogenase deficiency, and other metabolic problems.Only recently has scientific evidence emerged to assess the health impacts of drinking water with high nitrate on adults.

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A growing body of literature indicates potential associations between nitrate/nitrite exposure and other health effects such as increased heart rate, nausea, headaches, and abdominal cramps.

Lead:

The mining-related heavy metals as lead may originate in runoff from city streets, industrial dischargers, leachate from landfills, mining activities and a variety of other sources. Lead is toxic chemical, which are generally persistent in the environment, can cause reproductive failure or death in fish, shellfish and wildlife. In addition, lead can accumulate in animal and fish tissue, be adsorbed in sediments, or find their way into drinking water supplies, posing long term health risks to humans10. Lead is a general toxicant that accumulates in the skeleton as well as Infants, children up to 6 years of age pregnant women are most susceptible to its adverse effects. Lead also interferes with calcium metabolism, both directly and by interfering with vitamin D metabolism.Mineral matter in coal, primarily with sulphides such as galena (PbS), clausthalite (PbSe) and pyrite, as well as alumina silicates and carbonates generally associated with lead. It was also suggests that lead may also be associated with organic matter, most likely in the lower ranked coals.

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