

Impact of Heavy Metal and its Management : Bioremediation of Heavy Metal

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Abstract

Heavy metal contaminants have proven to be a major risk to environment. Due to industrialization and urbanization environmental effects the drinking water quality has been greatly affected in India. A number of industries are draining their waste containing heavy metals without any treatment in effluents. As a result of this practice almost all of the fresh water resources are getting contaminated, although the deep aquifer in most of the countries is still safe from contamination of heavy metals. In drinking water, presence of heavy metals is threat to human health. People exposed to heavy metals through water consumption are vulnerable to cancer and other risks. This research aims at reviewing the presence of heavy metals in drinking water and their possible health hazards.

Keywords: Water contamination; Drinking water; Heavy metals; Human health

Introduction

Heavy metals are generally referred to as the specific density. In India In recent years the accumulation of heavy metals in aquatic systems has become a problem of great concern throughout the world. These metals may accumulate to a very high toxic levels and cause severe impact on the aquatic organisms without any visible sign. Increase in population, urbanization, industrialization and agricultural practices have further aggravated the situation [1]. Although a few heavy metals are essential for human health, an excess amount of these metals can have negative effects [2]. Heavy metals are released into the environment through natural process and anthropogenic activities. Industrial processes generate wastes, which are mostly discharged into the environment. Industrial activities, especially electroplating, metal smelting and chemical industries and manufacturing processes are sources of anthropogenic heavy metals in water. Poorly treated domestic, industrial and agricultural wastewater contains high concentrations of metals, which are often discharged into the environment. Some heavy metals, such as mercury and lead, may also enter the atmosphere due to traffic pollution and industrial activities, which can be deposited in soils around the reservoir and then enter the water along with the surface runoff [3]. The sources of drinking water e.g., surface waters; ground water and sea water are likely to be polluted by heavy metals [4]. Leaching of metals from water distribution system (WDS) can contaminate drinking water. Although metals are removed during desalination of seawater, desalinated drinking water might contain various metals, possibly due to treatment and stabilization, blending with treated groundwater and leaching of metals from pipes of the WDS [5]. Studies have reported various chronic and sub chronic effects from exposure to heavy metals. Past studies report heavy metals in drinking water, including their types and quantities, factors affecting metal concentrations, sources, human exposure, risk and removal. Despite significant progress, research is needed to ensure safe drinking water. Small and rural communities and individuals often consume water with a higher level of

heavy metals than the guideline values. To date, removal of all heavy metals from drinking water with a comprehensive technique has not been reported. Further populations are exposed to drinking water from taps inside the building, where the metal concentrations increase due to stagnation of water in the water distribution system, cooler hot water tanks (HWTs) and plumbing pipes (PP) inside the building. This review focuses on human exposure and risks because of heavy metals in water.

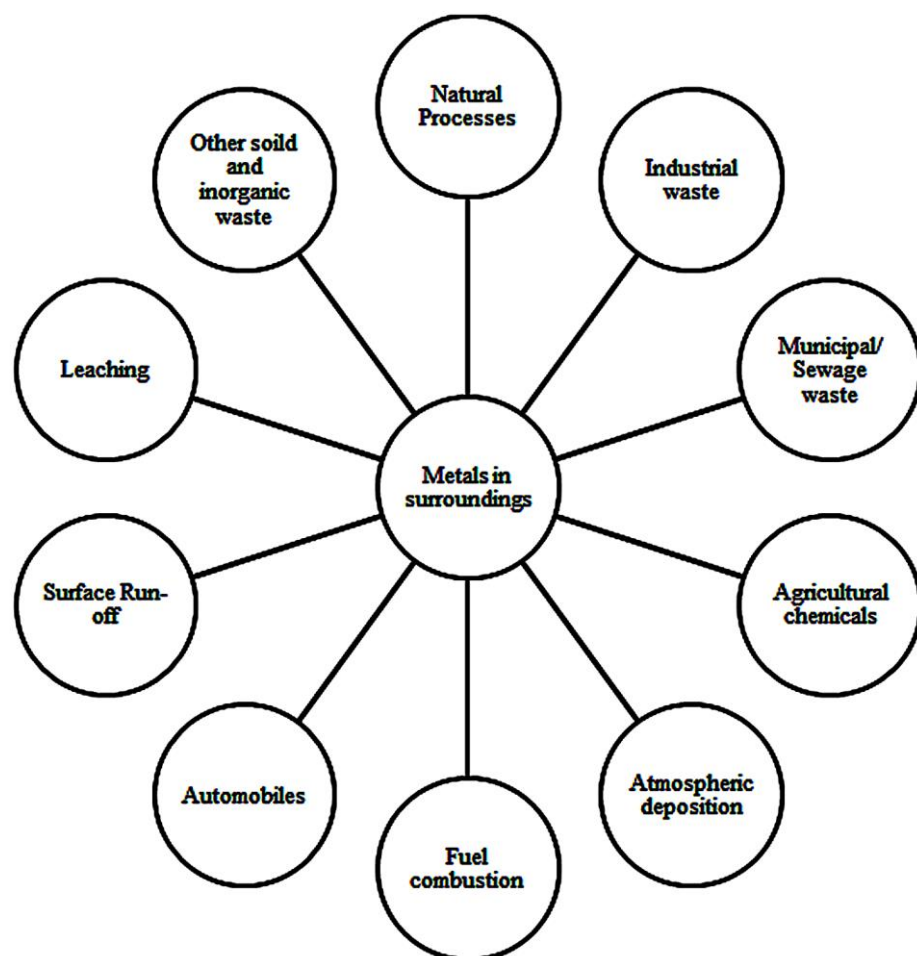
Human exposure and risks

Thirty five metals pose a threat to human health, 23 of which are heavy metals [6]. Among the heavy metals As, Cd, Pb, Cr, Cu, Hg and Ni are of major concern, mainly due to their presence at relatively high concentrations in drinking water and their effects on human health [7]. Reported that drinking 1 L/day water with As of 50 µg/L over one's life time could lead to cancer of the liver, lung, kidney or bladder in 13 per 1000 persons. Another study reports an mercury is a naturally occurring metal which is a shiny, and become colorless and odourless gas. Mercury is very toxic its various source include agriculture, mining, incineration and discharges of industrial waste water [8]. Biomagnifications causes significant disturbance to aquatic lives. Consumption of these contaminated aquatic animals is major route of human exposure to methyl mercury [9].

Its impact on human health

For the past few years, there has been a concerning spike in the levels of heavy metals in our daily lives. The contamination of drinking water with these harmful heavy metals is one of the most serious issues, as no amount of efforts so far have been able to rein in the growing levels of heavy metals in water. The major hazardous metals of concern for India in terms of their environmental load and health effects are: lead, mercury, chromium, cadmium, copper and aluminum. Their source is mostly anthropogenic industrial activity and vehicles. Natural causes like seepage from rocks, volcanic activity and forest fires can also be the contributing factors. In general, heavy metal toxicity can cause chronic degenerative diseases. The symptoms being mental disorders, pain in muscle and joints, gastro-intestinal disorders, vision problems, chronic fatigue, and susceptibility to fungal infections. Sometimes the symptoms are vague and difficult to diagnose at early stage. Geno-toxicity and cancers can also occur. Industrial workers and populations living near the polluting industry are more susceptible and have to be monitored for the effects of sustained exposure to heavy metals. Additionally, malnourished people and pregnant women are also extremely vulnerable. Heavy metals can enter a water supply by industrial and consumer waste, or even from acidic rain breaking down soils and releasing heavy metals into streams, lakes, rivers, and groundwater.

Off late, India has seen a spurt in health cases pertaining to physical, muscular, and neurological degenerative diseases that resemble Alzheimer's, Parkinson's disease, muscular dystrophy, and multiple sclerosis. Given this disturbing background, it is essential for the Government to step up its heavy metal contamination prevention and mitigation activity so that the growing concern of heavy metal poisoning in the country can effectively be addressed. For instance, a new low cost and safe method for removing chromium-6, a highly toxic heavy metal, from wastewater has been developed by a group of scientists from India



METALS IN SURROUNDINGS

The distribution of heavy metals across various components of environment is controlled by:

- Ion exchange in soil-soil, soil-water, soil-air interactions
- Dissolution and precipitation
- Adsorption and desorption
- Aqueous reactions
- Mobilization or immobilization by biotic components
- Uptake by plants

Further precautions required

The Government must encourage researches, such as the water hyacinth powder model, to remove extremely hazardous elements from industrial waste before it becomes dangerous to the humans and the environment. It is also essential that physico-chemical, as well bioremediation solutions, should be applied immediately to reduce the environment and public health load, preferably at the site of generation. While large industries are mandated to set up and operate their own effluent treatment plants, how well these plants work, or whether they work at all is anybody's guess. This dismal state of affairs must be dispensed urgently. Focus must be put on ensuring that the plants not only operate efficiently but also with due concentration on handling the heavy metals. The Government must set up a supervisory team comprising of representatives of industry employes, Government officials and representatives of the local population in the area

Conclusion

Conclusion of our study is to aware about the heavy metal contaminants in the water resource and the health effect due to its increased concentration and its preventive measures.

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