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A Review on Impact of Heavy Metal on Water Quality and on Aquatic Environment

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ABSTRACT: Water pollution is a global problem and the world's population suffers from polluted water. As the world's population increases, development and industrialization develop rapidly, becoming a major source of water pollution. With heavy metals in lakes, rivers, groundwater and various water sources, water is polluted by increased concentrations of heavy metals and metalloids from the sudden release of mine tailings, dumping of high-metal waste, growth of industrial areas, leaded gasoline and paint, use of fertilizers indoor, animal manure, electronic waste, sewage sludge, pesticide, sewage irrigation, coal, etc. These heavy metals not only reduce the quality of aquatic ecosystems but also human health. This study will provide an important theoretical basis for future research on water quality criteria and risk assessment of heavy metal contamination.

KEYWORDS: water pollution, heavy metal quality, aquatic environment.

I. INTRODUCTION

Elements that are denser and less harmful are called heavy metals. Examples of heavy metals are lead, iron, mercury, cadmium, zinc, arsenic, copper and chromium and the actual amount of these heavy metals is more than 6 g/m³ [1]. Heavy metals have environmental persistence and bioaccumulation properties, and these heavy metals enter aquatic systems through various routes. These heavy metals not only reduce the quality of aquatic ecosystems but also human health [2, 3]. These heavy metals occur in their normal form in the earth's crust. These heavy metals are very dangerous because they cannot be broken down or decomposed and have the ability to bioaccumulation [4]. These heavy metals enter ecosystems through the air, drinking water, or various chemicals and man-made products. The routes of application of these heavy metals are through inhalation, digestion and absorption through the skin. These heavy metals enter the biosphere through human activities, including industrial production, mining, agriculture, and transportation [5].

Water quality criteria specify the maximum concentration levels of toxic substances in water which will not adversely affect specific protected objectives under certain natural conditions. As the basis of the protection of water quality, the water quality criteria provide an important scientific basis for environmental protection agencies to safeguard aquatic ecosystems.

Heavy metal ions	WHO's permissible limit (mg/l)
Se	0.02
Hg	0.001
Mn	0.02
Ag	0
Cd	0.05
Cr	0.003
Pb	0.01
Zn	3
Fe	0.3
Cu	0.02
As	0.01

Table 1- Permissible limit of heavy metal ions in water [6]

II. SOURCE OF CONTAMINATION IN WATER

The presence of these heavy metals in the water surface may be due to these natural or anthropogenic activities. In natural activities, the weathering of rocks contains metals, volcanic eruptions, forest fires and nature weathering processes may be involved. From these activities, metal goes inside various parts of the area. Heavy metals come in the form of sulphates hydroxides, oxides, sulphides, phosphates and silicates [7, 8].

Natural Sources

The presence of heavy metals in water depends on the local geology, hydrogeology, and geochemical characteristics of the aquifer [9]. One of the main sources of pollution is weathering. The weathering of the sedimentary rocks such as limestone or dolomite or shale makes the water contaminated or polluted. When there is an interaction of water with rock element, it also leads addition of these elements into the water; thus, contamination occurs. Examples of such elements are granite, syenite, basalt, gabbro, nepheline, and andesite.

Anthropogenic sources

An anthropogenic event in which human settlements replace natural forests and Agricultural activities have increased the environmental impact, the carrying capacity of water has also decreased rapid industrialization and urbanization. Hg concentration in water has increased by agricultural activities and human activities. Activities such as homework Wastewater to water, waste incineration, coal and oil burning and pyrometallurgy Process and mining are the main reasons for this. Water or snow or Rain carries Hg-contaminated soil into adjacent water bodies [10, 11]. Those Sources of Ni are corroded metal pipes and containers [12].

Hazards of Heavy Metal Pollutants in Water Bodies

The danger from heavy metal pollutants in water particles as soon as heavy metals enter the water, they cause specific toxicity to aquatic organisms. is a heavy metal defined as a natural metal with atomic number (Z) is greater than 20 and the element density is greater than 5 g/ cm³ [13]. Some toxic heavy metals such as Ni, As, Cr, Zn, Cu, Cd, Co and Pb can cause serious environmental problems Damage. Ionic form of Cd²⁺, Pb²⁺, Hg²⁺, Ag⁺ and As³⁺ interact with biological organisms to form the corresponding ones toxic compound. Currently with increase bioaccumulation and concentration Heavy metals in the environment, their toxicity properties Heavy metal has changed. Ligands and oxidation states come into play important role in the bioavailability of heavy metals [14]. If cumulative concentration or effect of heavy metals reaches a certain limit, cell metabolism is destroyed Consequences and effects of heavy metals to poison [15]. The toxic effects of metals mainly cause functional loss of brain and nervous system function and severe Damage to the blood, liver, spleen, kidney, internal organs, etc other bodies. Disability causes physical weakness, hypomnesia, allergic skin reactions, hypertension, etc symptoms [16]. As a result, new technologies for waste containing heavy metals Treatments have been designed to achieve goals to reduce the harmful effects of heavy metals on the environment as soon as possible [17].

Effect of Heavy Metals on Aquatic Environment

Estuarine and fresh water bodies have not been polluted in some cases that water is also threatened with long-term pollution due to metal deposits due to past human activities [18]. The water in rivers and lakes can be high depending on the flow rate and proximity to the point source. During for human civilization, the content of an element in water increased. These elements are cadmium, lead, mercury, zinc and chromium. Unlike organic chemicals, there are several metals that cannot be converted into less toxic compounds, and one of its properties is the loss of biodegradability. After the heavy metals enter water system, it is redistributed in the column and accumulates in the sediments [19]. Sediments partially contribute to pollution this is a natural phenomenon due to its activity and metal remobilization process. Metal Residues present in the contaminated environment have the flexibility to bioaccumulation in water bodies [20]. Heavy metals are introduced in liquid form and as a component of surface water (carbonates, sulfates, humic organic substances, fulvic and amino acids) and formation of insoluble salts or complexes. They are not expected to be an aquatic species damaged by salts and these compounds. Some of them sink and accumulate in sediments under. Decrease in water pH due to acid rain or vice versa Acid crash due to accumulation of heavy metals in the water column, causes aquatic life becomes toxic.

Effect of Heavy Metals on Aquaculture

The main sources of water pollution are heavy metals because they destroy economically prestigious species either indirectly by cutting the biological chain or directly acting on toxic strains by chemical modification in the water [21]. Heavy metals enter the fish's body in three possible ways: through the gills, through the body surface and through the digestive tract. Direct absorption of metals from water occurs through the gills [22, 23], while it is generally assumed

that the body surface plays a lesser role in the uptake of these elements in fish [24]. Therefore, tissue metal concentrations cause many biochemical, physiological, and histological changes in fish and other freshwater fauna by altering the activities of various enzymes and metabolites [25]. Fish is one of the organisms that are universally distributed in aquatic ecosystems and their susceptibility to metal poisoning can indicate the magnitude of the biological effects of metal pollution in aquatic environments [26].

III. CONCLUSION

The presence of excessive levels of heavy metals in aquatic or aquaculture environments is a major concern. Water pollution is a global problem and the world's population suffers from it. Consequences of contaminated water. Living organisms are also affected by pollution lots of water and very polluting. Acute and chronic disease caused by the concentration of heavy metals in drinking water that exceeds the permissible value. Restrictions set by several national and international organizations. They may vary from non-fatal, such as muscle and physical weakness, to fatal, such as brain, nervousness systems and even cancer. Water quality testing is required for protection human and environmental health.

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