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A Review on Studies on Effect of Heavy Metals on Man and Environment

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Abstract— The presence of heavy metals in the water is harmful to man and environmental. These heavy metals include elements like cadmium, nickel, lead, copper, zinc, manganese, mercury etc. Many heavy metals have their toxic effects on man and environment. The presence of heavy metal results in bioaccumulation and further it can affect the biological and ecological cycles. The current review summarizes the studies and research carried out to know the effect of heavy metals on man, environment, aquatic life, plant and ecology.

Keywords— metals, health effects, sources, bioaccumulation.

I. INTRODUCTION

The metals like copper, silver, zinc, cadmium, gold, mercury, lead, chromium, iron, nickel, tin, arsenic, selenium, molybdenum, cobalt, manganese, and aluminium are considered as heavy metals. The presence of residual metals in the environment is a serious threat to human health and. aquatic ecosystems. The current review presents the research and studies carried out for assessment of the effect of heavy metals on man and environment.

II. STUDIES ON EFFECT OF HEAVY METALS

Pandey and Madhuri carried out review on the effect of heavy metals on animals and fishes [1].According to them the heavy metals are harmful pollutants for fishes. The heavy metals are not eliminated from aquatic systems by natural methods. Excessive concentration of heavy metals disturb ecosystem. According to them, bioaccumulation of heavy metals in blood and body can have long term effects on health. Heavy metals can enter the body via water which may be contaminated because of drainage, atmosphere, and soil erosion. All heavy metals exhibit their toxic effects via metabolic interference and mutagenesis. So it is very important to treat the wastewater containing heavy metal. Khayatzadeh and Abbasi studied the effects of heavy metals on aquatic animals [2].The metal pollution is low in sea water than other pollutants. But the effects of heavy metals on the ecosystem are very significant. The effects of heavy metals like reduction of the developmental growth, increase of developmental anomalies, and reduction of fishes survival are observed. The effects of heavy metal pollution are geological, hydrological and finally on biological cycles. Laniyan et.al. carried out study aimed at evaluating the geochemical implication of heavy metals on the groundwater surrounding a municipal solid waste dumpsite at Olusosun, waste disposal site Lagos[3].The dominating pollutants were found to be Pb, Fe and, Mn.Their concentrations were well above World Health Organization(WHO) standards. This pollution was dangerous as it may cause effects like delays in physical and mental development and slight deficit in attention span and learning abilities in infants and children; kidney problems and high blood pressure in adults.Accoerding to them the wastewater must be checked for heavy metal and treated before disposal. Babatunde and Oyegbami carried out studies on heavy metals concentrations in roadside dust of different traffic density [4]. They randomly collected dust from both sides of the roads and digested it. These digested samples were analysed for determination of Pb, Cd, Zn and Ni concentrations. These metal concentration were found in the sequence Pb > Zn > Ni > Cd.Musa and Abdullahi studied the toxicological effects of cadmium and some other heavy metals in plants and humans [5].They summarized the sources of heavy metals and their effects. Cadmium enters the ecosystem from washing powders as an impurity in phosphates, impurity in zinc steel industry, paint, plastic, etc. Cadmium was toxic to beans, beets and turnips at concentrations as low as 0.1mg/l in nutrient solutions. There is a risk of accumulation in plants and soil.Chromium coming from tanning, leather industries is carcinogen. Copper from plumbing, animal wastes, pesticides, earth crust can cause liver cirrhosis. Nickel is also carcinogenic. Brown et.al. studied Effect of biosolids processing on lead bioavailability in an urban soil[6]. According to their study, removal and replacement of contaminated compost reduced the bioavailability of soil Pb by 37 to 43%. According to them locally available biosolids can be used to reduce the adverse effect of elevated soil Pb.

Martin presented human health effects of heavy metals [7].Humans are exposed to the heavy metals by injection or inhalation. Important heavy metals which are threat to human being in this regard are arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver. Arsenic is observed in paints, dyes, metals, drugs, soaps and semi-conductors. The wood preserving industry uses about 90% of the industrial arsenic. Nausea and vomiting, decreased production of red and white blood cells,

abnormal heart rhythm, and damage to blood vessels are few adverse effects of arsenic. Barium as an element or compound is used in spark-plug electrodes, in vacuum tubes as a drying and oxygen-removing agent, fluorescent lamp, diagnostic medicine. The possible health risk include high blood pressure, changes in heart rhythm or paralysis and possibly death. According to Mudgal et.al. There is an enormous contribution of human activities to the release of toxic chemicals, metals and metalloids into the atmosphere [8].According to their study all forms of cadmium are dangerous. Organic forms of lead are more toxic and easily absorbed by the gastrointestinal tract. Also in case of arsenic, Inorganic arsenate [As (+5)] or [As (+3)] are more toxic. The food sources of cadmium includes egg, fish, mushroom, garlic, spinach, wheat, rice, oat, corn, soya bean, and peanuts, mushroom. Egg, cocoa powder, rice, wheat, potato, calcium supplement, smoked food, wine, beer, milk, carrot, raisins are food sources of lead. Arsenic enters our body through green papaya, rice, tomato, carrot, seafood, Indian mustard, bovine and chicken meat, wine, milk. Mercury is injected via egg, mushroom, seafood, fish oil.Pizent et. al. carried out studies on reproductive toxicity of metals in men[9]. Food, water, air, tobacco smoke, and alcoholic beverages are few sources of metals in our body. They summarized the information from epidemiological studies of the effects of metal exposure on reproductive function in men. According to their studies, even moderate to low level exposure to lead affects certain reproductive parameters. Also exposure to cadmium affects the prostate function and serum testosterone levels. A review on effects of heavy metals on plants and resistance mechanisms was carried out by Cheng[10].According to his review,the effects like growth inhibition, structure damage, a decline of physiological and biochemical activities were observed in plants. Environmental conditions, pH, species of element, organic substances of the media and fertilization, plant species are few factors governing the bioavailability of heavy metals. The plant have their own resistance mechanisms against toxic effects.

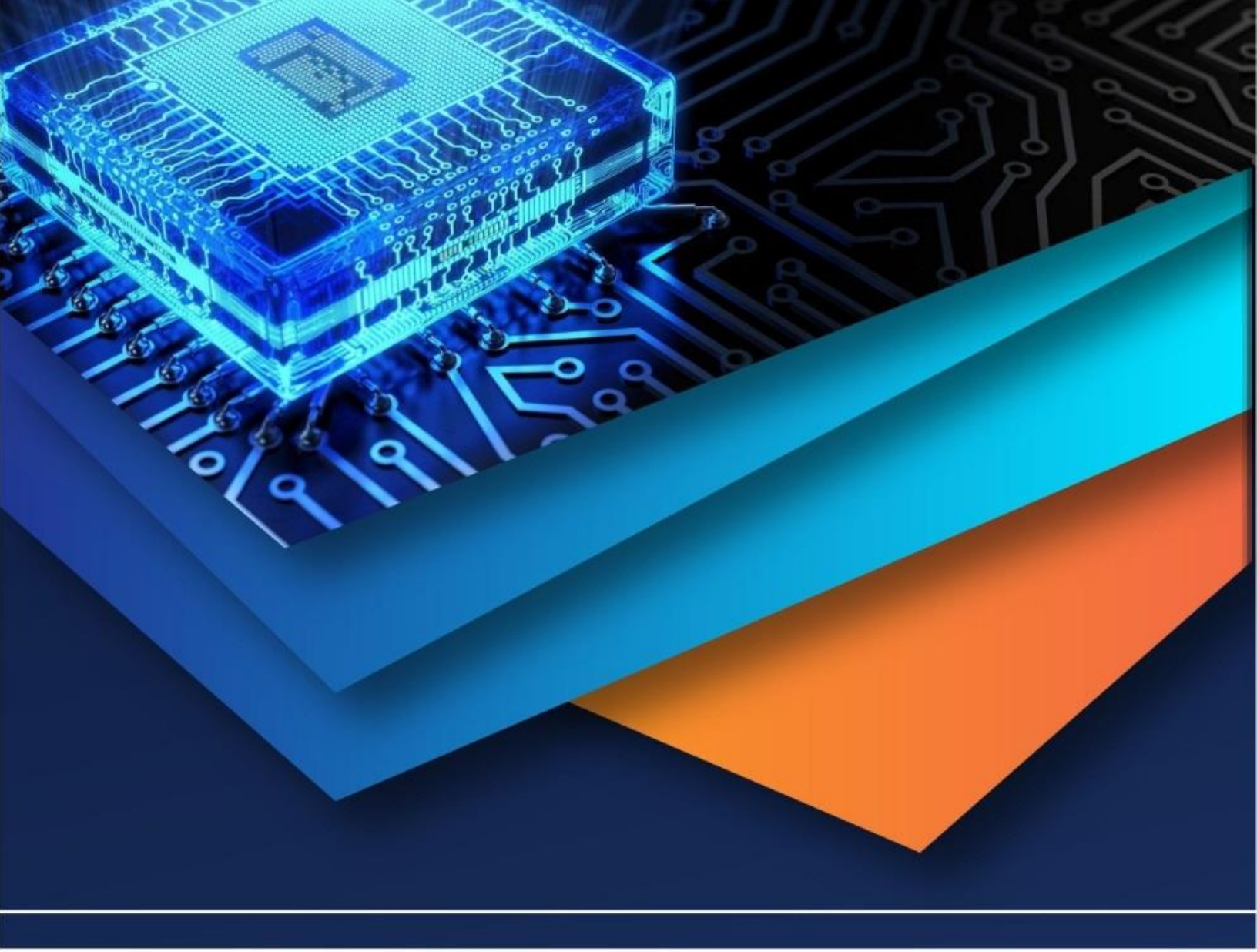
Ziemacki et.al. discussed the sources of heavy metals and their availability in environment[11].Studies were carried out on the presence of heavy metals in catfish Synodontis clarias by Agbozu et.al[12].The presence of heavy metals in catfish Synodontis clarias is a good measure of pollution of an aquatic ecosystem due to anthropogenic influence. They determined the concentrations of Zn, Cd, Pb, Mn and Ni. According to them the sources of the metals in the catfish appear to be point sources. These include rural and agricultural runoff sources in the catchments area. They concluded that it was necessary to institute quarterly monitoring programmes on the levels of these pollutants in the water body and other environmental segments. A review on heavy metal toxicity in environment was carried out by Chibbar and Sharma[13].They underlined the importance of awareness of effects of heavy metals and their effects on man and environment.Because of biological non degrable nature they persist in the environment for long time.According to them, prevention is the best wasy to tackle this problem.Phytoremediation technique was very effective for the heavy metals.Verma and Dwivedi presented a case study on heavy metal pollution[14].They discussed sources of heavy metals, human exposure through food, air and water, heavy metal poisoning and biotoxicity.According to their study heavy metals enter the body via water, food and air. Cosmetics, dental products, some drugs, particularly Ayurvaid and Unani drugs. Human life is exposed to heavy metals as they are present in many thing of human use such as accumulators (Pb), mercury-arch lamps and thermometers (Hg), utensils (Al) and a wide range of other products. They concluded that prevention of heavy metal poisoning is best way to tackle heavy metal pollution effects.Duruibe et.al. studied the human biotoxic effects of heavy metals[15].They discussed various sources of heavy metals and their effects. Isienyi et.al studied heavy metal effect on well water and biodiversity near lapite dumpsite in Ibadan, Oyo State, Nigeria[16]. They carried out study to determine the level of heavy metal leaching from the dumpsite on well water near the dumpsite. They collected water from a well in the area. It was observed that lead and manganese concentrations were well above the acceptable limits. Accordingly it was necessary to treat the water before using it for irrigation.Hodson discussed in detail the exact meaning of the heavy metals[17].Jung carried out research on heavy metal concentrations in soils and factors affecting metal uptake by plants in the vicinity of a Korean cu-w mine[18].He measured heavy metals in soils and plants in and around a copper-tungsten mine in southeast Korea. He observed that the heavy metals in soils decreased with distance from the source. The factors like soil pH, cation exchange capacity, organic matter content, soil texture, and interaction among the target elements affected bioavailability of heavy metals.

III.CONCLUSIONS

The research carried out to study the effect of heavy metals on human being, aquatic life and plants has been summarized. Control of the emission of heavy metals is better strategy than treatment. Heavy metals are not biologically degradable. So once they enter into ecosystem, they remain in the ecological cycle in some or other form. It is necessary to protect the general population from heavy metal exposure and aquatic life by following strict environmental guidelines.

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