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Effect of Heavy Metal on Health

***Reenu Mishra*[1]**

[1]Department of Chemistry, K. G. Arts & Science College Raigarh, C.G. INDIA workshop.raigarh@gmail.com

ABSTRACT

Pollution of drinking water has hazardous health effects on human health. Presence of heavy metal cause serious health effect. According to National Research Council Committee(1996) pollution is defined as an undesirable change in physical, chemical or biological characteristic of our air, land, and water that may or will harmfully affect human life or that of other desirable species , our industrial process , living condition and cultural assets or that may or will waste or deteriorate our raw materials recourses.

Key Words: Biological, parameters, health effects, heavy metals

Introduction

In chemistry, a metal (from the Greek " metallon , mine) is a chemical elements , compounds or alloy that has a characteristics of high electrical conductivity . In metals the atoms release electrons and built positive ions (cations). The metals with density greater than 5g/cm3 , are include in Heavy Metals. (Luka:, 2011)The most common and hazardous toxicants (.Guinee JB, 1999), (W Beauford, 1975)associated with AeroSystems (SW., 1998) are heavy metals, radionuclides, synthetic organic substances and pesticides [(Biocanin R, 2012),15,-18]

Sources of water pollution-

Domestic Sewage-Our own excreta besides that of animals and birds. Due to the domestic sewage the value of nitrate, nitrite, BOD, COD, Chloride, Sulphate, TDS. The high concentration of toxic and destroy fish and plant life.

Industrial Waste- Pesticides are chemical compounds used to control pests. There are two classes of pesticides

a) Organic Pesticides- Natural examples- Pyrethrum, Nicotine (Tobacco leaves), Retinoid .

Synthetic – examples- DDT, Adrin, Dieldrin, Hexachlorocyclohexane, Gammexane, Pentachloro phenol, Malathion, parathion.

Inorganic- S, As, Cu, Zn, Hg

Pesticides can be grouped as- a) Insecticides b) Herbicides c) Bactericides d) Fungicides e) Nematicides f) Rodenticides g) Defobiants.

Effects

Mercury; only liquid metals, Natural sources- evaporation from the earth crust (the bottom of the ocean, river and land.) It exists in lamentable form as Hg(I), and Hg (II). In an aqueous environment due to microbiological activity of methane bacteria formed as a product of methyl mercury and other organic compounds. It damages the nervous system, kidneys, liver, digestive system and glands with internal secretion. Some other toxic effects are also associated like- neurodegenerative diseases , autoimmune disorders, disorders during pregnancy and childbirth ,and a range of metals disorders. A new study conducted on laboratory rats finds that Vitamin E and selenium in combination as a supplement, reduce the toxicity of mercury found in Fish. The health benefit of omega-3 of the fatty acid's conflicts with the danger of mercury poisoning. Anti-oxidants in the diet can alter the toxicity of methyl-mercury. Beauford(1970) in his study found that [(W Beauford J. B., 1975)], accumulation of mercury in the bud is twenty times higher than in shoot. In the working environment one of the most common pollutant is the ash. Heavy metals like lead, cadmium and mercury are toxic not only in high concentration but also in low concentration. (Bakshi S, 2018)

High metal concentration inhibit cytoplasmic enzyme and due to oxidative stress damage cell structures. Modified[(Clijsters, 1990), (M.H.Fulekar, 2009)]Heavy metals replace the essential nutrients at the cation exchange site of plants , the indirect effect of heavy metals. (Zeiger, 2002)

Both direct and indirect toxic effects decline in plants growth and sometime cause of the death of plant.10 Rapid industrialization, uncontrolled and untreated discharge of xenobiotic pollutants and use of wastewater for irrigation pose sever unbearable danger to the sustainability of agroecological niches. (J.J.Liu, 2014), (Q. H. Wang, 2013)

Several soil factors , such as Ph, CATION EXCHANGE CAPACITY(CEC), organic matter content and adsorption by clays , affects the availability of metals FOR PLANTS. (G. Guo, 2018), (A. Karaca, 2004)

The atomic number of cadmium was 48, its oxidation state was +2, and exist in nature as $Cd(OH)_2$, $CdCO_3$ and $CdSO_4$. Cd is soft in nature, and when react with acids like hydrochloric acid , sulphuric acid and nitric acid , it forms cadmium chloride , cadmium sulphate and cadmium nitrate respectively. (Blanusa, 2005)

Adsorption, transportation and translocation are the three important ways by which Cd enters into the plants. Humic acid, pH and adsorbing material affects the Cd adsorption. Cd is adsorbed as Cd2+ ions, root hairs are the main part for cadmium adsorption. Apoplast and simplest are two paths by which transportation mechanism is done. (-Lin, 2012)

Factors like soil Cd content, soil pH, organic matter, clay minerals, cation exchange capacity (CEC) and type of fertilizers control Cd presence in soil. Cadmium uptake depends upon soil pH .

Rice is a source of carbohydrate, Vitamins, minerals, polyphenols, and phytosterols. (Matsuda, 2019) Study on bioaccumulating factors shows that both mercury and cadmium had high mobility than lead, nickel, chromium and arsenic, indicate the potential to transfer metals from soil to plant. (Fanfu Zeng, 2015)

Mercury is found in three forms : elemental mercury (Hg0), Inorganic mercury(Hg2+),and methyl-mercury(Me Hg). (Virginia Andreoli, 2017)The main site of adsorption of methyl-mercury is on gastro-intestinal tract. (Fernanda Maciel Rebelo, 2016)

After adsorption mostly binds with haemoglobin in erythrocytes, but also combine with glutathione, metallothionein, suspended in plasma or in various proteins make covalent bond with cysteine. (Arif Tasleem Jan, 2015), (Bernhoft, 2012), (Fernanda Maciel Rebelo, Arsenic, lead, mercury and cadmium: Toxicity, levels in breast milk and the risks for breastfed infants., 2016)

When it enters in nervous system it demethylated and form inorganic mercury which can accumulate. (9)

In a brain the mercury is disrupting the production of neurotransmitter, and act as neurotoxin. (9).Thioredoxin reductase, glutathione peroxidase and thioredoxin inhibits by mercury, and disrupting the oxidant/antioxidant production. (9)

Neurotoxicity caused by mercury is involved calcium and glutamate dysregulation and increase in oxidative stress. (Fernanda Maciel Rebelo, Arsenic, lead, mercury and cadmium: Toxicity, levels in breast milk and the risks for breastfed infants., 2016) Blood, cord blood, urinary and hair levels are biomarkers of mercury. (Niladri Basu, 2018)

Mercury is concentrate in brain, liver, kidney, placenta, peripheral nervous system, bone marrow and fatal brain.(10). Brain have strong affinity for methylmercury, its concentration is 3 ton 6 time higher than in blood.(10) Methylmercury is mainly excreted by urine and stool but also occur through sweat, saliva, tears and breastmilk.((Bernhoft, Mercury toxicity and treatment: a review of the literature., 2012))

Persons who consume fish on a regular basis have a high risk for methylmercury. By the bio amplification risk of methyl mercury increased, when fish is combined with rice. (Ping Li, 2010) (Kathleen F Lambert, 2012)

Conclusion

Heavy metals adversaly affects human health. They are harmful even if present in a verry littile quantity. The removal of heavy metals from water is essential. When it come in food chain ,effects plants, animals and humen beings. Several diseses are caused by heavy metals.they are mostely non-biodegradable. They show harmful effects.

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