



HEAVY METAL AND MICROBIAL CONTAMINATION IN WESTERN UTTAR PRADESH

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ABSTRACT

Heavy metals are being the global threat to human civilization regarding the health perspective. Several parts of India are severally affected by these problems including Odisha, Bengal are facing severe problem of arsenic (As) and other heavy metal contamination. Because of the bioaccumulation properties (the tendency to get accumulated in higher concentration in living tissues as compared to its natural concentration in the environment), heavy metals are drawing much attention of environmentalists as well as medical practitioners. 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. Heavy metal toxicity becoming lethal due to effect on central nervous system and also affecting the other vital organs like heart, lung and liver etc. If the exposure being persistent for longer duration then it results into some severe disease like Alzheimer's disease, Parkinson's disease, muscular dystrophy, and multiple sclerosis (International Occupational Safety and Health Centre, 1999). People of Western Uttar Pradesh are claiming that the frequency of cancer is increasing due to contaminated Kali river water.

Key words : Toxicity, Heavy metals, Contamination.

INTRODUCTION

Water is an integral part of life and about 80 per cent of human body is composed of water. However, this critical resource is perhaps one of the most stressed elements necessary for life. Multiple and sometimes competing demands—human consumption, agriculture, industry, recreation, electric power, and ecosystem requirements make water an essential component. Our planet contains vast amount of water, but making pure

and pristine water available is a challenging task. This is due to the contamination of water by physical, chemical and biological agents. Variety of physical agents get absorbed, precipitate and settle down in water bodies in due course of time. Chemical agents get dissolved in water that remain for longer duration making water toxic and unfit for consumption. Biological agents are more important contaminating agents as compared to others. Biological contamination may be due to viruses, bacteria,

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protozoans, fungi, and other microbiota. Among these, bacteria are the most diverse contaminating agents. The bacterial populations in the water are innumerable; they keep the water ecosystem balanced. Some are beneficial in direct or indirect way but certain bacteria are harmful to human beings as they cause serious diseases of diverse nature. Microbial pollution of surface and potable waters is one of the foremost challenges faced by water industry as well as regulatory authorities. Yet, despite the concern and increasing pressures on water resources in both developed and developing countries, understanding of microbial pollutants in the aquatic environment is fairly scattered. There is need for an improved methodology to quantify the processes that control the fate and distribution of enteric organisms to support decision making and risk management activities.

Some of the pollutants like lead (Pb), arsenic (As), mercury (Hg), chromium (Cr), nickel (Ni), barium (Ba), cadmium (Cd), cobalt (Co), selenium (Se), vanadium (V), oils and grease, pesticides and others are quite harmful, toxic and poisonous even in extremely traceful amount. Although some elements are beneficial in lower concentration, but may be harmful in higher concentration namely Zinc (Zn), copper (Cu), iron (Fe). For agriculture, some elements like zinc, copper, manganese (Mn), sulphur (S), iron, boron (B), together with phosphates, nitrates, urea, potassium, etc are useful in prescribed quantities. There are some compounds like cyanides, thiocyanides, phenolic compounds, fluorides, radioactive substances, etc which are harmful for humans as well as animals.

Sources of contamination

The source of contamination can be categorized into two categories, the biological contamination and heavy metal contamination. In biological contamination, the domestic and household materials including human and animal faecal matters are the leading source of pollution. The unbiased disposal habit of human being leads to major concern of biological contamination. The second major cause of contamination is untreated municipal wastes disposed in the environment. The dead and decomposed material from agricultural runoff is also a source of microbial contamination. Potential pre-harvest contamination sources of vegetables include soil, manure, human, farm animal feces and irrigation water (Islam *et al.*, 2004; Cooley *et al.*, 2007; Brandl *et al.*, 2008). All of these factors can influence both the composition of the indigenous microbial flora as well as the survival and growth of human pathogens on raw vegetables. Besides, aquatic flora growing in the river impacted by sewage discharge might also serve as environmental reservoirs

for pathogenic bacteria (Bhanumathi *et al.*, 2003). Aquatic vegetation and leafy vegetables cultivated in riverine systems could be important environmental reservoirs of fecal coliforms. A few studies suggested that aquatic flora and leafy vegetables could serve as nonpoint sources of human bacterial pathogens (Brandl *et al.*, 2008; Bhanumathi *et al.*, 2003, Ishii *et al.*, 2006).

Heavy metals in the environment can come up from natural and anthropogenic system as well. The natural source may be volcanic eruptions, weathering of parent rocks, forest fires and others. The rapid industrialization and consumeristic life style imposing exceeding burden in the environment for heavy metal contamination. These toxic elements enter the human body mostly through food and water.

The Kali River a river of Western Uttar Pradesh which originates from Doon Valley and run across Saharanpur, Muzaffarpur and Bagpat districts before confluencing with Hindon River (at Barnava, Bagpat), which itself merge in Yamuna River near Delhi, which ultimately meet with River Ganges at Sangam in Allahabad to go to Bay of Bengal. The total length of Kali River is 150 km from origin to its confluence with Hindon River. The name of this river is Kali possibly because the colour of the river is black due to presence of excessive amount of pollutants in it. The metal contaminants, such as lead, zinc, copper, cadmium, mercury, nickel, and iron that get deposited in soil may be detrimental to all organisms within rural and urban ecosystems. Metal contaminants are introduced into food webs at the bottom of the food chain and reach to higher level of organisms and their potential toxic effects accumulate within sensitive organs and tissues.

Human exposure through food and water

Although the water of this river is unfit for any use but people are using this water for various practices including irrigation, animal visit etc which ultimately enters in food chain and food web and passes to the human body. People belonging to adjoining area of the river are suffering from variety of problems like diarrhea, headaches, and several skin diseases. People of this region claim that there are risk and cases of cancer to human beings. The diseases can be categorized into two categories, one from biological origin such as gastrointestinal (GI) disorders, diarrhea, stomatitis (Verma *et al.*, 2013) and other from heavy metal origin which cause several fatal diseases. Probably the diseases related to alimentary canal is caused by biological origin and the diseases related to skin and other body parts including ataxia, paralysis, vomiting and convulsion, and depression when volatile vapours and fumes are inhaled and cancer

are caused by heavy metal contamination. Further research is needed for the confirmation of real cause.

CONCLUSION

Water is an essence of life. However, during last decade the quality of water has drastically declined in developing countries due to rapid industrialization, urbanization and population growth leading to microbial contamination of surface and potable water, which is responsible for the incidence and outbreaks of water-borne diseases. About one third human population of the world suffers from water-related diseases. In developing countries the potent sources of contamination of water are overburdened domestic, animal defecation, storm water drainage, municipal wastes and industrial effluents. The quality of river water gets deteriorated by various human activities in them leading to increase in microbial and heavy metal contamination. The microbiological quality of these river water resources is adversely affected by several point and non-point sources of pollution. Further, untreated surface waters are consumed for drinking and various household tasks in India making the public vulnerable to water-borne diseases and their outbreaks. Multiplication and survival of pathogens in aquatic environments are facilitated by addition of nutrients in the form of pollutants, proliferation of aquatic biota due to eutrophication of water bodies. Along with these agents heavy metal are also playing significant roles in causing various kind of curable as well as incurable diseases.

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