WATER POLLUTION

The purity of drinking water holds significant importance for human well-being. The contamination of water with sewage has been associated with the transmission of diseases like cholera and typhoid fever. The table provides information on the primary sources of major water pollutants.

Causes of Water Pollution

Microorganisms' Domestic sewage Organic wastes Domestic sewage, animal waste, decaying animals and plants and discharge from food processing factories Plant nutrients Chemical fertilizers Toxic heavy metals Industries and chemical factories Sediments Erosion of soil by agriculture and strip mining Pesticides Chemicals used for killing insects, fungi and weeds Radioactive substances Mining of uranium containing minerals Heat Cooling water used by industrial plants (which is discharged as hot water)

Pathogens

Disease-causing agents are called pathogens e.g., viruses, bacteria, protozoa, helminths, algae etc. Human excreta contain E. coli and Streptococcus faecalis bacteria which cause gastrointestinal diseases.

In addition, industrial wastes also contaminate water.

(i) Heavy Metals

Metals such as Cd, Pb and Hg may be present in industrial or mining waste. These metals can prove poisonous to humans – Cadmium and mercury can cause kidneys, liver brain and central nervous system. All of these metals are cumulative poisons the body does not excrete them and their concentration builds up.

(ii) Detergents and Fertilizers

These may contain phosphates as additives. The addition of phosphorous to water, in the form of the phosphate anion PO_4^{3-}, encourages the formation of algae, which reduces the dissolved oxygen concentration of water. The process, known as eutrophication, impedes the development of higher life forms, such as fish.

(iii) Acid-polluted water (pH < 3)

This is deadly to most forms of aquatic life. Water downstream from a mine may be contaminated by acid mine drainage, the result of microbial oxidation of discarded waste material at the mine site. Acid mine water principally contain sulphuric acid produced by the oxidation of iron pyrites (FeS_2).

Industrial wastes and acid rain may also contribute to the acidity of natural waters.

(iv) Polychlorinated biphenyls (PCBs)

These chemicals are relatively recent additions to the list of contaminants of water. Having high stabilities, PCBs find many applications, for example they are used as fluids in transformer capacitors. PCBs are resistant to oxidation and their release into the environment causes skin disorders in humans. They are reported to be carcinogenic.

Measures to Control Water Pollution

Treatment of Sewage

The initial step in sewage treatment involves mechanical agitation by machines to ensure thorough churning. Subsequently, the sewage is directed into a tank where the heavier particles settle down. The resultant purified water undergoes sterilization with chlorine, followed by treatment with substances like alum and lime to further enhance its quality.

Treatment of Industrial Waste

The treatment process for industrial waste begins with determining its pH level. Depending on the pH, neutralization is carried out using either acid or alkali. Dissolved chemical substances are then precipitated through the addition of appropriate chemicals. Modern techniques such as ion exchangers and photocatalysis are increasingly employed in the contemporary treatment of industrial waste, representing advanced approaches to enhance efficiency and environmental sustainability.