

WATER TOXICOLOGY

Major Types of Aquatic Contaminants

- **Ultraviolet (UV) radiation:** The effects are restricted to surface layers of water bodies, as light penetrates only a short distance in water.
- **Ionic liquids:** These compounds are called “environmentally friendly” solvents, because their vapor pressure is small; however, their aquatic effects are poorly known.
- **Genetic modification:** Contaminant effects of genetic modification are largely caused by methodological aspects.

Heavy metals

- Some metals can participate in redox reactions, with the ion having the lower valency being more stable in reducing conditions and the ion with higher valency being stabilized in oxidizing conditions.
- The different ions have different toxicities, which indicates that conditions affecting metal speciation will influence metal toxicity.
- Metal speciation and the bioavailability of metals are also affected by complex formation both environmentally and within organisms.

Heavy metals

- Metals reach the aqueous environment in mining and smeltery effluents, and in leachates from waste dumps.
- The specific sources of individual metals are different from each other, furthermore the toxicologically important metals are important.

Copper

- This metal is needed in small amounts, as its ion is a part of the active group of several enzymes and the invertebrate oxygen-binding protein hemocyanin.
- Copper is used especially in electric wires because it conducts electricity well.
- Copper is also used in water pipes, as it is easily malleable.
- It is also often a component of metal mixtures, and recently it has been used as a toxic component of boat paints could be toxic for the aquatic organisms.

Copper

- There are two states of the ions of copper, the copper(I) ion is usually more toxic than the copper(II) ion.
- Copper(II) is stable in atmospheric conditions.
- The copper(II) ion is converted to the copper(I) ion in some tissues, e.g. before transport across cell membranes.
- In some cases, the toxicity of copper is due to copper(I) even when the organism is exposed to copper(II).

Lead

- Lead the organometallic compound methyl lead was one of the most important pollutants, as it was a component of leaded fuel.
- Leaded fuel is no longer used in industrialized countries.
- Lead from exhaust fumes caused mainly air pollution, so the aquatic pollution by the metal is largely from the metal being a component of paints, batteries, or piping.

Lead

- Effluents of paint manufacturing, and industries and households using lead-containing paints or batteries are major aquatic pollution sources in addition to mining effluents.
- The other aquatic pollution source has been lead in shotgun pellets, which has caused high lead levels in environments inhabited by waterfowl.
- Lead has also been used as weights for fishing nets, etc., because of its high density.
- Lead is a typical nonessential metal.