Page No.
Date

Heavy metal & detergent :- Degradation of lignin and cellulose using microbes :-

Heavy metals :- Any metallic chemical element that has a relatively high density and is toxic or poisonous at low conch.

eg - Cr, Mn, W, Cu, Zn, Cd, Hg, As, Se, Sb, Pb etc.

Heavy metal Contamination :- Process of mobilizn from source areas → to water and sediments.

- Solubility under specific environmental condn,
- Not all heavy metals are toxic in every possible environmental condition.
- Dispersion in environment by water cycle
- Pb, Hg, Cd & As (arsenic) are common heavy metals. Natural Process
- Sources :- wind erosion
  Glacial erosion
  Volcanism and uplift
  Industrial/Agricultural —
  - fossil fuel combustion
  - Automobile exhaust
  - Mining
  - Paints,
  - Smelting
  - waste disposal,
  - Pesticide & Herbicide appln. fertilizer application

* Heavy metal consumption :→

- consuming foods that are high in heavy metal conch.
  - ~~Rate~~ Absorbed in GI tract.
  - Rate depends on solubility and chemical form of metal / element.
  - Plants growing in heavy metal rich soils or water (eg. rice)
  - Animals who have consumed plants rich in heavy metals.
- Through respiration of air that has a high conc^n of heavy metals.

  Fume, dust or particulates get trapped in upper respiratory tracts.
- Drinking water that is high in heavy metals (eg poisoning through lead pipes).

* Heavy metal toxicity :→

- Biochemical mode of action — inhibition of enzymes.
  - can deactivate the enzyme → stops or alters metabolic processes.
- Affinity for -SH (sulfhydryl grp) found in protein.
- Toxicity depends on speciation.

  Insoluble substances pass through the body without harm.

- Soluble compds are more toxic.
- Organic compds of heavy metals are highly toxic these are soluble in animal tissue by attaching with Alkyl grp & Also easily pass through biological membr.
- Toxicity in water depends on speciation and water quality. (pH/DOC)
- Many heavy metals tend to bioaccumulate in plants and animals and becoming higher in conch over time & travel up the food chain.

Arsenic: (As):—

* Major global occurances of Arsenic in ground waters. → presence of Arsenic in ground water is a major environmental problem globally. Arsenic is tasteless & odourless.
- Arsenic release from minerals.
- Arsenic causes induction of cancers of the skin. Also it linked to various internal cancers like liver, lung & bladder cancer.

* Arsenic Uptake: → Rice grown in flooded fields allowing As uptake from soil & water
- Pesticides and Herbicides containing As are added to the fields.

- some soils & waters naturally contain high As and certain rice plant varities uptake the As.
- As absorbed by inhalation or digestion, transformed via bloodstream to all organs causing systemic damage; commonly eating by rice contaminated with Arsenic.

Tungsten; Inert
- non toxic
- Linked to Leukemia
- occur naturally in the environment.
- It also caused tumor formn., DNA damage
- cardiovascular disease. Also cause nausea, seizures & first stage coma,
- W found in air particulate & surface dust

Manganese (Mn); Act as cofactor of several enzyme
- Transition metal
- most abundant mineral of soil
- essential element for all species. (most in fish)
Also it is toxic to the human body
- mostly found in human bones & kidneys.

✱ Detergent
- Made from benzene derivatives
- Poor biodegradability

- Produced excess foam washed into waterways.
- To overcome problems in hard water, detergents may contain additional substances such as phosphate derivatives
- Reduce water hardness and increase pH.
- Phosphates contribute to eutrophication.
- Discharge into waterways can lead to algal blooms and their associated problems.
- Can act as antiseptics and biocides.
- sewage treatment plants rely on bacteria to decompose the sewage.
- Bacteria may be killed by the biocidal action of these detergents.
- Made from natural - organic materials.
- Biodegradable, reducing impact on waterways.
- Readily broken down into harmless substances such as CO_2 & H_2O.