HEAVY METALS

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Definition

Heavy Metals: are natural components of the Earth's crust.

The term **heavy metal** refers to any metallic chemical element that has a relatively high density and is toxic or poisonous **at low concentrations**.

Some charactrastics:

- They cannot be degraded or destroyed.
- Its enter our bodies via food, drinking water and air.
- As trace elements, some heavy metals (e.g. copper,selenium, zinc) are essential to maintain the metabolism of the human body
- heavy metal poisoning could result, for instance, from drinking-water contamination (e.g. lead pipes), high ambient air concentrations near emission sources, or intake via the food chain.

Mercury - Hg

- Is the only common metal which is **liquid at ordinary temperatures**.
- It rarely occurs free in nature and is found mainly in **cinnabar** or (HgS) in Spain and Italy.
- It alloys easily with many metals, such as gold, silver, and tin - these alloys are called amalgams. Its ease in amalgamating with gold is used in the recovery of gold from its ores.

Health effects of mercury

- Disruption of the nervous system
- Damage to brain functions
- DNA damage and chromosomal damage
- Allergic reactions, resulting in skin rashes, tiredness and headaches
- Negative reproductive effects, such as sperm damage, birth defects and miscarriages

Air pollution

- Fossil fuel combustion
- Mining
- Smelting
- Solid waste combustion

Water pollution

- The application of agricultural fertilizers.
- Industrial waste water disposal

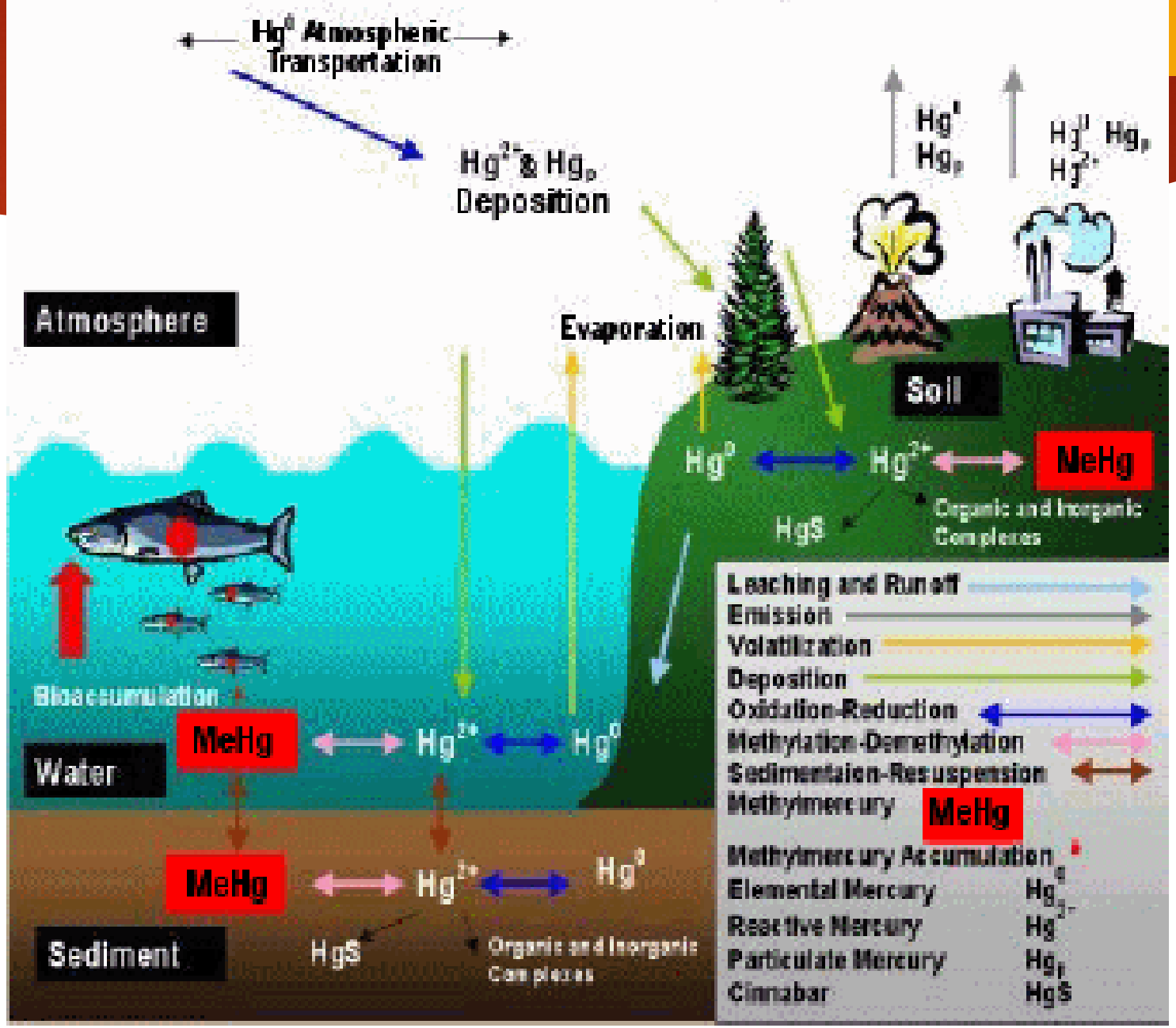
Environmental effects of mercury

- Acidic surface waters can contain significant amounts of mercury
- When the pH values are between five and seven, the mercury concentrations in the water will increase due to mobilisation of mercury in the ground.
- Once mercury has reached surface waters or soils microorganisms **can convert it to methyl mercury**, a substance that can be absorbed quickly by most organisms and is known to cause nerve damage.

Environmental effects of mercury

- **Fish** are organisms that **absorb** great amounts of **methyl mercury** from surface waters every day (**mercury can accumulate** in fish and in the food chains)
- **The effects that mercury has on animals are:** kidneys damage, stomach disruption, damage to intestines, reproductive failure and DNA alteration

Conceptual Biogeochemical Mercury Cycle



Cadmium – Cd

- Human uptake of cadmium takes place mainly through food.
- Food stuffs that are rich in cadmium can greatly increase the cadmium concentration in human bodies (liver, mushrooms, shellfish, mussels, cocoa powder and dried seaweed)

HEALTH EFFECTS OF Cd

- Diarrhoea, stomach pains and severe vomiting
- Bone fracture
- Reproductive failure and possibly even infertility
- Damage to the central nervous system
- Damage to the immune system
- Psychological disorders
- Possibly DNA damage or cancer development

Environmental effects of ca

- Cadmium can be transported over great distances when it is absorbed by sludge
- Sludge riched-Ca pollute surface waters as well as soils.
- Its strongly adsorbs to organic matter in soils.
- Soils that are acidified enhance the cadmium uptake by plants.
- This is a potential danger to the animals that are dependent upon the plants for survival – Cadmium can accumulate in their bodies.

- In aquatic ecosystems cadmium can bioaccumulate in mussels, oysters, shrimps, lobsters and fish
- The susceptibility to cadmium can vary greatly between aquatic organisms
- **Salt-water organisms** are known to be more resistant to cadmium poisoning than freshwater organisms

Chromium - Cr

- Chromium(III) is an **essential nutrient** for humans and shortages may cause heart conditions, disruptions of metabolisms and diabetes
- But the uptake of too much chromium(III) can cause health effects as well, for example: skin rashes.

- Chromium(VI) is a danger to human health, mainly for people who work in the steel and textile industry.
- People who smoke tobacco also have a higher chance of exposure to chromium
- Hexavalent Chromium – Chromium (VI) is a species of chromium that is forbidden to use in electrical & electronic industry.

HEALTH EFFECTS

- When it is a compound in leather.. products, it can cause allergic reactions, such as skin rash
- After breathing it in, chromium(VI) can cause nose irritations and nosebleeds
- Upset stomachs and ulcers
- Respiratory problems
- Weakened immune system
- Kidney and liver damage
- Alteration of genetic material
- **Lung cancer**
- Death

Environmental effects of chromium

- Most of the chromium in air will eventually settle and end up in waters or soils
- Chromium in soils strongly attaches to soil particles and as a result it will not move towards groundwater
- In water chromium will absorb on sediment and become immobile
- Only a small part of the chromium that ends up in water will eventually dissolve

Environmental effects of chromium

- Chromium(III) is an essential element for organisms that can disrupt the sugar metabolism and cause heart conditions, when the daily dose is too low
- Chromium(VI) is mainly toxic to organisms - it can alter genetic materials and cause cancer

Lead - Pb

- Foods such as fruit, vegetables, meats, grains, seafood, soft drinks and wine may contain significant amounts of lead.
- Cigarette smoke also contains small amounts of lead.

Health effects of lead

- Disruption of the biosynthesis of haemoglobin and anemia.
- Kidney damage.
- Miscarriages.
- Disruption of nervous systems
- Brain damage
- Declined fertility of men through sperm damage
- Diminished learning abilities of children
- Behavioural disruptions of children, such as aggression, impulsive behaviour and hyperactivity

- Lead can enter a foetus through the placenta of the mother.
- Because of this it can cause serious damage to the nervous system and the brains of unborn children.

That is why women in pregnancy can not work with lead.

Lead sources

- Application of lead in gasoline
- Fuel combustion
- Industrial processes
- solid waste combustion

Environmental effects of lead

- Lead accumulates in the bodies of water organisms and soil organisms
- Health effects on shellfish can take place even when only very small concentrations of lead are present
- Body functions of phytoplankton can be disturbed when lead interferes. Phytoplankton is an important source of oxygen production in seas and many larger sea-animals eat it
- That is why we now begin to wonder whether lead pollution can influence global balances

Environmental effects of lead

- Soil functions are disturbed by lead intervention, especially near highways and farmlands, where extreme concentrations may be present
- Also soil organisms are suffered from lead poisoning

Thank you