

Why is mercury a
water pollutant?



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PARTICIPANT DETAILS

MAHALI,

Thobias

MAHENGE,

Baraka

MAKALA

Emmanuel

S.

KAPINGA,

Luiza

MAJANI,

Ainea

MALEKELA,

Shauri

MANGE,

Rehema S.

QUESTION; Mercury is considered as serious water pollutant while there are only few major sources of mercury and most of its inorganic compounds are insoluble in water. Why?

Pollutants are substances introduced into the environment that have undesired effects, or harmfully affect the usefulness of a resource like water, land and

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air. There are different pollutants such as Biological pollutants (Organic matter, Microorganisms), Heavy metals (mercury, Cadmium, Lead), Synthetic chemicals, and Radioactive (Chitkara, 2005).

Water pollution is any chemical, physical or biological change in the quality of water that has a harmful effect on any living thing that drinks or uses or lives (in) it (Thomson, 2001)

Mercury is a naturally occurring element found in the earth's crust with natural deposits generally found as a vermilion red ore called cinnabar. Mercury exists in three different forms: elemental, inorganic and organic. Elemental (Hg^+ or Hg^{2+}) or metallic mercury is a silvery, shiny liquid at room temperature that produces a colourless, odourless vapour at room temperature. Inorganic compounds can be formed when elemental mercury combines with elements such as sulphur, chlorine or oxygen. These compounds are usually known as mercury salts, and Organic mercury compounds occur when elemental mercury combines with carbon and hydrogen (Health Canada, 2004)

The few major sources of Mercury Most of them released from manmade activities is elemental mercury released into the air due to mining ore containing mercury, burning fossil fuels and burning waste in some cases mercury is used in mining like Gold mining to separate gold from their ores by washing them with mercury, these mercury may be removed from gold when is heated where mercury tend to volatilize and removed as vapour, during washing process the wastes contaminated with mercury may be washed into water bodies, when enter into water, they sink down to water

floor where it accumulate there as are not dissolved easily in water (Are insoluble in water), so continuous accumulation in the water cause water pollution, the other mercury which escapes in vapour on heating goes to the atmosphere and mix with rain water and get back to the water bodies and other are inhaled by human being in vapour form. (*ibid*)

Combustion of coal, the mercury exist naturally in coal and on heating the coals the mercury are volatilized and escaped to the atmosphere and mixed with rain water then back to the water bodies through rain water also some dusts and other wastes may be drained into water bodies directly and pollute water. (*ibid*)

Volcanic eruption. This is natural source of mercury where mercury are escaped in gaseous state to the atmosphere and then mixed with rain water and back to the water bodies through rain, also some are inhaled directly in gaseous form into the body of organisms (*Health Canada, 2004*)

Chloralkali plants, this is using in manufacturing of chlorine gas and caustic soda, mercury is used in chloroalkali plants (metallurgical process) to convert salts to chlorine gas and caustic soda which is then used in products like detergents, plastids and breach thus when these lab-chemicals are thrown in water bodies they tend to pollute water as they contaminate water. (*ibid*)

House hold waste. The mercury comes from common house hold items such as compact fluorescence light bulbs, thermostats, mercury thermometer and from auto mobiles scraps, Mercury in form of ashes and dusts from incineration process may be washed directly into water hence pollute water

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when present in water bodies also some tend to escape in vapour state to the atmosphere where they mix with rain water.

Pesticides like Fungicides. Mercury is also used as fungicides and algaecides there for when applied in the farm they may enter water through erosion hence pollute water.

Sewage discharge. Some mercury is drained into water bodies through sewage drainage system, example drainage system in municipal when the water in sewage system is contaminated with mercury.

Industrial wastes. Also mercury may enter in water bodies from contaminated industrial wastes, when they are contaminated with mercury, thus when these industrial wastes are washed into water bodies they tend to pollute water.

Though there are few major sources, mercury is considered as serious water pollutant due to the following facts;

Ability to bio- accumulates; Being toxic heavy metal mercury undergo bio-accumulation, means that the organism can take up contaminants more rapidly than their bodies can eliminate them thus the amount of mercury in their body accumulate over time. If for a period of time an organism does not ingest mercury its body burden of mercury will decline, if however an organism continually ingest mercury its body burden can reach toxic levels, the smaller aquatic organisms in the food chain like small fishes, planktons tend to bio-accumulate with mercury and are called bio-accumulators .

(Huckabee et al, 1979).

Ability to bio-magnify; Bio-magnification means an increase of the concentration of the contaminant at each level of the food chain, mercury bio-magnify from the bottom to the top of the food chain, even at very low input rate to aquatic ecosystem that are remote from point sources, bio-magnification effects can result in mercury levels of toxicology concern. Release of mercury primary exposure to mercury pollution. Organisms which tend to eat directly to bio-accumulators are said to be bio-magnified like Shark, Sword fish, and human being (When feed on contaminated fish) (*Huckabee et al, 1979*).

Mercury is able to travel long distances in the air, when volatilized at higher temperature and changed to gaseous form hence can spread easily and bring toxic effects as they are neurotoxicant. Volatilized mercury can be easily inhaled by human being. Also some volatilized mercury may go to the atmosphere and mix with rain water and then back to the water bodies through rain.

They are easily changed to toxic form by microbes. Certain bacteria (*pseudomonas spp*), play an important role in water by converting insoluble inorganic form of mercury compounds like mercury sulphide, mercury chloride to soluble organic form (Methyl mercury), CH_3Hg^+ which is more toxic than inorganic compound of mercury and require considerably longer to be eliminated from the body of organisms, when these toxic form of mercury compounds are taken into human body the human body either through consumption of contaminated aquatic resources (like fishes) they lead to various health problems like deteriorates nervous system, corrodes skin and mucous membrane, may cause damage to the brain, for the

pregnant woman they affect inborn fetus, may cause hearing and vision impairment, kidney damage, ulcers, carcinogenic or mutagenic also may lead to death when in the form of methyl mercury.

Does not decompose easily in the environment. As they are non-biodegradable thus cannot be easily decomposed by micro-organisms or oxidized by micro-organisms like biological pollutants do. Thus they existed a long time in the water bodies when present.

Generally mercury is a serious water pollutants and when taken in human body result into health problems like affection on the central nervous system and in severe cases irreversibly damage areas of Brain, Ulcers, Blindness, Carcinogenic or mutagenic, Kidney damage and other disorders, thus care should be taken in order to protect water bodies from contamination with mercury or mercuric compounds, also about water resources like fishes should be well examined before consumed by human being also there should be proper water disposal.

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