

GLOBAL JOURNAL OF ENGINEERING SCIENCE AND RESEARCHES

A BRIEF ACCOUNT OF BIO CHEMICAL EFFECTS OF HEAVY METALS

R R Upadhyay¹ and M Islam²

¹R R Upadhyay, Lecturer (Senior Scale), Govt. Polytechnic, Adityapur

²Mujahidul Islam Lecturer (Mech. Engg.), Govt. Polytechnic, Adityapur

ABSTRACT

The word 'environment' is derived from French word 'environ' which means 'to surround' or 'around' and is referred to as the external condition in which an organism lives.

Environment can be defined as the sum total of physical, chemical, and biological factors which act upon an organism and an ecological community.

The environment never remains static for any living organism, it changes with time and place.

Environment consists of four segments where all interact among themselves.

ATMOSPHERE - the sphere of air

HYDROSPHERE - the sphere of water

LITHOSPHERE - the sphere of Rocks.

BIOSPHERE - the sphere of living organisms.

Technology is the skill to do anything in a proper way. Ever since the advent of human beings on the earth, they have been continuously putting their efforts to find the mystery of nature. The ongoing thought process in human brain differentiates this species from others. Searches and researches have changed the human civilization rapidly. Technology has made life easier, but people are at great risk to their health with the advancement in technology. Most of the people do not realize the health risk. They are taking everyday when they do their daily tasks. We do not care about air we breathe and the water we drink.

Though technology has been capable to fulfill many needs of human life but the haphazard and un-directional advancement in technology has devastated the natural ecological balance which ultimately will cost in loss or extinction of many living beings.

The strength of technology brought industrial revolution in England and as a result a handful English people managed to overpower and rule over more than half of this globe.

Gradually many industrial houses came in existence:

1. Engineering industries.
2. Metallurgical industries.
3. Chemical industries.
4. Nuclear reactors.
5. Agro based industries.
6. Plastic and polymer industries.
7. Leather industries.
8. Ceramic industries.
9. Thermal power stations.
10. Building and road constructions.
11. Mining industries.
12. Automobiles industries and many more to count.

The exploding population is getting more relaxed by over utilizing of resources in an unwanted way. Despite the advancement in technology, the human civilization is moving towards a black blank.

Keywords- Bio-chemical, heavy metal etc.

I. ENVIRONMENTAL DEGRADATION

The alarming rate of growth in population followed by the need for acquisition of quality life has put excessive pressure on all of the natural resources. In order to meet the basic needs of mankind, there is rapid deforestation, industrialization and unplanned urbanization. All these activities along with some natural occurrences have modified and even transformed the basic components of the environment. Some of these components have changed to such an extent that they cannot be set right by self regulatory mechanism of the environment. Environmental degradation has led to the destruction of the environmental stability and ecological balance.

II. HEAVY METALS

With increase in need and advancement of technology, human race is trying to overpower the natural phenomena. Human being has forgotten the normal rule of stability of any body. In rapid and random race of researches and

application of technologies without proper consequences, we are always busy in digging our graveyards ourselves. Ores and minerals of different metals are being excavated, processed and extracted without following any norms and acts imposed by the regulatory body.

Besides measure factors which are macroscopic, we have to focus more precisely on the microscopic level that is biochemical effects of heavy metals.

The most important heavy metal pollutants are

Mercury (Hg),
Lead (Pb),
Cadmium (Cd)
and Arsenic (As).

The sources and effects of these metals are being discussed as follows-

MERCURY(Hg)

Sources :

- 1) Mining and refining of Hg.
- 2) Agricultural industries producing organic mercury as pesticides and fungicides.
- 3) Paper industry using Hg as cathode.
- 4) Laboratories using Hg.

The identification of Hg as toxic metal came into limelight after the incidence of Minamata diseases in Japan (1953-60). At Minamata Bay in Japan, many people lost their lives, many were permanently crippled and babies born to mothers consuming Hg contaminated fish were genetically defective.

The source of mercury was the discharge of the effluent from a vinyl chloride plant, Minamata Chemical Company.

Minamata incident was followed by a tragic incident in Iraq, where many people died consuming wheat contaminated with organic mercury used as fungicides for seed dressings.

Due to high vapour pressure of mercury, when inhaled, it causes serious damage to central nervous system. The most toxic species are, however, organic Hg, specially CH_3Hg^+ as it is soluble in fat, lipid of membrane and brain tissues.

The covalent Hg-C bond can't be disrupted easily and thus, remains for the long time in the cells and in tissues, prohibits active transport of sugar.

Effects of Hg:

- 1) Numbness of limbs, tongues and lips.
- 2) Blurred vision, deafness and mental disorders.
- 3) Kidney damage

Lead(pb):

Sources of Lead are :

- 1) Mining and refining of lead base ores.
- 2) Automobiles emission (tetraethyl lead used as anti-knocking agent).
- 3) Electricals storage batteries.
- 4) Ceramic industry.
- 5) Agricultural industry.
- 6) Paint, pigments, varnishes.
- 7) Hair dyes, Canned food, Painted toys etc.

Lead prohibits utilization of oxygen and glucose for the life sustaining energy i.e interferes with normal metallic function. When the blood lead level reaches 0.8 ppm, symptoms of anemia occur with high degree kidney infection and brain damage.

One of the most harmful effects of lead is that it can replace Calcium in the bones, accumulate there and subsequently remobilize. Organic lead can penetrate the skin, and can get absorbed in the body tissue.

Effects of lead :

1. Liver and kidney.
2. Mental retardation.
3. Genetic modification.

It is believed that the fall of **Roman Empire** was due to lead poisoning. Lead was an expensive metal during the era of Roman Empires. Roman aristocracy used lead containers for storing wine and for cooking. The leaching of lead ultimately caused chronic lead poisoning and caused mental retardation, degenerate behavior and collapse of the Empire.

Cadmium (Cd) :

Sources of Cadmium :

- 1) Industrial effluent.
- 2) Cadmium nickel batteries.
- 3) Nuclear fission plants.
- 4) Water Pipes.

Cadmium occurs in nature in association with Zinc minerals Plants. The absorbed cadmium gets attached to the active sites of enzymes which leads to cadmium toxicity.

Effects of Cadmium :

1. Kidney damage.
2. Disorder of liver and brain.
3. Bone marrow disorder.
4. Gastric and intestinal disorder.

Arsenic (As) :

Sources of Arsenic :

- 1) Natural rocks and soils.
- 2) Agricultural industry.
- 3) Fungicides, pesticides and herbicides.
- 4) Glass industry

One of the major causes of Arsenic pollution is contamination of ground water.

Effects :

1. Affects liver badly.
2. Affects central nervous system and causes Cancer.
3. Damages Bone marrow.

III. CONCLUSION

Due to misuse or overuse of technology, the harmful effects of heavy metals can be easily observed.

These metals are so toxic in nature such they are silently killing the living organism. People are looking towards the direct gain without any delay by using Technology, but they are fully ignorant of destructive nature and there effects they suffer in the long run. A time is not far away when people equipped with latest facilities will be seen walking like statues without lives.

General methods to control environmental degradation are:

- Public awareness
- Govt awareness
- Domestic awareness
- Industrial awareness

REFERENCES

1. *Masters Gilbert M., Introduction to Environment Engg and science, Pearson education, New Delhi*
2. *Pandey G.N, Environmental Management, Vikas Publishing House, New Delhi*
3. *Bharucha Erach, Textbook of Environmental studies ,UGC.*
4. *Dash M.C Fundamentals of Ecology, T.M.H, New Delhi.*
5. *Gurukrishna Dasmohapatra, Environmental Pollution and Control, N.S.E.C, Kolkata*