

ENVS PROJECT ON
'HEAVY METAL POLLUTION AND
EFFECT ON HUMAN'



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TABLE OF CONTENTS

<u>PAGE</u>	<u>SERIAL NO.</u>	<u>TOPIC</u>
1	Introduction	1
2	Water pollution	2
3	Soil pollution	2
4	Noise pollution	2
5	Radioactive contamination	3
6	Thermal pollution	3
7	Sources and Emission	3-4
8	Toxic metal and effect	4-6
9	Pollution by heavy metal	6-11
10	Heavy metal and Human Health	12-13
11	Acknowledgement	14
12	References	15

Introduction :

Pollution can be defined simply mean introducing contaminants into the natural environment and causing adverse change. While pollutants are a vast material that pollutes the air, water or soil, pollutants differ according to chemical nature, persistence and concentration. There are many types of pollution that can be recorded including.

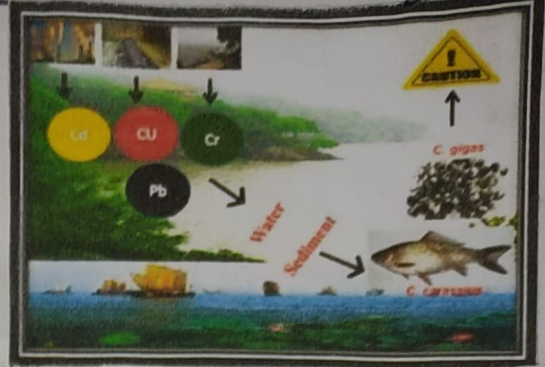
Metallic elements are intrinsic components of the environment. Their presence is considered unique in the sense that it is difficult to remove them completely from the environment once they enter in it. Metals constitute an important class of toxic substances which are encountered in numerous occupational and environmental circumstances. The impact of these toxic agents on human health is currently an area of intense interest due to the 'ubiquity' of exposure. With the increasing use of a wide variety of metals in industry and in our daily life, problems arising from toxic metal pollution of the environment have assumed serious dimensions.

Air Pollution refers to any contaminating of the atmosphere leading to effects on the normal components and the air chemistry. Chemicals, dust and excessive gases are most air pollutants. Air pollution sources include manufacturing exhaust, fires in the forest, volcanoes, construction of buildings or demolition, and others.

Air pollutants cause several effects like smog increasing, higher acid rain increasing, low yields of the crops, not enough oxygen and results in increased asthma rates. Many new theorists insist on the strong relation between global warming and increasing of air pollution.

Water Pollution:

Water pollutants means the presence of different types of contamination in the water, such as contamination by chemicals, or microbial organisms, leading to attack the quality and purity of water. We

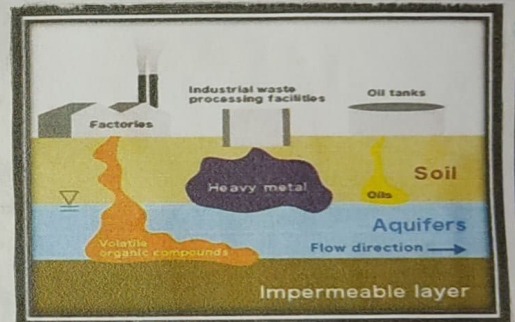


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can notice water pollution easily in different water sources flow like rivers, lakes and oceans. Many factors lead to occurring pollution in water like soil erosion sediment, waste and the decay of organic material. The main effects of this type of pollution lead to decreasing in drinking water quantity, decreasing water supplies for plants, animals and all normal living populations in water.

Soil Pollution:

Soil pollution that means producing of any types of pollutants to the soil that lowers or stops normal growth in soil. As a result of soil pollution poor growth, low crop productions, and finally loss of many types of normal flora, and habitat. The main sources of soil pollution include danger industrial waste, sewage, pesticides.



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Noise Pollution:

Noise pollution means any increase or abnormal level of noises as a result of activity by a human. Noise pollution can occur especially in big cities because of industry, traffics, transport like airports and so on, the effects of noise pollution may include loss of hearing, wildlife distribution, and consider more danger on lifestyle.



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Radioactive contamination is very little but large in Iraq, it may because death for the human, animal also plant when it occurs. Sources of radioactive contamination obtain from nuclear: plant, waste, and wars. Radioactive energy may cause teratogenicity, cancers, fertilization, as well as many dangers for the health of humans and other organisms.



Thermal Pollution means increasing of heat degree. Thermal pollution may happen due to power plant activity, deforestation, and temperature moderating water sources, heat contamination may cause death. There are many other types of pollutions like light, Visual, Pollution, and fighting Pollution.



SOURCES AND EMISSIONS

Toxic metals, to a large extent, are dispersed in the environment through industrial effluents, organic wastes, refuse burning, and transport and power generations. They can be carried to places many times away from the sources by wind, depending upon whether they are in gaseous form or as particulates. Metallic pollutants are ultimately washed out of air into land on the surface of water ways. Thus air is also a route for the pollution of environment.

Metal containing industrial effluents constitute a major source of metallic pollution of hydrosphere. Another means of dispersal is the movement of drainage water from catchment areas which have been contaminated by waste from mining and smelting units.

The chief toxic metals in industrial effluents are shown in table-1.

Table 1 : Toxic Metal in Industrial Effluents

Metal	Manufacturing Industries
Arsenic	Phosphate and Fertilizer, Metal-
Cadmium	Hardening, Paints and Textile
	Phosphate Fertilizer, Electronics, Pigments And Paints
Chromium	Metal plating, Tanning, Rubber And Photography
Copper	Plating, Rayon And Electrical
Lead	Paints, Battery
Nickel	Electroplating, Iron steel.
Zinc	Galvanizing, Plating Iron And steel
Mercury	Chlor-Alkali, Scientific Instrument,
	Chemicals.

TOXIC EFFECTS

In general the toxicity of metal ions to mammalian systems is due to chemical reactivity of the ions with cellular structural proteins, enzyme and membrane system. The target organs of specific metal toxicities are usually those organs that accumulate the highest concentrations of the metal in vivo. This is often dependent on the route of exposure and the chemical compound of the metal i.e. its valency state, volatility state, volatility, lipid solubility etc.

The target organs and clinical manifestations of chronic exposures to the metal are given in table. Besides the general toxicities of metals, we are today also concerned with the potential carcinogenicity of metal compounds. Certain metals

Such as chromium and nickel have been linked with cancers in exposed human populations. Metals have been shown to cause acute as well as chronic poisoning in man and other experimental animals. Harmful effects of individual metals are presented briefly below.

Table 2: Clinical Aspects of Chronic Toxicities

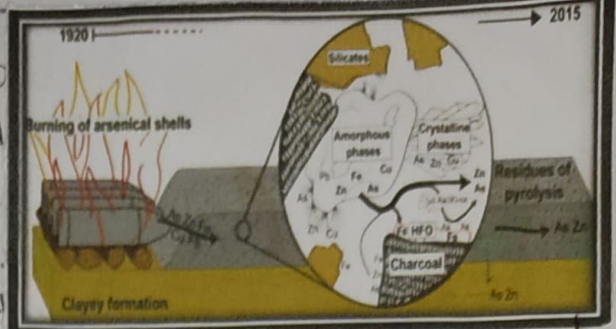
Metal	Target Organs	Primary Sources	Clinical effects
Arsenic	Pulmonary Nervous system, skin	Industrial Dusts, Medicinal Uses of Polluted Water.	Perforation of Nasal septum, Respiratory Cancer, Peripheral Neuropathy Dermatomes, Skin Cancer.
Cadmium	Renal, Skeletal Pulmonary	Industrial Dust And Fumes And Polluted water And Food	Proteinuria, Glucosuria, Osteomalacia, Aminoaciduria, Emphysema.
Chromium	Pulmonary	Industrial Dust And Fumes And Polluted Food	Ulcer, Perforation of Nasal Septum, Respiratory Cancer.
Manganese	Nervous System	Industrial Dust And Fumes	Central And Peripheral Neuropathies
Lead	Nervous System, Hematopoietic System, Renal	Industrial Dust And Fumes And Polluted Food	Encephalopathy, Peripheral Neuropathy, Central Nervous Disorders Anemia.
Nickel	Pulmonary, skin	Industrial Dusts, Aerosols	Cancer, Dermatitis

Metal	Target organs	Primary sources	Clinical effects
Tin	Nervous Pulmonary System	Medicinal Uses, Industrial Dusts.	Central Nervous System Disorder, Visual Defects And EEG Changes, Pneumoconiosis.
Mercury	Nervous System, Renal	Industrial Dust And Fumes And Polluted water And Food	Proteinuria.

Pollution by Heavy Metals

Heavy metal are characterized by a high atomical number, weight, and height specific gravity (more than 5). These metals like some metalloids, transition metals, basic metals, lanthanides, and actinides. Numbers of these metals considered to be essential to life. But if H.M presents in high concentrations, it will be toxic, because HM. May build up in biological systems and it will be dangerous for health. The state of heavy metals emission was low because of the high stability of most metals and or because of low industrial activity. In past years, increasing the activity of industry by humans has substantially enhanced emissions, and therefore raised concentrations of HM. in the atmosphere. The atmosphere is great. The amounts in city will become higher, values. there are many examples of heavy metals.

Arsenic: Soluble inorganic arsenic can have immediate toxic effects. Ingestion of large amounts can lead to gastrointestinal symptoms such as severe vomiting, disturbances of the blood and circulation, damage to the nervous system, and eventually death. When not deadly, such large doses may reduce blood cell production, break up blood cells in the circulation, enlarge the liver, colour the skin, produce tingling and loss of sensation in the limbs, and causes brain damage.



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Long-term exposure to inorganic arsenic in drink water in Taiwan has caused black foot disease, in which the blood vessels in the lower limbs are severely damaged, resulting eventually in progressive gangrene. The relationship between arsenic exposure and other health effects is less clear. The evidence is strongest for high blood pressure, heart attacks and other circulatory disease. The evidence is weaker for diabetes and reproductive effects; it is weakest for strokes, long-term neurological effects, and cancers at sites other than lung, bladder, kidney and skin, as well as other skin changes such as hyperkeratosis and pigmentation changes. These effects have been demonstrated in many studies using different study designs. Exposure-response relationships and high risks have been observed for each of these end-points. The effects have been most thoroughly studied in Taiwan but there is considerable evidence from studies on populations in other countries as well.

Cadmium is naturally, occurs in ores together with zinc, lead and it does not have useful functions known in biology, however not considered an essential metal. In the atmosphere, the natural sources of cadmium from the volcano fires in the forest and transported particles of soil by wind movements. Human being exposed to cadmium simply from diet, drinking water, and air, then slowly accumulating in the human body, it has many undesirable effects on health in human, targeting the kidney, liver and vascular system in particular cadmium compounds industrial used in plastic stabilizers, color pigment, welders and many type of rechargeable batteries.



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Mercury:

Main effects of Mercury on Human Health and the environment effects on human health Toxicity of mercury is dependent on whether it takes the form of element mercury inorganic mercury or organic mercury compounds. Accordingly, the exposure scenario varies considerably for these different forms of mercury, and complicates toxicity assessment. In terms of methylmercury, dietary ingestion is the major sources of human exposure, especially for sea-food and fish. Around 80% of inhaled elementary mercury vapour is retained in the tissue of the lungs where it goes on to penetrate the blood-brain barrier where neurological effects take place. Ingestion of elementary mercury does not always lead to high levels of absorption but deaths have been reported. Inhalation of elementary mercury vapour has been observed to lead to symptoms as well as effects on the kidney & thyroid.



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Copper:-

Copper is a naturally-occurring metallic element that occurs in soil at an average concentration of about 50 parts per million (ppm). It is present in all animals and plants and is an essential nutrient for humans and animals in small amounts. The major sources of environmental copper releases include the mining, smelting and refining of copper, industries producing products from copper such as wire, pipes, and sheet metal, and fossil fuel combustion. Water pipes are often made of copper and bath fixtures may be made from brass and bronze alloys that contain copper. The principal sources of copper in drinking water results from the leaching of copper from pipes and bath fixtures due to acidic water. Blue-green stains left in bath fixtures are a sign of the presence of copper in water. Other releases of copper to the environment include agricultural use against plant diseases and treatments to applied to water bodies to eliminate algae. Health Effects Absorbed or Metabolism Studies investigating oral absorption of copper have found the percentage of copper in the diet and competition with other metals found in food such as iron and zinc.



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Chrome:

Chrome is one of the more existing elements in the world. Its Chrome can be examined in different forms, less than $0.1 \mu\text{g}/\text{m}^3$ in the air to $4 \text{ g}/\text{kg}$ in soils in concentrations as fixed by WHO in 2020. It can be used in ferrochrome production, electroplating, drying color production, tanning factories, metal plating, and alloy manufacture, metal welding and forming process. Contamination by chromium occurred by inhaling activity in air, contaminated food, and contaminated water, then many problems obtained



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Like many cases of irritation, ulceration, problem in pulmonary works, and lesions in stomach and small intestine, anemia, and attacking of reproductive system in main, leading to sperm count decline.

Cobalt:

Cobalt found naturally in the earth's crust as $[CoAsS]$, $[Co_3(AsO_4)_2]$ and $[CoAs_2]$ compounds. It is a very important material necessary for mammals to produce many types of vitamins and enzymes. Cobalt has genotoxic and carcinogenic effects also inhibit DNA repair, alter the patterns of gene expression, inducing apoptosis, changes in the structure of chromosomes, and defects of mitotic apparatus. Cobalt has also leads to lung disease, asthma and central nervous system defects.



Lead:

Lead exist naturally in the world and is can be examined in air, water and soils. Contamination by lead from nature is very low, but leads important in many industries, like plastic, enamels, paints, insecticides, and petrol, among others. The entry of lead into the human body by inhalation, ingestion and through the skin. It can distribute in the body by blood, soft tissues, and bone and causes damage, especially in the kidney. Lead has carcinogenesis and mutagenesis effects on human lesion gastrointestinal tract, immune system, endocrine and reproductive system.



Manganese:

Manganese for human, animals and plants, very necessary nutrition and it is needed for grow

Development it can be recognized in many oxidation form and it highly exists in the earth's crust It Can be examined



in soil, water and food

industry, it is the most used metals, in the production of many chemicals. A variety of diseases especially in the nervous system , and 'manganism'

Nickel:-

. Nickel is found in very low amounts as metal, recognized in the



18 century, it found in some

Vegetables like spinach. Natural sources

of atmospheric nickel from dust, volcanic emissions and the weathering of soils. Natural sources of aqueous nickel derive from biological cycles and compounds from soils. In industry, it is used in catalytic converter for automobiles, electroplating, electroforming, cast coins, produces jewelers, medical prostheses, and production of nickel cadmium batteries.

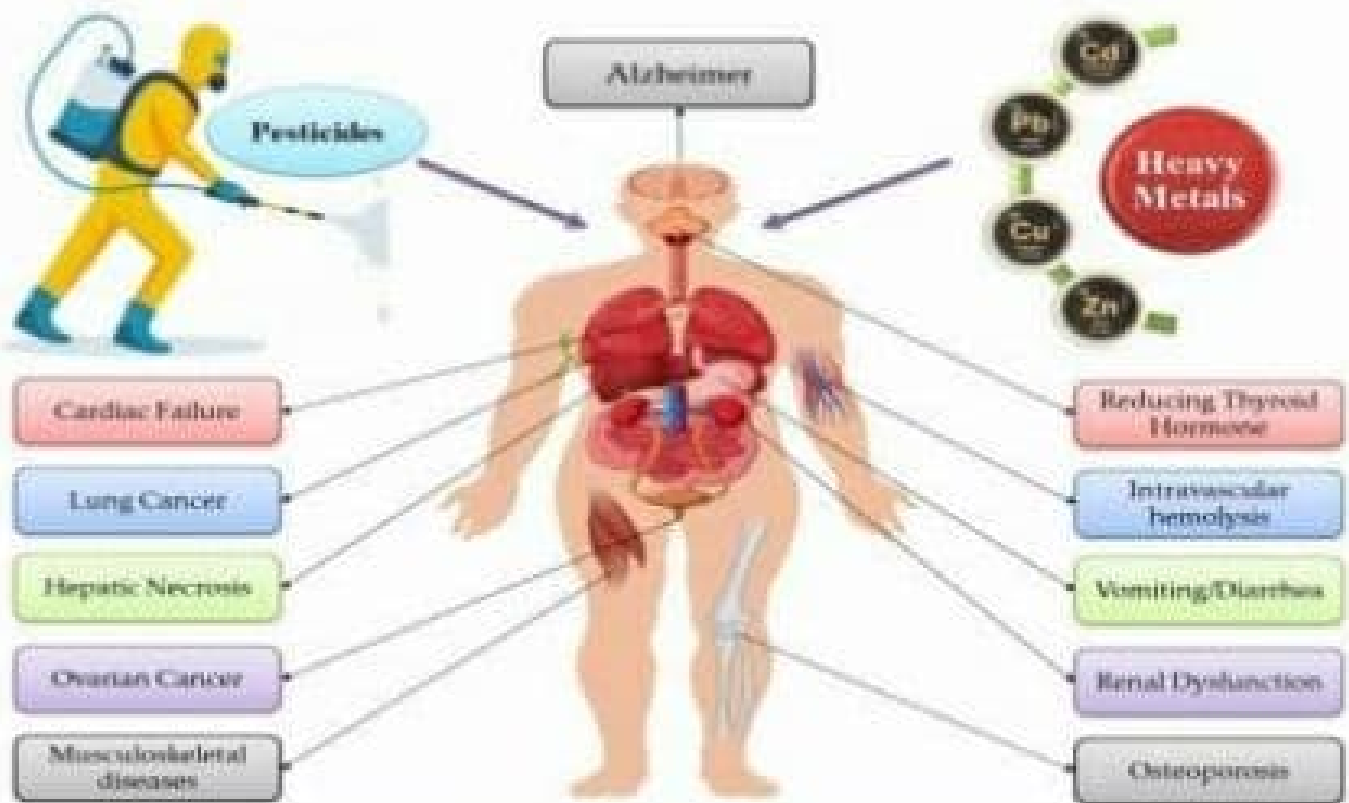
Heavy Metals And Human Health

According to the WHO World Health Organization in 2000 also, there is no safe level for nickel compound can be recommended. Increased risk of the respiratory tract and nasal cancers in miners

and workers in nickel refineries, increasing nickel concentration in humans may lead to cardiovascular disease kidney defects (14). Many research discussed pollution problem in Iraq, It is documented that some heavy metals have many effects on environment.

They have wide effects on

human health, Heavy metals considered as complex environmental pollutants, their levels increased highly in air, water, and soil as a result of industrial and agricultural activity. Causing many disorder including cancer, cardiac disorders, bronchitis, asthma, pneumonia, emphysema, and many other diseases.



Heavy Metals and Pesticides Effect on Human Health

To prevent the effects of the heavy metals of health, safe limits must be determined for different substances. These agreed limits, when the case of the high presence of different pollutants. It will lead to undesirable reactions between pollutant materials and living organism's life, in case any accumulation or increase in toxicity must not pass these safe limits. It was reported that, most human health problems in Iraq associated with heavy metal toxicity like cancer, anemia, damage in kidney and liver, respiratory system, and breast milk .

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