

Environmental Toxicology

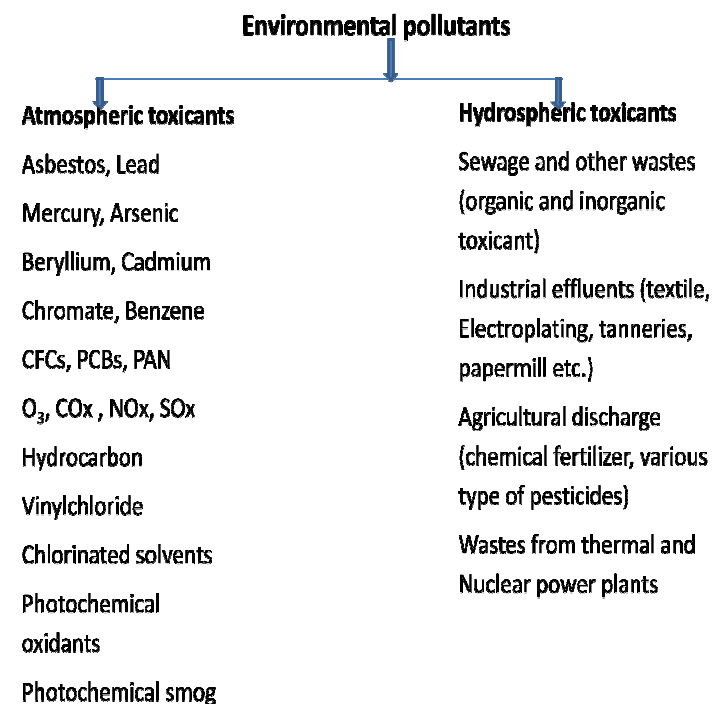
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Definition: Environmental toxicology is refers to the study of various toxic substances such as physical, chemical and biological agents. These substances are administered and interaction between biological system of living being and show the adverse or delayed effects. The toxicology includes the detection, symptoms, pathogenesis, mechanisms and control of toxicity.

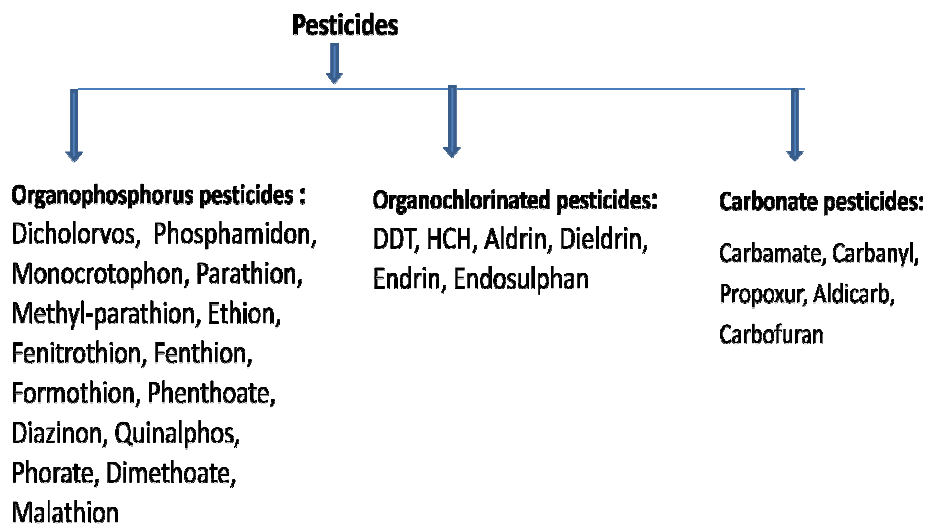
Classification of toxicants: The study of environmental toxicants i.e. their nature and properties, sources, environmental fate and harmful effects. Environmental Protection Agency (EPA), and Occupational Safety and Health Administration and Consumer Product Safety Commission (1978) are classified different type of toxicants present in environment.

Atmospheric toxicant: A large numbers of chemical substances reach the atmosphere as result of natural processes and human activity. Environmental Protection Agency (EPA), and Occupational Safety and Health Administration and Consumer Product Safety Commission have listed 24 substances of the atmosphere as the most hazardous.

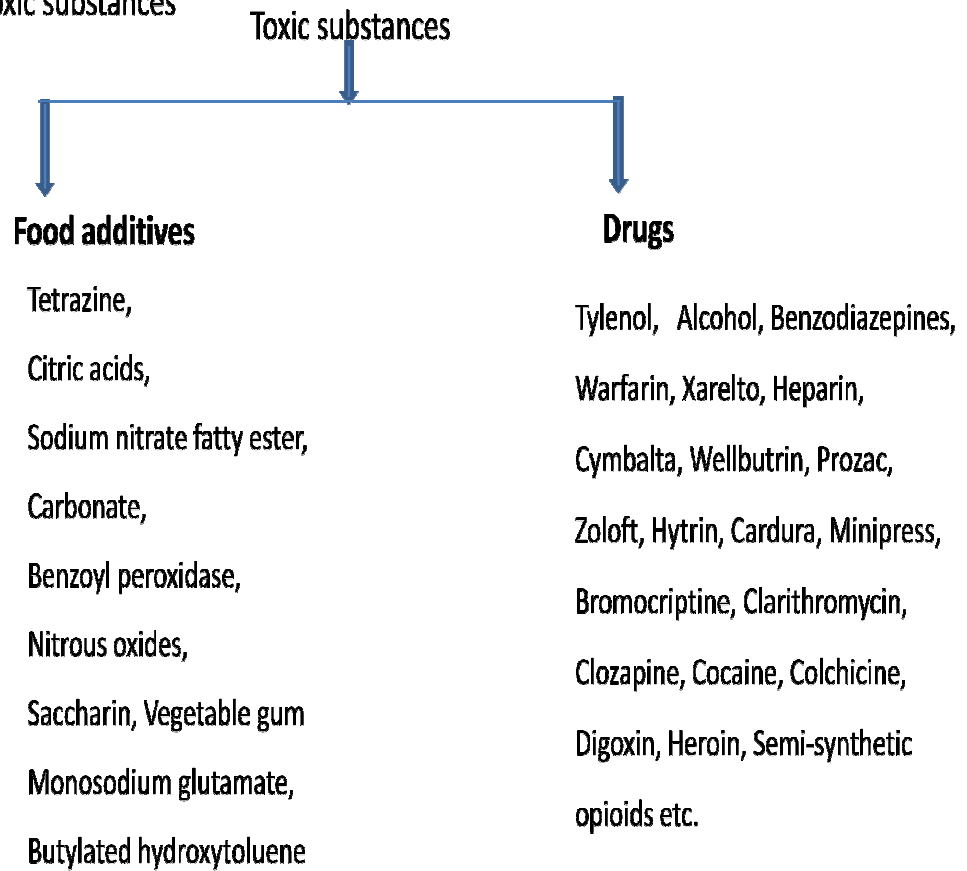
Classification of toxic substances



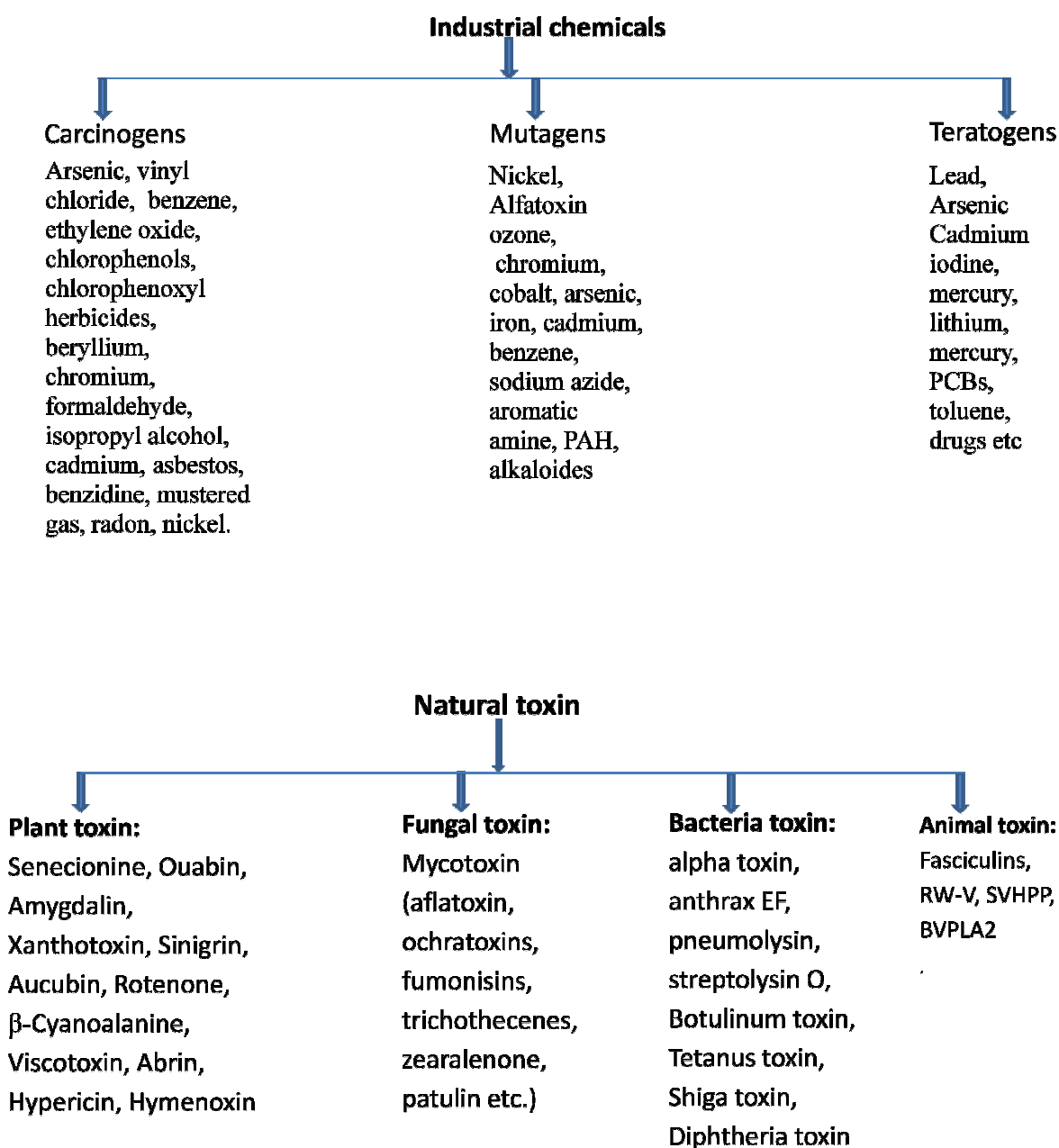
Classification of toxic substances



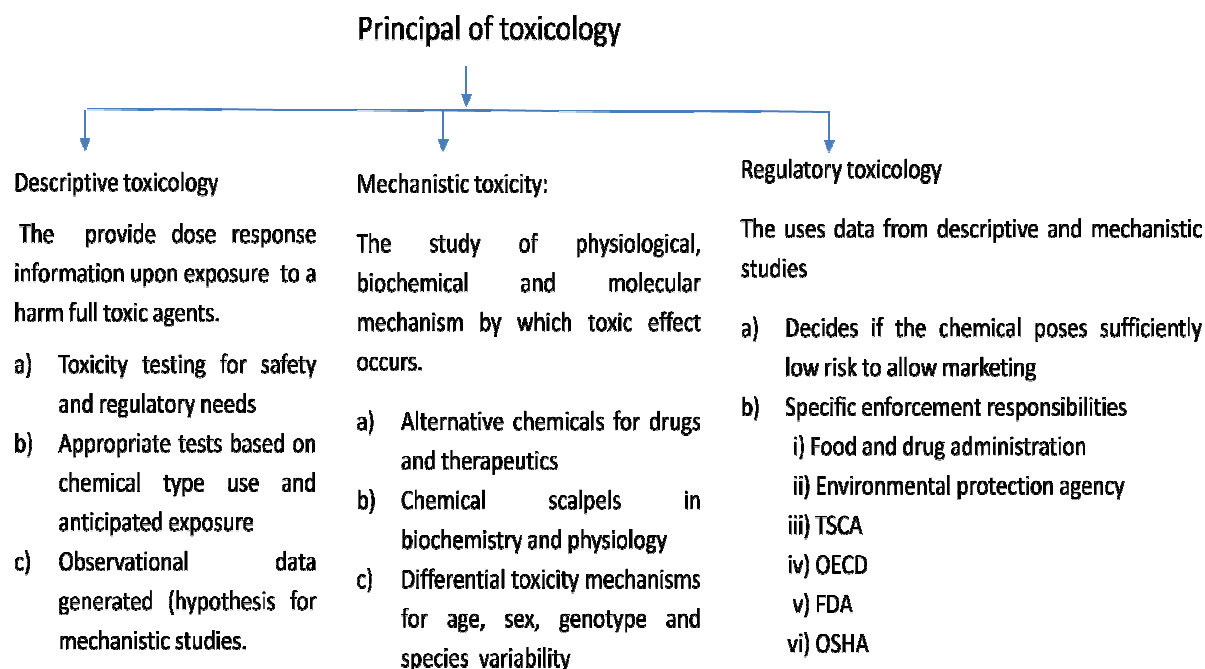
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Principles of toxicology: Toxicology is refers to the study of adverse effect of chemicals on living system. A toxicologist is trained to examine and communicate the nature of those effect on living being. The toxicologist research examines cellular, biochemical and molecular mechanism of action as well as functional effects.



Importance of toxicology: The study of toxicology may be useful to human being in many ways:

1. The data on acute toxicity test for various chemical against various organism
 - a) to have an idea of toxic doses for xenobiotics for certain organisms
 - b) fixation of sub-lethal doses for long term toxicity test
 - c) evaluation of safe doses of those toxicants for certain organisms
 - d) recommendation for maximum permissible limits for those substances in the ambient air, surface and portable water.
 - e) evaluation and recommendation of maximum acceptable daily intake
 - f) determination of sensitive species
 - g) determination of suitable indicator species in aquatic and terrestrial ecosystem
2. The data on long term toxicity tests may be reliable for the:
 - a) evaluation of safe level of toxicants.

- b) development of sensitive predictive tests useful in obtaining information for risk assessments
- c) rational therapy of intoxications
- d) determination of most sensitive stage of particular organisms

The knowledge of toxicology may be helpful in the development of:

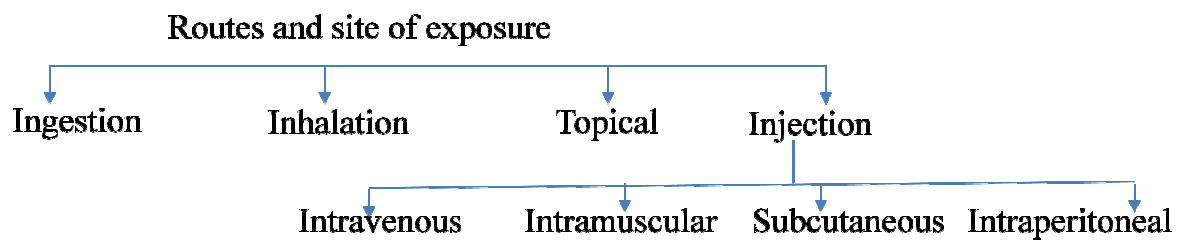
- a) suitable drugs against diseases
- b) suitable and safe food additives
- c) suitable and safe pesticides

4. Analytical toxicology provides suitable methods to evaluate the presence or absence of different substances and their levels in the environment

5. Toxicology may be helpful in the development of suitable antidotes that are useful in the treatment of cases of occupational, accidental or internal poisoning, and thus helpful in protecting the living being.

Exposure of Toxicants: The toxic response occurs in biological system in depend on the physical and chemical properties of the toxicants, the exposure situation and susceptibility of the biological system. The toxic substances, which are metabolic breakdown (biotransformation) product reach appropriate site in the body at a concentration for a length of times. The major factors that influence toxicity as it relative to exposure situation for a specific chemical are the route of administration and the duration and frequency of exposure.

Route and Site of Exposure : The routes and site of exposure is define as nature of toxic substance. The major routes by which toxic substances gain access to the body are GI tract (ingestion), lungs (Inhalation), skin (topical, percutaneous or dermal) and other parenteral routes. The toxic substances generally produce the greatest effect and most rapid response when given directly into blood stream.



Duration and frequency of exposure: The toxicologist usually divide the exposure of animal to chemical can be divided into four categories

- a) Acute exposure – exposure period less than 24 hr.
- b) Subacute exposure- exposure period 1 month or less
- c) Sub-chronic exposure- exposure period 1 to 3 months
- d) Chronic exposure - exposure period more than 3 months or 1 year but may be longer

These three categories of repeated exposure can be by any route, but most often this occurs by the oral route, with the chemical added directly to the diet.

