

Chemical Hazards

By

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- **Outline of Toxicology**
- **Spectrum of toxic effects**
- **Body defense mechanism to toxicants exposure**
- **The hazard of a given chemical substances are related to different substances**
- **Fate of toxins**
- **Assessment of exposure**
 - A. **Environmental monitoring**
 - B. **Biological monitoring**
- **Early detection of occupational diseases**
- **Some important chemical uses in industry with adverse effects e.g. (lead , mercury, cadmium. Arsenic, manganese, chromium, nickel, CO, CO₂, Hydrogen sulfide H₂S, Benzene C₆H₆, Carbon tetrachloride CCL₄, C₂H₃, organophosphorus compound, insecticide)**
- **Lung diseases (Pneumoconiosis)**
 - Asbestosis, Silicosis, Byssinosis**

Toxicology

Toxicology (from Greek words *toxikos* and *logos*)

Is the study of the adverse effects of chemicals on living organisms.

It is the study of symptoms, mechanisms, treatment and detection of poisoning, especially the poisoning of people.

Is a science deal with chemical, physical and its adverse effect on living organism

Types , element of chemical or physical agents capable to produce response on side of action .

Biological mechanism on which harmful effect are produce .

- No chemical agent is entirely safe or entirely harmful .
- When concentration of chemical agent below minimal effective level there is no effect .
- The term LD50 refers to the dose of a toxic substance that kill 50 percent of a test population (typically rats or other surrogates when the test concerns human toxicity) LD50 estimation in animals are no longer required for regulatory submissions as a part of pre-clinical development package.

Types of toxicity

A. Environmental

- Pollution**
- Industrial**
- Residue**

B. Economic

Development drugs

- Food additive**
- Pesticides**
- Insecticides**

C.Forensic

- Medicolegal aspect**
- Diagnosis therapy**

Classification of toxic agents.

Toxic agents are classified in a variety of way e.g.

- Related to target organ (liver , kidney , haemopiolic)
- Their user (pesticides , solvent , food additive)
- Their effects (carcinogenic , mutagenic)
- Their sources (animal , plant)
- Their physical state (gases , dusts , vapors , fumes , mists)
- Their labeling requirements (explosive , flammable , oxidizers)
- Their chemistry (aniline derivative , halogenated hydrocarbons)
- Their poisoning potentials (extremely toxic , very toxic , slightly toxic)
- Their biochemical action on the body (sulhpahydral inhibition)
- More general classification e.g. air pollution , acute and chronic poisoning

Spectrum of toxic effect

- 1. Immediate or delayed toxicity .**
- 2. Reversible or irreversible toxic effects .**
- 3. Local or systemic toxicity.**

Interaction of chemical

- 1. Additive effect .**
- 2. Synergistic effect .**
- 3. Potentiation effect .**
- 4. Antagonism effect .**

Toxicity rating chart

- 1. Particularly non toxic.**
- 2. Slightly toxic .**
- 3. Moderately toxic .**
- 4. Very toxic .**
- 5. Extremely toxic .**
- 6. Super toxic .**

Body defense mechanism to toxicants

- 1. Physical or anatomic defense mechanism to toxicant; skin, mucus membrane, coughing.**
- 2. physiological defense mechanism**
prevention of absorption of agents e.g. protein binding as barrier to toxicants, binding to RBC, excretion of chemical or metabolites.
- 3. Biological defenses**
Act at cellular level to prevent or repair damage.

The hazards of chemical substances is related to:-

A. Chemical factors

- 1. Its absolute toxicity**
- 2. Its physico-chemical properties (solubility, size of particle)**
- 3. Concentration level**
- 4. Length of exposure**
- 5. route of entry**
 - Inhalation +++**
 - Skin ++**
 - Ingestion +**
- 6. Sensitivity of certain organ (target organs)**

B. Workers factors

- 1. age**
- 2. sex**
- 3. ethnic grouping**
- 4. genetic**
- 5. endocrine status**
- 6. atopic state**
- 7. nutrition**
- 8. fatigue**
- 9. coexistence diseases e.g. heart failure, diabetic**
- 10. coexistence exposure to other synergistic or antagonist**
- 11. coexistence exposure to the same agent**
- 12. individual susceptibility**
- 13. previous exposure to the toxic agent**

Fate of toxins

- 1. Metabolism to non-toxic end product**
- 2. Metabolism to toxic product (menthol to formaldehyde)**
- 3. Tissue localization**
 - A. Protein binding (Hg, Cr, Cd)**
 - B. Fat—DDT high lipid solubility, localized in fat tissue**
 - C. Bone—Pb, radiation have affinity to bone marrow**
- 4. Combination of fates e.g. Pb**
 - A. store**
 - B. metabolism**
 - C. excretion**
 - D. unchanged**
- 5. Excretion of toxins or metabolites**
 - A. Volatile—expired air (benzene)**
 - B. GIT—bile, feces**
 - C. Urine—Pb, Cd, Hg**
 - D. Saliva—Pb**

Storage of toxic substances

- 1. Plasma protein**
- 2. liver and kidney**
- 3. fat**
- 4. Bone**

Assessment of exposure

- 1. Environmental**
Work places air samples
- 2. Biological assessment (monitoring)**
Biological media—blood, urine, enzyme
- 3. Health examination**
 - A. Pre-placement medical (pre-employment)**
 - 1. Medical history**
 - 2. Physical examination**
 - B. Periodical medical examination**
 - C. Screening test particularly on risk group**

Early detection of occupational diseases

Occupational diseases can be prevented:-

- 1. The causal agents can be identified, measured, and controlled**
- 2. The population at risk are usually easily accessible and can regularly supervised and treated**
- 3. Initial changes are often reversible if treated properly**

The image features two large, stylized yellow roses with white highlights, set against a teal background. The roses are positioned on the left and right sides of the frame. The text "Thank you" is written in a red, serif font across the top, and "very much" is written in the same font across the middle, overlapping the roses. The overall style is graphic and celebratory.

Thank you

very much