TOXICOLOGY

OCCUPATIONAL HAZARDS

CHEMICAL

PHYSICAL

ERGONOMIC

PSYCHOLOGIC

BIOLOGIC

- **Toxicology:**

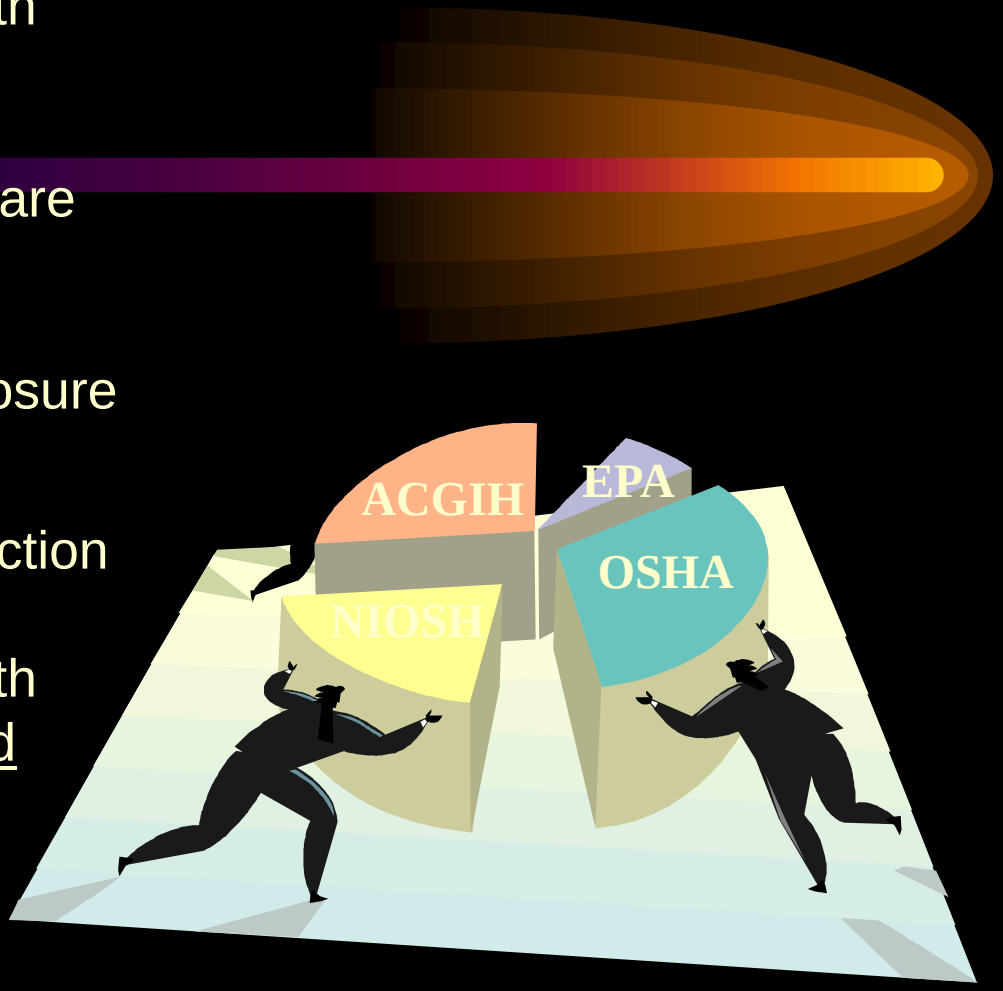
  The study of the adverse effects of chemicals on living organisms & the assessment of the probability of their occurrence.

- **Hazard:**

  When a chemical is used in a closed space without appropriate protection.

The National Institute for Occupational Safety and Health (NIOSH) and the American Conference of Governmental Industrial Hygienists (ACGIH) are organizations that sponsor chemical hazard research and recommend occupational exposure limits.

The U.S. Environmental Protection Agency (EPA) and the Occupational Safety and Health Administration (OSHA) set and enforce permissible chemical exposure limits.



AIRBORN CHEMICALS

GASES & VAPORS

AEROSOLS

- *** DUST**
- *** MIST**
- *** FUME**
- *** SMOKE**

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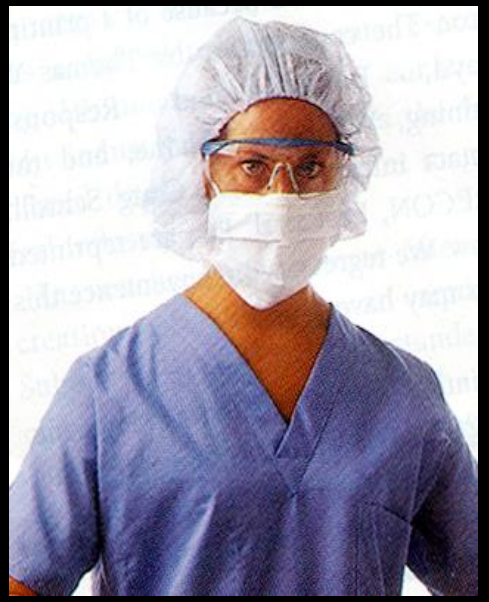

FACTORS AFFECTING CLINICAL RESPONSE TO A TOXIC AGENT

- Duration of exposure
- Frequency of exposure
- Route of exposure
- Environmental Factors
- Individual Factors

CHEMICAL AGENTS IN WORKPLACE

- **Gases**
- **Metals**
- **Solvents**
- **Pesticides**
- **Plastics**
- **Rubber**
- **Others**

OCCUPATIONAL EXPOSURE LIMIT STANDARDS

Threshold Limit Value (TLV)

- Threshold Limit Value - Time Weighted Average (TLV - TWA)
- Threshold Limit Value - Short Time Exposure Limit (TLV - STEL)
- Threshold Limit Value - Ceiling (TLV-C)

- Short-Term Exposure Limit (**STEL**) understood to be a 15-minute average unless stated otherwise.

- Ceiling (**C**) - a level that should never be exceeded

Compound	OSHA	NIOSH	ACGIH
Grain dust	10mg/m^3	4mg/m^3	4mg/m^3
Uranium	0.25mg/m^3	0.20mg/m^3	0.20mg/m^3
Acrylamide	0.03mg/m^3	0.03mg/m^3	0.03mg/m^3
Propane	1000ppm	1000ppm	2500ppm
Ethanol †	1000ppm	1000ppm	1000ppm
Benzene	1ppm	0.1ppm	0.5ppm

•8-hour time-weighted average

LD_{50} values are reported in milligrams toxin administered to the test animal per kilogram of body weight. A lower LD_{50} value means that it takes less material to induce a toxic effect, that is, the toxin is potentially more harmful.

LC_{50} values are reported in milligrams toxin per cubic meter of air (mg/m^3) or in parts per million (ppm). As with LD_{50} values, a lower LC_{50} means that the material has a higher toxicity.

Acute Toxicity Hazard Levels

Toxicity Rating	Oral LD_{50} (Rats, per kg)	Skin contact LD_{50} (Rabbits, per kg)	Inhalation LC_{50} (Rats, ppm, 1 hr)	Inhalation LC_{50} (Rats, mg/m^3, 1 hr)
high	<50mg	<200mg	<200	<2,000
medium	50-500mg	200-1,000mg	200-2,000	2,000-20,000
low	500-5,000mg	1-5g	2,000-20,000	20,000-200,000

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low	500-5,000mg	1-5g	2,000-20,000	20,000-200,000

Lethal dose and lethal concentration examples

Compound	Animal	Route	LD_{50}/LC_{50}
Ethanol	Rat	Inhalation	20,000ppm
Ascorbic Acid*	Rat	Oral	11,900mg/kg
Acetone ♌ ♌	Rat	Oral	5,800mg/kg
Acetic Acid ♌	Rat	Oral	3,310mg/kg
Aspirin	Rat	Injection	1,450mg/kg
Formaldehyde	Rat	Oral	800mg/kg
Atrazine (herbicide)	Rat	Oral	672mg/kg
Phenol	Rat	Oral	317mg/kg