



TOXICOLOGY

OCCUPATIONAL HAZARDS



CHEMICAL

PHYSICAL

ERGONOMIC

PSYCHOLOGIC

BIOLOGIC

☐ Toxicology:

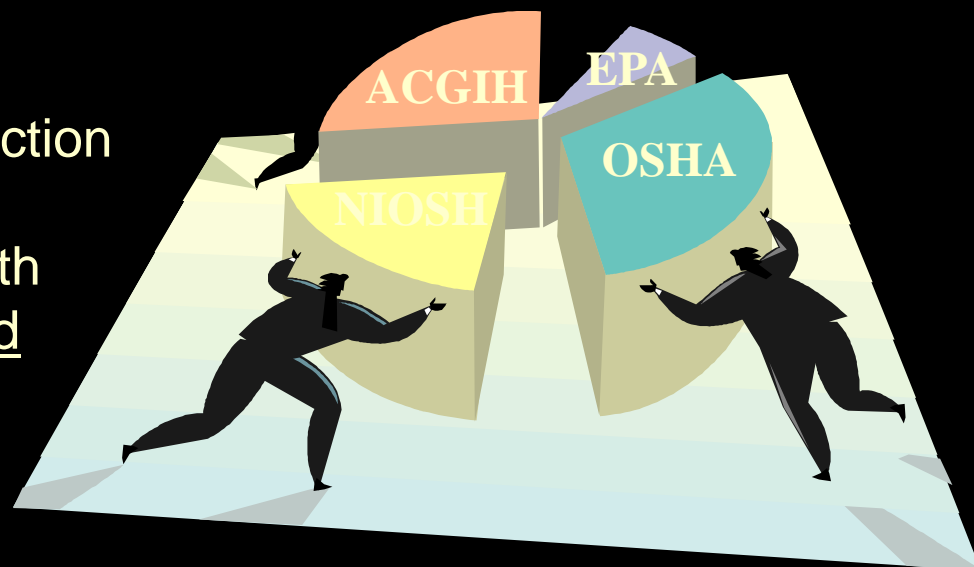
The study of the **adverse effects** of chemicals on living organisms & the assessment of the probability of their occurrence.

☐ 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**

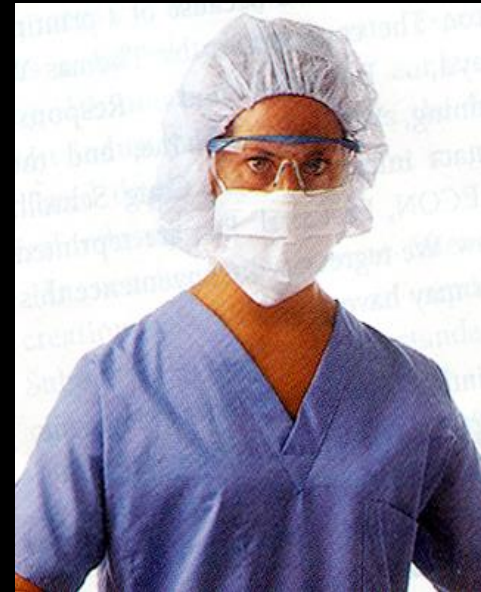
*** FUME**

*** SMOKE**

AIRBORN CHEMICALS

GASES & VAPORS

AEROSOLS



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**

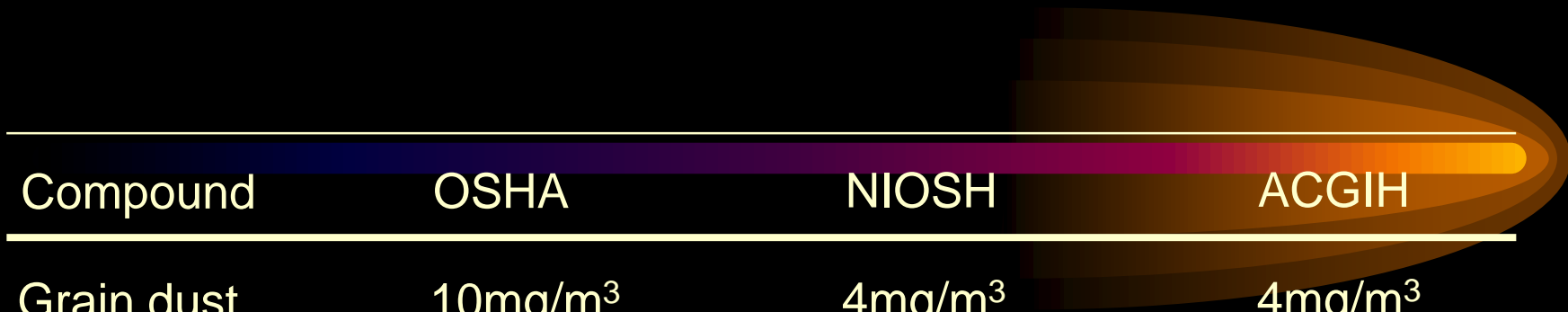
OCCUPATIONAL EXPOSURE LIMIT STANDARDS



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

LD₅₀ values are reported in milligrams toxin administered to the test animal per kilogram of body weight. A lower LD₅₀ value means that it takes less material to induce a toxic effect, that is, the toxin is potentially more harmful.

LC₅₀ values are reported in milligrams toxin per cubic meter of air (mg/m³) or in parts per million (ppm). As with LD₅₀ values, a lower LC₅₀ 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 Ω Ω	Rat	Oral	5,800mg/kg
Acetic Acid Ω	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