Al-Mustaqbal University College
Department of Pharmacy
5th stage
Practical Clinical Toxicology
Lab: 1

Introduction to Clinical Toxicology Lab1

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Outline

- What is the Toxicology ?
- What is the Clinical Toxicology.
- Toxicodynamic and Toxicokinetic
- LD50 and Therapeutic index
- Toxidrome

Human Related effect

Definition

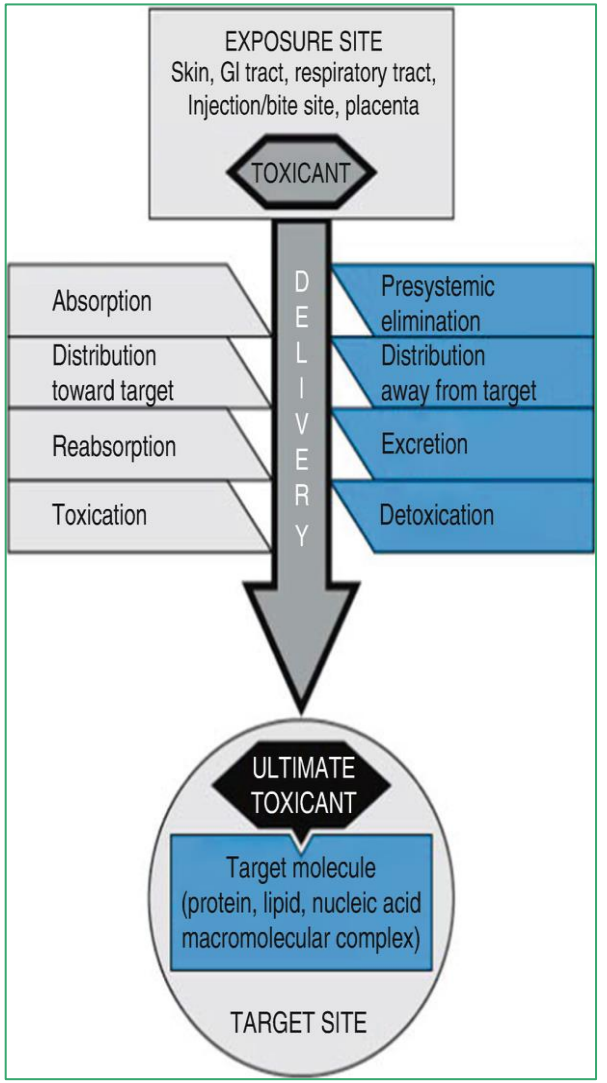
- ✓The term toxicology derives from the Greek **Toxicon**, meaning **poison**, and **logos**, meaning **science**.
- ✓Toxicology is the **study** of the **adverse effects** of chemical, physical, or biological agents on **living organisms** and the **ecosystem**, including the **prevention** and **amelioration** of such adverse effects.

Toxicology

✓**Toxicology focuses on the study of:**

1. **The agents responsible for adverse effects**
2. **The mechanisms involved**
3. **The damage that may occur**
4. **Testing methodologies to determine the extent**

of damage, and ways to avoid or repair it.



Clinical Toxicology

- Is a subspecialty of toxicology dealing with the bedside management of poisoned patients, including definitive toxicological diagnosis, assessment of immediate severity and long-term prognosis, and selection of treatments including antidotes.
- Knowledge of potential drug and chemical hazards allows a clinical toxicologist to participate in the **preparedness for or readiness for and prevention** of chemical intoxications, Whatever , As short term exposure or long term .
- Toxicants are a major cause of clinical disease.
- Clinical toxicology requires having a strong basis in **pharmacology** involved **pathophysiologic ,management**

concerned with all aspects of the interaction between these chemicals and humans.

Common Causes of Death in the Acutely Poisoned Patient

Comatose patient:

- **Loss of protective reflexes**
- **Airway obstruction** by flaccid tongue
- **Aspiration** of gastric contents into tracheobronchial tree,
- **Loss of respiratory drive, Respiratory arrest**
- **Hypotension** – due to depression of cardiac contractility
- **Shock** – due to hemorrhage or internal bleeding
- **Hypovolemia** – due to vomiting, diarrhea or vascular collapse
- **Hypothermia** – worsened by i.v. fluids administered rapidly at room temperature
- **Cellular hypoxia** – in spite of adequate ventilation and O2 admin. – due to CN, CO or H2S poisoning

Common Causes of Death in the Acutely Poisoned Patient

- **seizures –** may result in pulmonary aspiration; asphyxia
- **Muscular hyperactivity** resulting in hyperthermia, muscle breakdown, myoglobinemia, renal failure, lactic acidosis and hyperkalemia
- **Behavioral effects** –traumatic injury from fights, accidents, fall from high places. Suicides, etc

Massive damage to a specific organ system:

Liver (acetaminophen; amanita phylloides [poison mushroom]

Lungs (paraquat-herbicide),

Brain (domoic acid shellfish …) ,

Kidney (ethylene glycol),**Heart** (cobalt salts)

Note: death may occur in 48 – 72 hrs

Toxicodynamic and Toxicokinetic

✓**Toxicology is largely concerned with the interaction of toxicants and biological systems.**

✓ **Toxicodynamic**

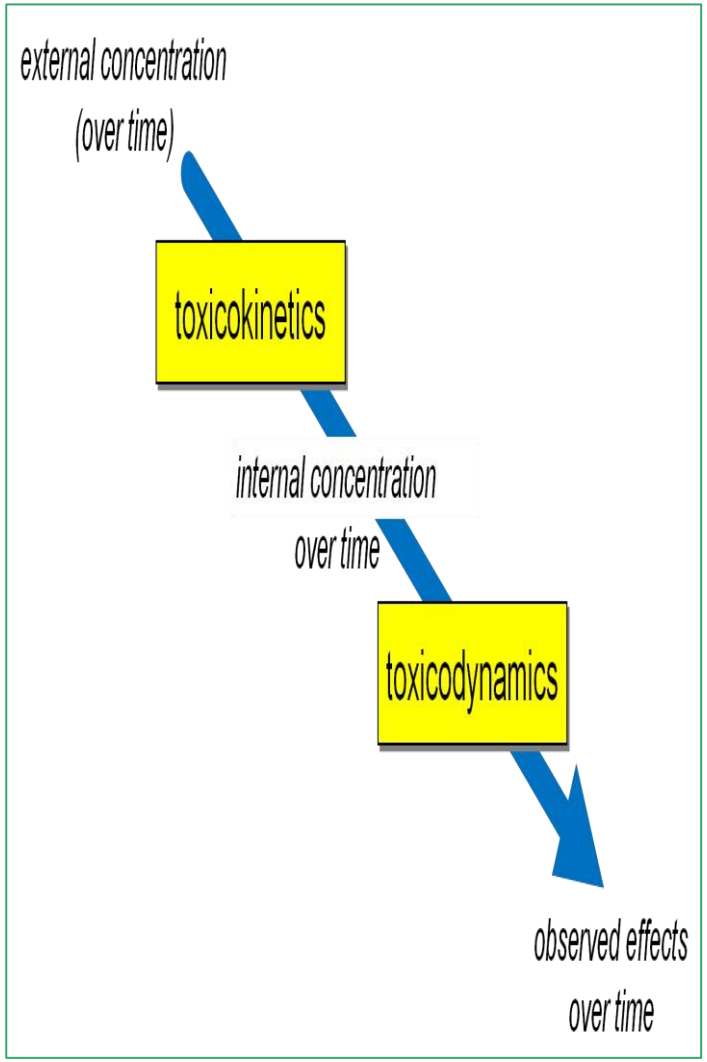
investigates the effect of the toxicant on the organism.

✓**Toxicokinetic**

looks at how the organism affects the toxicant (e.g., absorption, biotransformation, distribution, and elimination).

✓**Toxidrome (toxic syndrome)**

is a 'clinical fingerprint', characterised by a classic constellation of symptoms and signs due to toxic effects of chemicals in the body. Anticholinergic ,anticoagulant , opiod , sedative,beta blockers …



Toxicity Values

- **Chemicals** produce toxic effects on a biologic system whenever they reach a critical concentration in the target tissues.
- Overall, the toxicity of a substance is routinely expressed by an **LD50** value, or the dose of a chemical required to produce death in **50%** of the organisms exposed to it.

LD50

An **LD50** determination is used to categorize the potential toxicity of chemical compounds to humans.

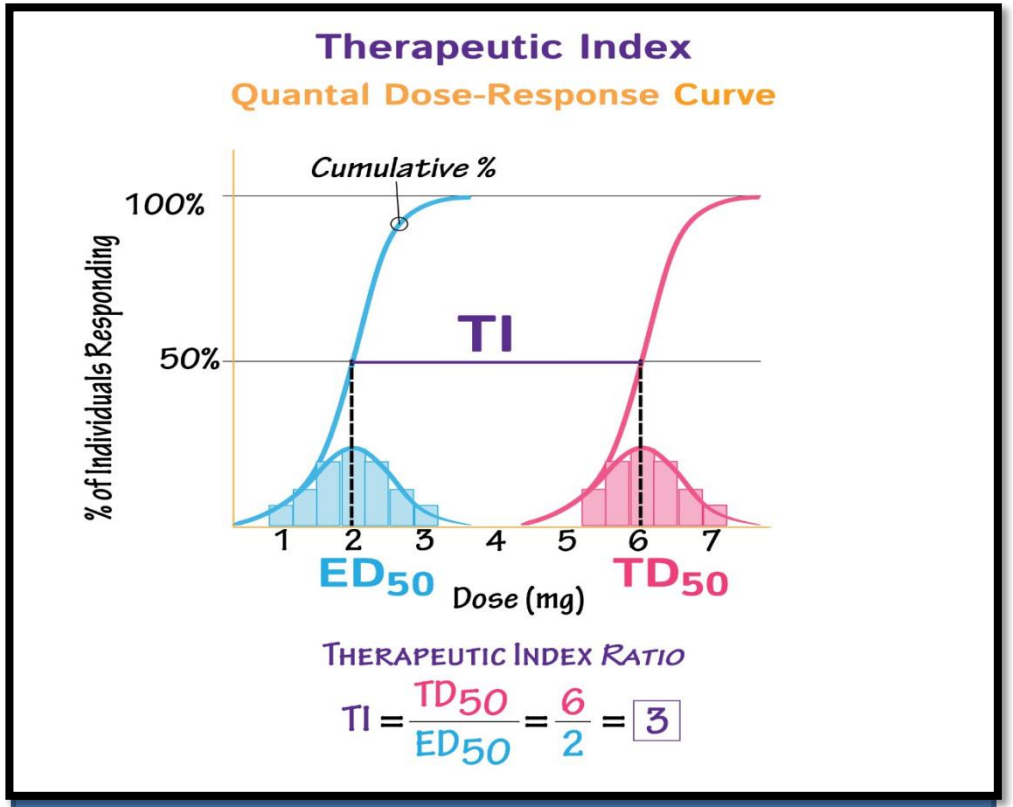
Another application of **LD50** determination

is to compare the value with the **ED50**,

(the dose of a chemical that is **therapeutically effective** in 50% of the subjects receiving it).

From this comparison,

a therapeutic index or margin of safety can be calculated.



The therapeutic index (TI) is defined as the ratio of the **LD50** to the **ED50**
(**TI = LD50/ ED50**)

Toxidrome(toxic syndrome)

Toxidrome is a 'clinical fingerprint',

- ✓ **Characterised by a classic constellation of symptoms and signs due to toxic effects of certain substances in the body.**
- ✓ **Useful for remembering the assessment and management of the different substances in the same group .**
- ✓ **Take from history and physical signs**

Example :Anticholinergic ,anticoagulant , opioid , sedative,beta blockers …

Anticholinergic Toxidrome

ATROPINE POISONING

CLINICAL FEATURES & TREATMENT

CLINICAL FEATURES :

i) ↓↓ SWEATING ⟶ ↑↑ HYERTHERMIA — HOT AS HARE ✓

ii) VASODIALATION ⟶ FLUSHING OF SKIN — RED AS BEAT ✓

iii) ↓ SALIVATION, ↓ LACRIMATION → DRYNESS → XEROSTOMIA, XEROPTHALMIA — DRY AS BONE ✓

iv) MYDRIASIS + CYCLOPLEGIA — BLIND AS BAT ✓

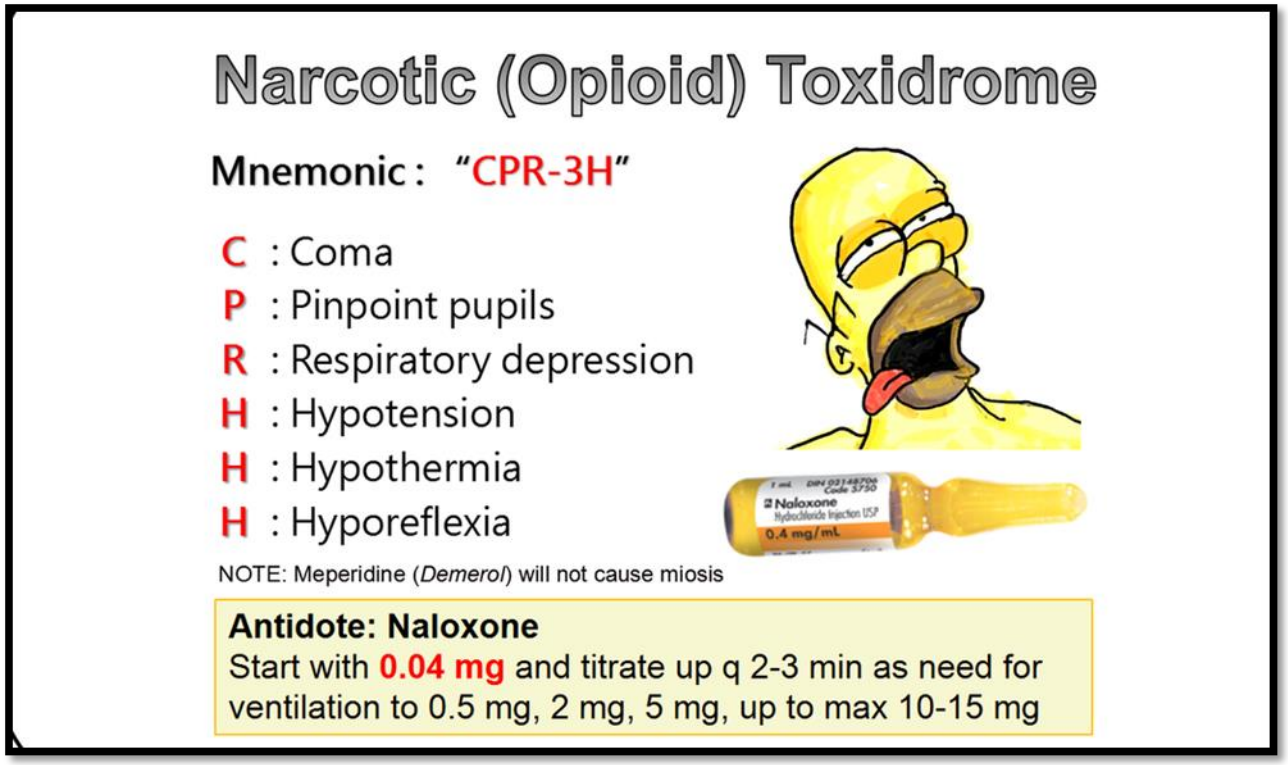
v) CNS : EXCITATION, HALLUCINATION, DELIRIUM, CONVULSIONS. — MAD AS HATTE

vi) TACHYCARDIA (↑HR)

vii) CONSTIPATION

Narcotic (opioid) Toxidrome

- CNS depression
- Respiratory depression
- Pin point pupils (miosis)



THANK YOU FOR YOUR ATTENTION