Forensic & Toxicology Team

MED 433

طب ٤٣٣

# Chapter: Miscellaneous Poisons

# Arsenic poisoning:

☺ Arsenic exists in two forms: **organic** and **inorganic**

- Bound to another organic molecule
- **Unable to exert toxicity**
- The resultant compounds are called
- Arsenosugars and arsenobetaine
- **e.g.** The arsenic found in oysters from
- Contaminated oyster beds

- Arsenic indicates that the arsenic atom exists as a salt bound to another cation
- **This salt may disassociate and then cause poisoning**
- **e.g.** Arsenic found in coal deposits

☺ Detecting arsenic in postmortem materials does not differentiate organic from inorganic arsenic

☺ Found in the drinking water of millions of people all around the world

☺ **Liver** is capable of rapidly detoxifying free arsenic and excreting it from the body. This protective mechanism does have its limits though, and in the presence of massive amounts of arsenic, **the liver's ability to detoxify arsenic is overwhelmed.**

☺ **At any stage of the disease the breath may have garlic-like odor**

☺ Three forms of arsenic poisoning are recognized: **acute**, **subacute** and **chronic**

| | |
|---|---|
| * When ≥ 1 g of inorganic arsenic has been administered | * Vague symptoms of leg and arm pain due to arsenic-induced nerve damage |
| * Gastrointestinal symptoms, bloody vomiting and diarrhea | *Skin may become overly dry and pigmented |
| * Cause shock and cardiorespiratory failure | *The liver will contain excessive amounts of fat around the edges |
| *Esophagus has become red and inflamed | * The nails may shows 'Mee's lines' |
| * 'Red velvet' appearance of the bowl | |
| * Bleeding from left ventricular sub endocardium | |

# Carbon Monoxide poisoning:

☺ **It is a colorless, odorless and non-irritant gas**

☺ Exposure occurs in two main ways:

(1) Acute exposure for varying lengths of time where the effects are generally immediately obvious

(2) Delayed or chronic exposure where the effects may be unrecognized for days, months or years

☺ **CO is absorbed through the lungs and binds to hemoglobin (Hb) forming carboxyhemoglobin (COHb). HbO2 + CO → COHb + O2**

☺ The affinity of Hb for CO is up **to 250 times greater than that for oxygen** and the presence of CO results in a **shift of the oxygen–hemoglobin dissociation curve to the left**, causing decreased oxygen-carrying capacity and impaired delivery of oxygen to the tissues.

☺ Disease with a thousand faces and cause the **triad of cherry-red lips, cyanosis and retinal hemorrhages**

☺ Unspecific symptoms include headache, dizziness, nausea, shortness of breath, altered vision, altered hearing, chest pain, palpitations, poor concentration, muscle aches and cramps, abdominal pain, loss of consciousness, myocardial ischemia, hypotension, congestive cardiac failure, arrhythmias, mental confusion, and mood variation

☺ **Diagnosis is made by measurement of venous COHb levels**

☺ **A level above 10 per cent is considered to confirm the diagnosis, unless the individual is a heavy smoker**

# Carbon Monoxide poisoning:

**Box 22.1** Haemoglobin concentrations of carbon monoxide (CO) and guideline symptoms

- In non-smokers less than 3% total haemoglobin contains CO
- In smokers 2–10% of haemoglobin contains CO
- 20–30% of haemoglobin causes headache, nausea, vomiting and confusion
- 30–40% of haemoglobin causes dizziness, muscle weakness, confusion, rapid heart beat
- 50–60% of haemoglobin causes loss of consciousness
- Over 60% of haemoglobin causes seizures, coma, death

Symptoms produced by carbon monoxide:

| Concentration (ppm) | Symptom |
|---|---|
| 35 | Headache, dizziness |
| 100 | Headache, dizziness |
| 200 | Headache, loss of judgement |
| 400 | Frontal headache |
| 800 | Dizziness, nausea, convulsions |
| 1 600 | Tachycardia, nausea, death in less than 1 hour |
| 3 200 | Tachycardia, nausea, death in less than 20 minutes |
| 6 400 | Convulsions, respiratory arrest, death in 1–2 minutes |
| 12 800 | Unconsciousness after two breaths, death in 3 minutes |

# Cyanide poisoning:

☺**Cyanide ions prevent cells from utilizing oxygen**; they inhibit the enzyme cytochrome c oxidase

☺**High concentrations of cyanide lead to cardiac arrest within minutes of exposure**

☺Exposure to lower levels of cyanide over a long period results in increased blood cyanide levels, which can cause weakness and a variety of symptoms including permanent paralysis

☺ **Cigarette smoking and sodium nitroprusside infusions can increase cyanide level**

☺ Cyanide is said to have the smell of bitter almonds

# Lead poisoning:

☺Routes of lead exposure include contaminated air, water, soil, food and lead-containing products
☺Lead can substitute for calcium in many fundamental cellular processes and can cross red blood cell membranes as well as the blood–brain barrier and enter the neuroglia cells which support brain function and that will cause permanent learning and behavioral disorders.
☺ Abdominal pain, headache, anemia, irritability and in severe cases, seizures, coma and death.

**☺The main tool for diagnosis is measurement of the blood lead level and the treatment depends on it also.**

# Methanol poisoning:

☺Methanol is often referred to as '**wood alcohol**'

☺ Can **cause fatal central nervous system (CNS) depression**

☺it is metabolized to produce **formic acid** (present as the format ion) via **formaldehyde** in a process initiated by the enzyme **alcohol dehydrogenase** and all of these processes occur in the **liver**.

☺**Format is toxic because it inhibits mitochondrial cytochrome c oxidase, causing hypoxia at the cellular level.**

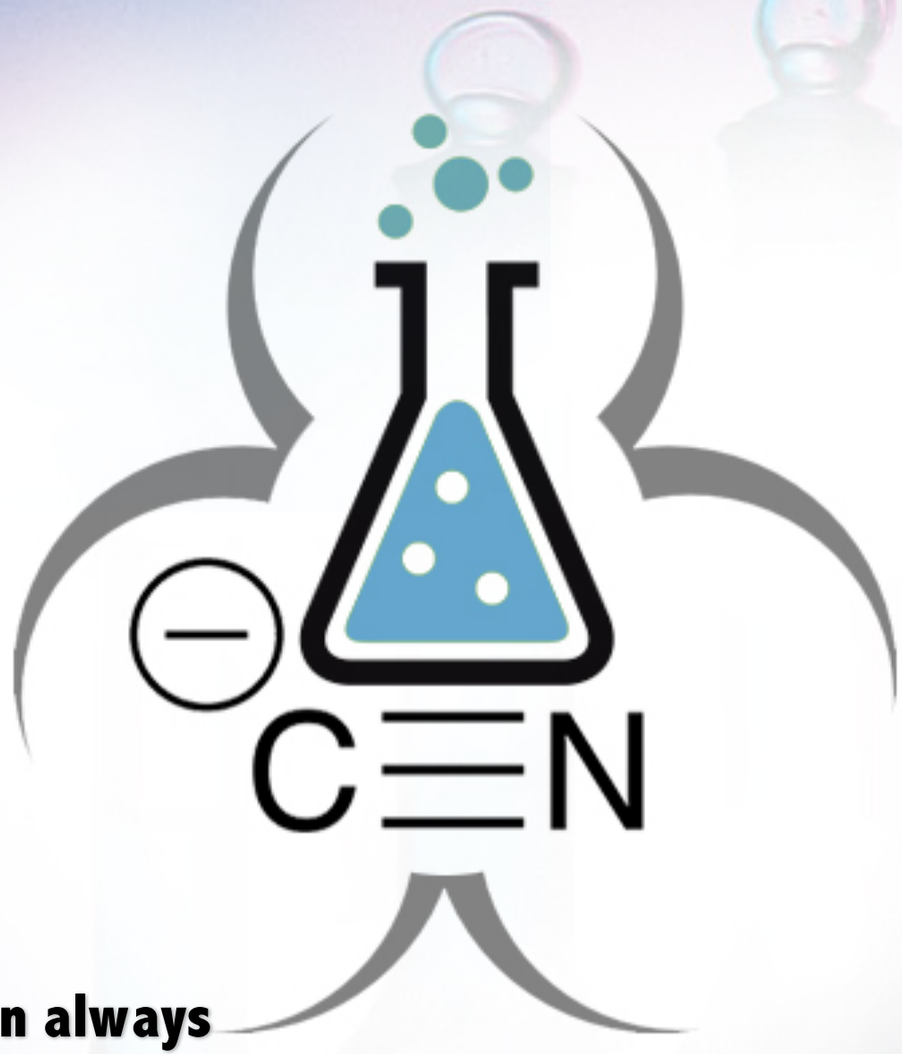
☺Methanol also causes **metabolic acidosis**.

☺ Drinking windscreen-washer fluid, 'moonshine' liquor ingestion and embalming fluid(which contains the same type of methanol as the copy machines) could cause methanol poisoning.

☺ May lead to **blindness** or even **multi-organ system failure and death**.

☺ The initial symptoms of methanol intoxication include CNS depression, with headache, dizziness, nausea, lack of coordination and confusion and Large doses quickly lead to unconsciousness and death.

☺**Methanol poisoning can be treated with the antidotes ethanol or fomepizole**




**If you have any questions You can always contact us at : forensic433@gmail.com**

Done By: Naif alhefdhi

Revised By: Mohammed Alnafisah