

FORENSIC & TOXICOLOGY SUMMARY

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Toxicology summary

Lecture 3: Carbon monoxide poisoning

CO sources:

- ❖ Motor vehicle exhaust fumes.
- ❖ Gasoline, diesel and propane-powered engines.
- ❖ Smoke from charcoal fire.
- ❖ Tobacco smoke.
- ❖ Methylene chloride (in paint and cleaning).

Toxicokinetics:

- ❖ CO affinity to Hb is 200-300 times more oxygen, forming carboxyhemoglobin (COHb).
- ❖ Cause tissue hypoxia via:
 1. CO reversibly binds to Hb resulting in functional anemia.
 2. Shifts O₂-Hb dissociation curve to the left = increase the affinity for O₂ = decrease the release of O₂ in tissues (Bohr effect)
 3. Bind to myoglobin causing cardiac ischemia and decrease in cardiac output.
- ❖ Body systems most affected are the cardiovascular and central nervous systems.
- ❖ CO half-life on 21% room air O₂: 4-6 hours.

Signs and symptoms:

Mild severity	Moderate severity	Severe
COHb level is 5-20%	COHb level is 21-40%	COHb level is 41-60%
May be asymptomatic Mild to moderate headache Dizziness Blurred vision Shortness of breath Nausea and vomiting	Severe headache Confusion Syncope Weakness Dyspnea & tachypnea Chest pain & tachycardia	Confusion Seizures Coma Dysrhythmias & palpitation Hypotension Cardiac ischemia Cardiac arrest Respiratory arrest Pulmonary edema

Treatment:

1. Remove the patient from contaminated area into fresh air.
2. Give artificial respiration or CPR, as appropriate.
3. **Immediately give 100% O₂ with hyperbaric O₂ (antidote).**

Lecture 4: Cyanide poisoning

Cyanide sources:

- ❖ Sodium nitroprusside.
- ❖ Fire victims.
- ❖ Trace is produced indigenously from Vitamin B12 metabolism.
- ❖ Amygdalin, which are hydrolyzed to hydrogen cyanide is present in the seeds of apple, peach, plum, apricot, cherry, and bitter almond.
- ❖ Industrial chemicals.

Mechanism of toxicity:

- ❖ Cyanide binds to cytochrome complex IV > block electrons transport chain > decrease oxidation.
- ❖ The tissue will not be able to utilize O₂, will remain in venous blood
- ❖ Anaerobic respiration.
- ❖ No ATP production.

Metabolism:

1. By cyanide > thiocyanate by rhodanese enzyme >>>renal excretion. (Major pathway)
2. Cobalamin + cyanide > cyanocobalamin
3. Excretion via breath and sweat.

Signs and symptoms:

Major affected organs are CVS & CNS.

- ❖ Weakness, dizziness, headache.
- ❖ Tachycardia, flushing, nausea, vomiting.

Treatment:

1. ABCD.
2. Decontamination.
3. **Antidote:**
 - a. Amyl nitrite.
 - b. Sodium nitrite.
 - c. Sodium thiosulfate.