Toxins

1.3.7.1.1 Carbon Monoxide

2025

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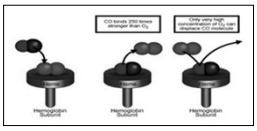
CO Pathophysiology

- Affinity for heme 2-300x O_2
  - displaces O_2 from binding sites.
  - prevents O_2 from binding.
- Shifts oxy-Hgb curve to left preventing release of O_2
- Essentially induces relative (functional) anemia



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Pathophysiology

- CO also binds to other iron-containing proteins:
  - Myoglobin (dysrhythmias and cardiac dysfunction)
  - Cytochrome oxidase (met acidosis)
- Direct injury to endothelium releases nitric oxide
  - Peripheral vasodilation and hypotension
  - Inflammatory response
  - Increased free radical injury

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Clinical Features of CO Poisoning

- Presentation resembles other diseases
  - Often dubbed ***the great imitator***
- Often misdiagnosed as:
  - Viral illness (e.g., the "flu")
  - Acute coronary syndrome
  - Headache/Migraine
  - Other Toxic Ingestions
- Misdiagnosis may occur in 30-50% of CO-patients presenting to the ED, often due to failure to consider
- ***Key is to suspect the diagnosis in first place***

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Non-combustion Source

- Don't forget methylene chloride *(for the test)*
  - Look for in the patient using paint thinner/stripper
- Transdermal absorption
- Is metabolized to CO
- Carboxyhemoglobin levels may continue to rise
  - Unlike inhaled -should decline once source removed
  - Also could be utilized on a test scenario

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Diagnosis

- Lab determination of carboxyhemoglobin
  - Suspicion primarily based on history
  - Treatment primarily based on symptoms in setting of CO
- Now have co-oximetry capable of detecting
  - Carboxyhemoglobin
  - Methemoglobin
- May have value as screening tool
- Fire/EMS/Hazmat units often have RAD-57 (Massimo)

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Patient Groups at Higher Risk

- Children
- Pregnant women
  - Fetal hemoglobin has greater affinity for CO
  - may exhibit milder symptoms with high fetal toxicity
- Elderly and underlying disease, co-morbidity in any ages
  - Cardiopulmonary diseases
  - Anemia

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Treatment

- Supportive
  - ABC
  - Cardiac monitor
  - Symptomatic management
- Early high concentration oxygen reduces T 1/2:
  - Room air: 240-360 minutes
  - O_2 (100%): 80-90 minutes
  - Hyperbaric O_2: 22 minutes

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Lightning Refresher

- Nerve agents are OPPs: SLUDGE, DUBBELSS
- Antidote kits: Duodote (atropine+pralidoxime)
- Remember “aging” and effectiveness
- CO: also binds other Fe-containing proteins: myoglobin(arrhythmia), cytochrome (met acidemia), direct endothelial injury
- Remember methylene chloride: becomes CO

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