

## Emergency Medical Education: 20 Questions

**20 Questions** is a monthly educational resource developed for HCMC EMS paramedics and authored by their medical directors and other subject matter experts. This content is intended for educational purposes only and not intended to be a substitute for professional medical advice, diagnosis, or treatment.

### Danger! Carbon Monoxide

#### 20 Questions about Carbon Monoxide

1. What are the common signs and symptoms of CO toxicity?
2. How many US ED visits a year are related to CO toxicity? How many worldwide deaths?
3. What is the normal level of carboxyhemoglobin in an adult? What if they are a smoker? What level is concerning?
4. How is carbon monoxide produced?
5. Are there any nongaseous sources of CO toxicity?
6. Where in your house should you place the CO detector, what level or levels of the home?
7. Are CO levels higher near the floor or near the ceiling?
8. Can CO diffuse through walls/floors/ceilings?
9. Is there any physiologic function for CO?
10. How much greater is the affinity of Hgb for CO as opposed to O<sub>2</sub>? 5x, 50x, 100x, or >200x?
11. How does CO poisoning affect the pulse oximetry?
12. Do pets (dogs and cats) show clinical manifestations of CO poisoning?
13. T/F: Pregnant women are at greater risk for CO poisoning?
14. What is the initial treatment of choice for CO poisoning.?
15. What is the half-life of COHb?
16. You are on vacation and not near HCMC. How do you find the nearest hyperbaric chamber?
17. What are some complications of hyperbaric oxygen therapy?
18. What is the only absolute contra- indication for hyperbaric oxygen therapy?
19. What would happen if you treated a patient with an untreated pneumothorax with hyperbaric oxygen?
20. What level of carboxyhemoglobin mandates hyperbaric oxygen?
21. With the short half-life of COHb, what benefit does HBOT provide?



#### 20 Answers: Carbon Monoxide Poisoning

1. What are the common signs and symptoms of CO toxicity? (Headache, nausea, flushing, cherry red skin (very rare), vomiting, malaise, syncope, chest pain, EKG changes, tachycardia, arrhythmias, seizure, anoxic brain injury, death – be especially suspicious when multiple people are presenting with similar symptoms)
2. How many US ED visits a year are related to CO toxicity? How many worldwide deaths? (15,000 US ED visits. 5,000-6,000 deaths worldwide per year. It is one of the most common causes of poisoning death in both



developed and developing countries)

3. What is the normal level of carboxyhemoglobin in an adult? What if they are a smoker? What level is concerning? (Nonsmokers 1-3%, smokers <10%, possible CO toxicity >15%)
4. How is carbon monoxide produced? (Incomplete burning of fossil fuels. Any fuel burning can lead to CO production, -heaters, furnaces, water heaters, charcoal fires, gas powered generators)
5. Are there any nongaseous sources of CO toxicity?(Methylene Chloride, a component of paint thinners will metabolize to CO)
6. Where in your house should you place the CO detector, what level or levels of the home? (the Consumer Product Safety Commission (CPSC) recommends it be located near the sleeping area, where it can wake you if you are asleep. Additional detectors on every level and in every bedroom of a home provides extra protection against carbon monoxide poisoning)
7. Are CO levels higher near the floor or near the ceiling? (Neither, although it is slightly less dense than air (97%), in a turbulent atmosphere CO will quickly diffuse uniformly throughout the house.
8. Can CO diffuse through walls/floors/ceilings? (yes- CO quickly diffuses through most dry wall)
9. Is there any physiologic function for CO? (yes, It looks like it may function as an endogenous central nervous system neurotransmitter)
10. How much greater is the affinity of Hgb for CO as opposed to O<sub>2</sub>? 5x, 50x, 100x, or >200x? (230 -270 x)
11. How does CO poisoning affect the pulse oximetry? (Pulse oximetry cannot be used to assess adequacy of arterial oxygenation because the device confuses carboxyhemoglobin (COHgb) for oxyhemoglobin, causing a falsely elevated level)
12. Do pets (dogs and cats) show clinical manifestations of CO poisoning? (yes, they can often function as the "canary in the coal mine")
13. T/F: Pregnant women are at greater risk for CO poisoning. (F, though there is an increased risk of fetal demise with CO toxicity which leads to a lower threshold for treatment in pregnant women. Teratogenicity of carbon monoxide exposure is controversial)
14. What is the initial treatment of choice for CO poisoning. (100% NBO – normobaric oxygen by non-rebreather mask)
15. What is the half-life of COHb? (3-4 hours on room air, 60-90 min 100% NBO, 15-23 minutes with HBO)
16. You are on vacation and not near HCMC. How do you find the nearest hyperbaric chamber? (Call the Divers Alert Network at 1-919-684-8111)
17. What are some complications of hyperbaric oxygen therapy? (oxygen seizures (extremely rare), middle ear barotrauma, worsening cataracts, myopia)
18. What is the only absolute contra- indication for hyperbaric oxygen therapy (untreated pneumothorax)
19. What would happen if you treated a patient with an untreated pneumothorax with hyperbaric oxygen? (this could develop into a tension pneumothorax)
20. What level of carboxyhemoglobin mandates hyperbaric oxygen? (No absolute level. Decisions for hyperbaric oxygen therapy are based on evidence of neurologic or cardiac injury – syncope, persistent neurologic deficit, elevated troponin, EKG change, etc.)
21. With the short half-life of COHb, what benefit does HBOT provide? (CO poisoning can cause delayed neurologic sequela such as headaches, trouble concentrating, mood swings, memory lapses and other cognitive problems. HBOT has been shown to reduce these cognitive deficits. HBOT is not just improving the hypoxia, but also has an anti-inflammatory effect.)

