

Aurora Health Care – South Region EMS **2010 3rd Quarter CE Packet**

“Carbon Monoxide and Cyanide Poisoning”

Carbon monoxide is the leading cause of poisoning in the United States for the last 100 years and is a common hazard to First Responders. Carbon Monoxide is a colorless, odorless, tasteless, toxic gas that, when inhaled, can cause serious physical problems and even death. Carbon monoxide is often referred to as “CO”, which is its chemical symbol. Even at low levels, carbon monoxide may cause long-term cardiovascular and neurological disorders.

Carbon monoxide can be a serious and sometimes deadly threat to firefighters and EMS personnel. Firefighters have regular contact with carbon monoxide at fire and rescue scenes, increasing their health risks.

Incomplete combustion of any carbon-based material will produce carbon monoxide. Closed or confined spaces are particularly hazardous. Common sources are:

- Automobiles, trucks, buses
- Boats, campers
- Gas heaters, furnaces and water heaters
- Gas-powered generators
- Small gasoline engines
- Portable/space heaters
- Barbecues/fireplaces
- Cigarette smoke
- Lanterns
- Structure/wild land fires
- Paint strippers (Liver converts chemicals to CO)



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Carbon monoxide is inhaled and passes from the lungs to the blood where it binds with the hemoglobin. Hemoglobin is in the red blood cells and is required for transportation of oxygen. The binding produces carboxyhemoglobin. The affinity of CO to hemoglobin is greater than 200 times that of oxygen. It creates an immediate threat to life as a result of oxygen starvation, cardiac arrhythmias and alteration of judgment and reasoning.

SIGNS AND SYMPTOMS

SpCO %	Clinical Manifestations
0-4%	None - Normal
5-9%	Minor Headache
10-19%	Headache, Shortness of Breath
20-29%	Headache, Nausea, Dizziness, Fatigue
30-39%	Severe Headache, Vomiting, Vertigo, ALOC
40-49%	Confusion, Syncope, Tachycardia
50-59%	Seizures, Shock, Apnea, Coma
60% -up	Coma, Death

Koster LA, Rupp T. The Silent Killer, Recognizing and Treating Carbon Monoxide Poisoning. *JEMS*. October 2005

CO poisoning is often unrecognized due to the presence of exhaustion, heat stress, illness or injuries. Studies have shown low levels of untreated CO lead to central nervous system and cardiovascular disease. Moderate to high levels are immediate threats to health and safety, and cause cardiovascular injury

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TREATMENT CONSIDERATIONS

- ALWAYS remember to protect yourself from the dangers of CO.
- Remove the patient from the poison.
- Verify AND maintain ABC's.
- Check patients CO level with monitoring equipment if available. (Do not place the sensor on the thumb or 5th digit).
- Treat with 100% oxygen
 - Decreases half-life of CO in blood
 - Increases delivered oxygen in blood
 - Support ventilations if/when needed
- Transport to closest, most appropriate facility
- Consider hyperbaric treatment facility when:
 - Adult patient has CO level >25% unless the patient is a pregnant female, than if the CO level is >15%. The fetal SpCO may be 10-15% higher than the maternal reading. Heavy smokers may have pre-existing levels up to 10%.
 - Pediatric patient has a CO level >15%
- Monitor vital signs and CO level
- Always follow local EMS protocols

HALF-LIFE OF CARBON MONOXIDE

Half-life: The amount of time required to reduce the blood level of CO by 50%. These are estimates for patients that otherwise are healthy. Age and health will impact the half-life of CO.

If your patient is:

Breathing Room Air: The half-life of CO in the blood is approximately 240 minutes or 4 hours.

On high-flow oxygen (100%) via non-rebreather mask: The half-life of CO in the blood is reduced to 40-60 minutes.

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In Hyperbaric Oxygen Treatment (HBOT) at 2.5 to 3 Atmospheres: The half-life of CO in the blood is reduced to 20-24 minutes.

CYANIDE POISONING

Cyanide is a chemical that is a deadly poison. It may be a crystal (like salt), or a colorless gas. Cyanide may smell like bitter almonds or have no smell at all.

Cyanide is used as an ingredient to make things like paper, cloth, and some plastic items. It can also be used in developing photographs, cleaning metal, removing gold and silver from ore, and electroplating. It is also used as a poison in certain components such as ant poison. Cyanide is naturally present in parts of some foods such as apricot pits. It is found in the roots of some plants, such as the cassava plant. Cyanide is found in artificial nail removers that contain acetonitrile. Cyanide is also an ingredient of cigarette smoke.

Cyanide can be used as a chemical weapon against both military and civilian (non-military) populations.

Cyanide can be breathed in, swallowed, or absorbed through the skin. Breathing in cyanide will cause rapid, harmful effects. If it is swallowed or absorbed through your skin, the effects of cyanide will occur more slowly. Following are some of the ways you may come in contact with cyanide:

- **Building fire smoke:** Cyanide gas may be created as a chemical reaction when a building is on fire. Cyanide is also used in some building parts. If those parts catch fire, cyanide gas escapes into the smoke.
- **Contamination:** Cyanide may leak into the ground if it is used either as an ingredient or in a process. If you live near a building where cyanide was used, the soil, groundwater, and well water may be contaminated. Contaminated means that cyanide may have leaked into the soil, groundwater, or well water. Food grown in cyanide-

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contaminated dirt may retain some cyanide.

- **Chemical warfare:** People, groups, and countries may use cyanide to kill people or animals. To be most effective, cyanide must be used in an enclosed area. Cyanide spreads quickly in open air.

How does cyanide work? The air you breathe has oxygen in it. The oxygen goes deep into your lungs and is absorbed into your blood. Your red blood cells pick up the oxygen and carry it throughout your body. All your organs and tissues depend on your blood to bring oxygen to them.

- Cyanide causes a chemical change that keeps the oxygen from getting into your red blood cells.
- No matter how cyanide gets into your body, it works the same way. It does not have to be breathed in to cause this change. It can also be swallowed or absorbed through your skin.

SIGNS AND SYMPTOMS

Signs and symptoms depend on how you are exposed to cyanide (breathing in, swallowing, or absorbing through the skin). Signs and symptoms also depend on how much cyanide there is, and how quickly cyanide gets into your body.

If you are exposed to small or moderate amounts of cyanide you will have the following signs and symptoms:

- Rapid (fast) breathing.
- Restlessness and decreased ability to settle down to tasks like watching TV or reading.
- Dizziness.
- Weakness.
- Headache.
- Eye irritation (itching, burning).
- Nausea (feeling sick to your stomach) and vomiting (throwing up).
- Rapid heartbeat.

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If you are exposed to a large amount of cyanide your signs and symptoms may also include:

- Convulsions (seizures).
- Very slow heartbeat.
- Loss of consciousness.
- Your breathing will stop.

How is cyanide poisoning diagnosed?

- Cyanide is a known ingredient of smoke. When a building is on fire, rescue workers or firefighters may make a diagnosis of cyanide poisoning. Smoke survivors reaching a hospital or clinic may be diagnosed by caregivers there. They will make a diagnosis based on information from rescue workers and from your signs and symptoms.
- In areas where cyanide is in the ground, food, or water, government officials may make a diagnosis based on samples.

TREATMENT CONSIDERATIONS

Seek medical care as soon as possible. There are antidotes available for cyanide poisoning. To get these antidotes you need to go to a hospital or clinic as soon as possible.

What should I do if I am exposed to cyanide?

Gas or spray:

- If cyanide is being used as a gas or spray, leave the area and get to some fresh air. If it is released outdoors, move away from the area. If released indoors, go outside.
- Cyanide is lighter than air, so it rises. If you cannot get away from the gas, lie on the floor or ground and take shallow breaths.

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- Remove any clothing that may have cyanide on it. **Do not shake the clothing.** Put it down carefully. If there is a plastic bag available, put clothing items into it and tie the top. If possible, put the first bag into a second bag and tie the top of the second bag. Do not handle the bags after tying them.
- If cyanide gets into your eyes, rinse them for several minutes under running water.
- If cyanide may be on your skin, shower with soap and water. Shampoo your hair.

Swallowed cyanide:

- If you have swallowed cyanide, do not make yourself vomit. Do not drink more liquids. Call 911 to get to a hospital or clinic. **Do not drive yourself.**
- If you suspect that tiny amounts of cyanide are in the air you breathe, the water you drink, or the food you eat, call or see your caregiver. Testing may need to be done. Your testing may include blood tests, urine tests, or stool samples. Environmental testing of water samples, food samples, and air samples may also need to be done.