

Oakland County Medical Control Authority
System Protocols – Hazardous Materials Medical Response Team
CYANIDE EXPOSURE

Date: September 2022

Section 11-6

Cyanide Exposure

Chemical Agents

1. Agents of Concern Include: Cyanide
 - a. Hydrogen Cyanide
 - b. Potassium / Sodium Cyanide
 - c. Cyanogen Chloride
2. Detection: The presence of these agents can be detected through specialized environmental monitoring equipment available to hazardous materials response teams.
3. Modes of Exposure
 - a. Inhalation (including smoke inhalation)
 - b. Ingestion
 - c. Skin absorption unlikely

Assessment

1. Shortness of breath
 - a. Possibly accompanied by chest pain
 - b. Generally not associated with cyanosis (blue skin membranes)
 - c. Pulse oximetry levels usually normal
 - d. Usually associated with increased respiratory rate and depth
 - e. Potential for rapid respiratory arrest
 - i. Confusion, decreased level of consciousness, coma
 - ii. Seizures
 - iii. Headache, dizziness, vertigo (sense of things spinning)
 - iv. Pupils dilate (late)

Pre-Medical Control

PARAMEDIC

1. Follow the **General HAZMAT Treatment** protocol.
2. Administer oxygen 10-15 L via non-rebreather mask.
3. **Caution: Responders must protect themselves from secondary contamination due to off-gassing and body fluids.**
4. Transport with good ventilation and appropriate respiratory protection.
5. If in respiratory arrest follow the **Emergency Airway Procedure**. Note: Patients in respiratory arrest (i.e., not breathing but still having a pulse) have been found to respond to antidote therapy and should receive positive pressure ventilation when operationally feasible.

In the symptomatic patient with a significant exposure, administer treatment in the following order. (Use the Cyanide Antidote Kit or the Cyanokit. The Cyanokit is the preferred antidote, especially for unknown cases or CO/smoke inhalation.)

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6. Administer Amyl Nitrite: Break pearl into gauze sponge and hold under patient's nose or BVM intake for 30 seconds of every minute until sodium nitrite solution is ready. Change ampule every 3 minutes. Avoid if uncertain or smoke inhalation.

Post-Medical Control

1. Administer Sodium Nitrite (3% IV solution):
 Adult: 10 ml (300 mg) over 5 – 10 minutes, or 0.33 ml/kg slow IV push over 5 – 10 minutes.
 Pediatric: 0.33 ml/kg, maximum of 10 ml, over 5 – 10 minutes slow IV push.
2. Sodium Thiosulfate (25 % IV solution). Use alone if uncertain or smoke inhalation:
 Adult: 12.5 gm (50 ml of 25 % solution) IV push over 10-20 minutes or as an infusion in 100 ml D5W.
 Pediatric: 1.65 ml/kg of 25% solution, maximum dose 50 ml, over 10-20 minutes slow IV push.
3. Repeat antidote at 50% of initial dose if symptoms persist after 20 minutes. If symptoms worsen after treatment consider nitrite toxicity causing Methemoglobinemia. Follow **Methemoglobinemia** protocol, but do not treat with Methylene Blue.
4. If available, administer the Cyanokit (preferred for CO/smoke inhalation):
 - A. The starting dose of hydroxocobalamin for adults is 5 g (i.e., two 2.5g vials OR one 5g vial) administered as an intravenous (IV) infusion over 15 minutes (approximately 15 ml/min), i.e., 7.5 minutes/vial. See charts below for pediatric dosing (70 mg/kg).

Two Vial Kit (2.5g/100mL):

AGE GROUP	AMOUNT	DOSAGE
Infant/Toddler (0-2 years)	¼ bottle	0.625g
Preschool (3-5 years)	½ bottle	1.25g
Grade School (6-13 years)	1 bottle	2.5g
Adult ≥14 years	2 bottles (entire kit)	5g

One Vial Kit (5g/200mL):

AGE GROUP	AMOUNT	DOSAGE
Infant/Toddler (0-2 years)	¼ bottle	0.625g
Preschool (3-5 years)	¼ bottle	1.25g
Grade School (6-13 years)	½ bottle	2.5g
Adult ≥14 years	1 bottle (entire kit)	5g

- B. Each vial of hydroxocobalamin for injection is to be reconstituted with diluent (not provided with Cyanokit) using the supplied sterile transfer spike.

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1. The recommended diluent is 0.9% Sodium Chloride injection (0.9% NaCl).
 2. The line on each vial label represents the volume of diluent. Following the addition of diluent to the lyophilized powder, each vial should be repeatedly inverted or rocked, not shaken, for at least 30 seconds for the 2.5g bottles prior to infusion, 60 seconds for the 5g bottles.
 3. Hydroxocobalamin solutions should be visually inspected for particulate matter and color prior to administration.
 - a. If the reconstituted solution is not dark red or if particulate matter is seen after the solution has been appropriately mixed, the solution should **not be administered to the patient** and should be discarded.
 - C. There are a number of drugs and blood products that are incompatible with Cyanokit, thus Cyanokit requires a separate intravenous line for administration.
 - D. Depending upon the severity of the poisoning and the clinical response, a second dose of 5 g may be administered by IV infusion for a total dose of 10g in adults. The rate of infusion for the second dose may range from 15 minutes (for patients in extremis) to two hours, as clinically indicated. Contact medical control for second dose instructions for pediatric patients.

SPECIAL CONSIDERATION FOR SMOKE INHALATION:

Many, but not all, smoke inhalation victims will have cyanide poisoning and may present with burns, trauma, and exposure to other toxic substances making a diagnosis of cyanide poisoning particularly difficult. Prior to administration of Cyanokit, smoke-inhalation victims should be assessed for the following:

- Exposure to fire or smoke in an enclosed area
- Presence of soot around the mouth, nose or oropharynx
- Altered mental status

The Cyanokit should be considered for all serious smoke inhalation victims (including cardiac arrest).