

## **CYANIDE: Health Care Information**

Cyanide is commonly used in industry for electroplating, chemical synthesis and the production of paper, textiles and plastic. Hydrogen cyanide (**HCN**) is a gas that is released when an acid is added to a cyanide salt (e.g., sodium cyanide, potassium cyanide, etc.). Cyanogen chloride (**CK**) is a colorless irritant gas that has been used as a military cyanide agent. These agents may be released accidentally in industrial settings (the addition of acid to cyanide salts) or by intentional combination of cyanide salts with acids or release of liquid cyanogen chloride or cyanide.

**Recognition and Triage:** Severe cyanide exposure may lead to **rapid-onset loss of consciousness, hypotension, seizures, coma and ventricular arrhythmias**, as well as **hyperlactatemia** and **elevated anion gap metabolic acidosis**. Mild toxicity includes headache, nausea, lightheadedness, confusion and dyspnea. The **smell of bitter almonds** may be detected on the patient, but is not detected by all people and should not be used to rule-out a cyanide exposure. **Cyanogen chloride is an irritant gas** that may cause irritation of the skin and mucous membranes, and potentially upper airway edema and pneumonitis that may be **delayed up to several hours**. Patients may be triaged as follows:

**Immediate:** Coma, hypotension, seizures, dysrhythmias

**Delayed:** Headache, nausea, mild dyspnea

**Minor:** Asymptomatic

**Personal Protective Equipment (PPE) (at the health care site):** Personnel who decontaminate patients should wear splash-proof PPE (waterproof outer garment and chemical-resistant gloves) and a filtered-air respirator. Personnel treating patients who have already been decontaminated require no PPE other than universal precautions.

**Decontamination (at the health care site):** Sufficient decontamination includes removal of **ALL** clothing and jewelry and thorough washing of the skin and hair with water for 3 to 5 minutes. If eyes are exposed to cyanogen chloride and are painful, they should be flushed with 1 to 2 liters of water or normal saline. An ophthalmic anesthetic may be used prior to flushing.

## **Diagnosis and Treatment**

**1. Cyanide salts or hydrogen cyanide gas:** Patients with severe symptoms (dyspnea, coma, seizures, arrhythmias) should receive supplemental **oxygen, and either hydroxocobalamin or nitrites and thiosulfate**. These antidotes may be available in a "cyanide kit" that contains amyl nitrite, sodium nitrite and sodium thiosulfate.

### **A. "Traditional" Cyanide Antidote Kit**

**Nitrites:** The nitrites produce vasodilation and methemoglobinemia, both of which may increase metabolism of cyanide. **Sodium nitrite 300 mg (children 6 mg/kg)** is given **intravenously** over 3 minutes and amyl nitrite (less effective than sodium nitrite) is administered by breaking the perle under the patient's nose. Either nitrite may lead to hypotension or methemoglobinemia, so **nitrites should not be used in patients with mild symptoms or with concomitant carbon monoxide toxicity**.

**Sodium thiosulfate:** **Sodium thiosulfate 12.5 g IV (children 400mg/kg)** over 10 to 20 minutes should be given to any patient with severe cyanide toxicity. Thiosulfate induces the metabolism of cyanide via the enzyme rhodanese. Thiosulfate has no serious side effects.

*This information is current as of the date faxed and for the patient specified ONLY. Do not use this information for other patients without contacting the Poison Center at 1-800-222-1222.*

OR

**B. Hydroxocobalamin (Cyanokit)**

1. The starting dose is 5 g, (two 2.5 g vials) administered by IV infusion over 15 minutes (approximately 15 mL/min).
2. The recommended diluent is 100 mL of 0.9% sodium chloride injection, although 100 mL of lactated ringers injection or 5% dextrose injection (D5W) may be used if 0.9% sodium chloride is not available.
3. Depending on the severity and the clinical response, a second dose of 5 g may be administered over an infusion rate of 15 minutes to 2 hours, based on patient's condition.
4. Monitor blood pressure carefully as significant rises may occur.
5. We recommend sending a serum cyanide level for confirmation as well as a lactate and venous pH.

**Cautions to using hydroxocobalamin:**

1. Will cause both urine and skin to turn red. Skin redness may last up to 2 weeks. Urine redness may last up to 5 weeks.
2. Because of the red color, hydroxocobalamin has been found to interfere with colorimetric determination of certain laboratory parameters, including artificially increasing creatinine, bilirubin, triglycerides, cholesterol, total protein, glucose, albumin, alkaline phosphatase and hemoglobin. It may artificially decrease ALT and amylase. Caution should be used in interpreting certain lab values. See product insert for further information.
3. Safety of co-administration with other antidotes to cyanide poisoning has not been studied, but co-administration of sodium thiosulfate is probably safe.

**Cyanogen Chloride:** Patients exposed to cyanogen chloride should be treated for cyanide toxicity as above and, in addition, must be treated for mucosal irritation/edema. **Oxygen** may be required for hypoxemia. **Early intubation** should be considered for upper airway swelling. **Bronchodilators** (e.g., albuterol) may be used for wheezing or cough.

**Detection:** Cyanide may be detected in serum in many hospitals. Confirmatory testing may be performed by sending **3 purple-top tubes** (EDTA) to the State Public Health Laboratory (see attached chemical specimen sheet).

**Patient Monitoring:** Patients with severe symptoms should have continuous cardiac and blood pressure monitoring and pulse oximetry.

**Disposition Criteria (when to send patient home):** Symptoms generally do not progress once the patient is removed from the exposure. Liquid dermal exposures with cyanogen chloride should be observed for 6 hours due to the potential of delayed pneumonitis, upper airway edema and cyanide toxicity. Asymptomatic and decontaminated patients exposed to cyanide salts or hydrogen cyanide may be discharged. Patients with mechanical ventilation, arrhythmias and hypotension should be admitted to an intensive care setting.

**Reporting/Coordination Link:** Call the **Poison Center (1 800 222 1222)** for information on specific patients. Contact the local or state public health authority (**Oregon Public Health Hotline: 1 800 805 2313**) to report a mass casualty incident.