



R7DHRE Hazardous Materials Guideline: **Phosgene**

REGION VII DISASTER HEALTH RESPONSE ECOSYSTEM (R7DHRE)

CHEMICAL SPECIALTY TEAM

Call Your Poison Center for Immediate Assistance: 1-800-222-1222

Hazardous Materials Guideline: Phosgene

This document is intended as a supplement for discussion with your local poison center or toxicologist.

1.0 BACKGROUND

1.1 Description: Phosgene is a poorly water-soluble irritant gas. At room temperature, phosgene is a colorless, nonflammable gas. At temperatures below 47°F, it is a colorless, fuming liquid. At low concentrations, its odor is like green corn or newly mown hay. At high concentrations, it is mildly irritating and has a sharp and suffocating odor. Phosgene is used in industrial chemical synthesis and has been used as a chemical warfare agent. **Phosgene oxime and phosphine are different, but similar sounding, chemicals and not covered by this guideline.**

1.2 Mechanism of Injury: In the presence of water (sweat, saliva, tears), the liquid or gas slowly hydrolyzes to hydrochloric acid. It is directly toxic to the cells and is corrosive to the lungs and intact skin. Phosgene is heavier than air and may cause asphyxiation in poorly ventilated, low-lying, or enclosed spaces. Phosgene is frequently transported in cylinders as a liquefied compressed gas and contact with liquid phosgene may result in frostbite injury.

1.3 Routes of Exposure: Inhalation, Ocular, Dermal, Ingestion.

2.0 PROVIDER SAFETY

2.1 Personal Protective Equipment (PPE) – Decontamination Team: Personnel decontaminating patients must wear **full-body chemical-resistant clothing and respiratory protection**. Respiratory protection may consist of either:

2.1.1 A positive pressure air or oxygen source, such as an air-line respirator or a Self-Contained Breathing Apparatus (SCBA) or

2.1.2 A filtered air respirator (including Powered Air Purifying Respirators (PAPRs)) with filters capable of adsorbing phosgene.

2.1.3 A positive pressure air or oxygen source is preferred if there is doubt as to the identity of the chemical in question or if there may be exposure to a level of phosgene which would overwhelm the filter.

2.2 2.2 Personal Protective Equipment (PPE) – Treatment Team: Personnel treating patients who have been adequately decontaminated need no additional PPE other than **universal precautions** since there is no serious risk of secondary contamination.

2.3 Patient Decontamination:

- 2.3.1** Persons exposed to only **phosgene gas** and have **no skin irritation, no eye irritation, dry skin, AND dry clothes generally do not need decontamination**. These patients do not pose a significant risk of secondary contamination.
- 2.3.2** Persons contaminated with **liquid phosgene** do **pose a risk of secondary contamination** from off-gassing of phosgene vapors and direct contact with the chemical.
- 2.3.3** Remove contact lenses if it can be done without additional trauma to the eye. **Irrigate eyes for a minimum of 15 minutes**. Continue irrigation until eye pH is neutral (7 to 8).
- 2.3.4** Remove ALL clothing and jewelry. Double bag clothing and jewelry to prevent off-gassing.
- 2.3.5** Decontamination is best **accomplished by irrigation with copious amounts of water**. Wash skin and hair with plain water for a minimum of 5 minutes and then wash twice with soap & water after washing with plain water. Washing with water alone (for a longer period of time) is acceptable if soap is not available.
- 2.3.6** Watch for hypothermia (1) in children and the elderly, (2) when decontamination is done with un-heated water, or (3) during cold weather.

3.0 SIGNS & SYMPTOMS

3.1 Severity of symptoms will depend upon the concentration of the phosgene to which the person is exposed and the duration of exposure. **Patients can develop symptoms up to 48 hours after exposure though more severe exposures develop symptoms more rapidly**.

3.2 Inhalation: **Irritation to moist mucous membranes** resulting in inflammation of the eyes, nose, throat, and upper airway as well as coughing, bronchoconstriction, wheezing, and shortness of breath. **Severe pulmonary damage is characterized by progressive pulmonary edema, tachypnea, hypoxia, cyanosis, and a painful paroxysmal cough producing large amounts of frothy white or yellowish liquid**. Pulmonary edema typically peaks in 1 to 3 days. Exposure to phosgene can lead to reactive airways dysfunction syndrome (RADS), a chemical irritant-induced type of asthma.

3.3 Dermal: **Irritation, pain, and burns particularly in moist areas**. Severe exposures can lead to blistering and full thickness skin burns. Exposure to compressed liquefied phosgene gas has caused frostbite.

3.4 Ocular: Irritation and burns to the eyes. **Severe exposure can lead to blindness**. The full extent of eye damage may not be fully evident for several days.

3.4 Systemic: Nausea, vomiting, headache. Large exposures can cause hemolysis, methemoglobinemia, bone marrow suppression, liver damage, and renal damage. Destruction of red blood cells in the pulmonary circulation can cause capillary blockage leading to right heart strain and heart failure.

4.0 DIAGNOSTICS

4.1 Pulse oximetry should be used in symptomatic patients to evaluate the need for supplemental oxygen and additional monitoring.

4.2 Consider a chest x-ray in patients with persistent symptoms and hypoxia.

5.0 TREATMENT

5.1 General: **Treatment is mainly decontamination and supportive care** including basic and advanced life support. There is no specific antidote for phosgene poisoning. **Enforce strict rest and limitation of activity.** Even minimal physical exertion may shorten the clinical latent period and increase the severity of respiratory symptoms and signs in a lung-damaging agent casualty. Physical activity in a symptomatic patient may precipitate acute clinical deterioration and even death.

5.2 Inhalation: Maintain the patient's airway as necessary. Endotracheal intubation should be performed under direct visualization because of edema and potential damage to the oropharynx. **Support oxygenation and ventilation as necessary.** Use standard treatments for pulmonary edema and bronchospasm. Consider the use of **PEEP, bronchodilators, and corticosteroids.**

5.3 Dermal: **Treatment is the same as that for thermal burns.** If frostbite is present, rewarm the affected area in the same manner as for environmentally induced frostbite.

5.4 Ocular: **Irrigate eyes to a neutral pH.** Perform a thorough eye exam: test visual acuity and perform fluorescein and slit lamp examinations. Ophthalmology consultation may be necessary. Immediately consult an ophthalmologist for patients who have corneal injuries.

Disclaimer: This guideline is intended to be an informational reference only and should not be used as a substitute for consultation with a poison center or toxicologist, and/or the clinical judgement of the bedside team.

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