PHOSGENE

Background:

Phosgene is produced commercially by chlorinating carbon monoxide. It is used as a chemical intermediate in the manufacture of chemicals such as isocyanates, polyurethane, polycarbonates, dyes, pesticides and pharmaceuticals. It also is a by-product of burning or heating most volatile chlorinated compounds such as Freon, certain solvents, dry-cleaning agents and paint removers. Phosgene is a colorless, fuming liquid at 47°F, and is a gas at room temperature. At a low concentration, it may have the odor of newly mown hay; however, the odor threshold is 5 times the OSHA permissible exposure limit (PEL), so detection of odor correlates with a potentially significant exposure. Phosgene is slightly soluble in water and hydrolyzes to hydrochloric acid. Its main toxicity is from inhalation; toxicity is determined by concentration of phosgene in the air and length of exposure. Phosgene is heavier than air and may cause asphyxiation in poorly ventilated, enclosed spaces. All suspected or confirmed cases of phosgene intoxification must be reported to the local department of public health and the Illinois Department of Public Health (IDPH).

Signs/Symptoms:

1) Airway: Upper airway irritation may not be present or may have mild irritation if a large exposure has occurred. Phosgene is a slightly water soluble gas and exerts most of its damage in the lower respiratory tree.

2) Pulmonary: Usually asymptomatic initially; however 30 minutes to 72 hours later, patients may develop respiratory problems such as cough, dyspnea, tachypnea progressing to pulmonary edema and ARDS. Patients who survive 48 hours usually survive to discharge. Phosgene exposure also has been associated with chemical-induced asthma.

3) Cardiovascular: Instability can be caused by hypoxia and respiratory collapse.

4) Dermal: If the skin is wet or moist, may develop irritation and erythema.

5) Eyes: Tearing and irritation not uncommon; opacification of the cornea may occur in rare instances.

6) GI: May have hepatic and/or renal necrosis from direct phosgene effects on end organs. Nausea and vomiting may be seen post exposure.

Diagnostic Studies:

1) CXR (may show changes consistent with pulmonary edema or ARDS)

2) ABG (may show hypoxia, possible hypercarbia)

3) Continuous pulse oximetry

Treatment:

1) Decontamination:

   a) Fluid exposure will need dermal decontamination.

   b) Gas exposures without eye or skin complaints do not need decontamination.

   c) For symptomatic ocular exposures, flush eyes for 15 minutes.

2) Treat bronchospasm with aerosolized bronchodilators.

3) Consider steroids for treatment of pulmonary damage.

4) *Consider racemic epinephrine for pediatric patients with stridor.*

5) Support airway as clinically indicated with PEEP in intubated patients and CPAP in non-intubated patients for patients with pulmonary edema or ARDS.

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Disposition:

Admission and observation should be considered for all patients with a known phosgene exposure for a minimum of 23 hours. All symptomatic patients with signs of pulmonary edema or ARDS should be admitted to the ICU.