

Irritant Gases

Common Agents:

- High Water Solubility: Ammonia, Chloramine, Hydrogen Chloride, Sulfur Dioxide
- Intermediate Water Solubility: Chlorine, Hydrogen Sulfide, Zinc Oxide (HC)
- Low Water Solubility: Phosgene

Mechanism of Action: Form acids or bases when exposed to water.

Signs/Symptoms: In large doses or with chronic exposure these can affect the entire respiratory tract. In small to moderate doses the following is typical:

- Highly Water Soluble: affect upper respiratory tract predominately with rapid onset of drooling, mucosal edema, cough, stridor, eye irritation, dermal irritation. Little to no potential for delayed symptoms.
- Intermediately Water Soluble: affect all airways, some potential for delayed pulmonary injury/edema. Combination of high and low water soluble symptoms.
- Low Water Soluble: affect lower respiratory tract predominately. Delayed symptoms common including bronchitis, bronchorrhea, bronchospasm, non-cardiogenic pulmonary edema.

Triage:

- Immediate - airway edema (voice changes, stridor / wheezing, oral mucosa swelling), respiratory distress, hypoxia, hypotension
- Delayed - oral/nasal irritation or burns without airway edema
- Minor - minor irritation to skin

Decontamination:

- **Health care workers decontaminating patients should wear splash-proof PPE and use a filtered-air respirator that includes protection against acid-forming gases.**
- **Workers treating decontaminated patients require only Universal Precautions.**
- Remove all clothing and jewelry.
- Thoroughly wash skin and hair with soap and water for 3-5 minutes.
- May use bag-valve mask ventilation if necessary until decontamination complete – endotracheal intubation is technically difficult while wearing PPE and is not advised. Airway pressures may be high, limiting utility of BVM, LMA and other adjuncts. Laryngeal tissues may be very edematous.

Treatment:

- Provide supportive care with fluids, O₂, bronchodilators as needed.
- Consider early endotracheal intubation if upper airway swelling.
- CPAP or BiPaP may relieve respiratory distress and reduce need for intubation.
- If intubated, may need to add significant PEEP.
- May transudate large quantities of fluid into lungs. Non-cardiogenic pulmonary edema does not respond to diuretics and in fact patients may require significant fluid resuscitation.
- In chlorine, chloramine, and phosgene exposure, nebulized sodium bicarbonate solution may decrease acidic damage to pulmonary tissue.
 - Typically 1 ml of 7.5% or 8.4% sodium bicarbonate solution is diluted with 3 ml sterile water (forming an approximately 2% solution) and nebulized.
- Flush exposed eyes with 1-2 liters of water or normal saline and treat with lubricants.
- Unroof significant skin blisters and treat with silver sulfadiazine.

Disposition Criteria: Toxicity may be delayed in clinically asymptomatic patients with intermediate and low water solubility agents for up to 8 hours. Thus, patients with mild to no symptoms after 8 hours may be discharged to home with instruction on warning signs that should prompt return to the Emergency Department (respiratory difficulty, throat irritation, voice changes, chest discomfort).

For more information contact Minnesota Poison Control System at 1-800-222-1222.