CBRN Hazards: Blister Agents

There is no available antidote in Canada. Treatment is symptomatic and supportive.

Agent Overview

Blister agents (vesicants) are chemical warfare agents that cause severe local tissue injury to skin, eyes and the respiratory tract. Most are oily liquids that can be dispersed as liquid, aerosol or vapour.

- **Common agents:**
  - **Sulfur mustard (HD):** oily liquid; faint garlic odour; persists in environment.
  - **Nitrogen mustard (HN):** oily liquid; similar to sulfur mustard.
  - **Lewisite (L) (arsenical vesicant):** oily liquid; faint geranium odour.
  - **Phosgene oxime (CX) (urticant or nettle agent):** volatile solid/liquid; disagreeable odour.

Exposure and Onset

- **Routes of exposure:** Inhalation, ocular and dermal. Systemic toxicity develops through skin or pulmonary absorption.
- **Onset by agent:**
  - **Sulfur/Nitrogen mustard:** Symptom-onset is delayed 2–24 hrs, but cellular injury begins immediately. Exposure is often unrecognised when it occurs.
  - **Lewisite:** Rapid onset of pain and irritation within seconds to minutes of contact.
  - **Phosgene oxime:** Immediate onset; pain and tissue injury within seconds.

Clinical Features

- **Respiratory:** Rhinorrhea, sore throat, cough, dyspnea, hoarseness or stridor. Airway involvement can progress; assess early. Pulmonary edema can occur in severe exposures.
- **Ocular:** Lacrimation, conjunctival injection, pain, photophobia, blepharospasm, periorbital and eyelid edema, corneal ulceration.
- **Dermal:** Erythema; pruritus and burning; vesicles progressing to bullae; ulceration and necrosis. Moist areas (axillae, groin, genitalia) affected first and most severely. CX is an exception: expect immediate skin blanching, urticaria and necrosis, rather than blistering or vesicles.
- **Gastrointestinal/systemic/hematological:** Nausea, vomiting; bone marrow suppression and leukopenia (with mustard agents); septic complications; hypovolemic shock.

Diagnostic Tests

- Diagnosis is clinical.
- Exposure diagnosed by history and clinical findings. Confirmatory testing (urine metabolites, blood/blister fluid analysis) is unavailable acutely and does not alter initial management.
- Slit-lamp exam with fluorescein staining for persistent ocular symptoms or any visual complaints after irrigation.
- **Investigations guided by clinical presentation:**
  - **Complete blood count (CBC) with differential:** baseline and serial monitoring for leukopenia; bone marrow suppression may not manifest for several days.
  - **Venous blood gas (VBG):** respiratory symptoms.
  - **Chest x-ray:** respiratory involvement or significant inhalational exposure.

Treatment and Decontamination

- **Contact the Ontario Poison Centre for case-specific clinical guidance: 1-800-268-9017.**
- **Staff protection:** Follow institutional CBRN/HazMat PPE protocols before any patient contact. When treating non-decontaminated patients, wear gloves, gown, eye protection, and a surgical mask at minimum. For decontaminated patients, use universal precautions. Where possible, treat in a well-ventilated area.
- **Patient decontamination (perform first):** Remove all clothing and footwear immediately; double bag and seal. If ocular symptoms, remove contact lenses and irrigate eyes with copious water or saline for 15–20 minutes. Gently wash skin with copious water and soap, **avoiding vigorous scrubbing**.
- **Respiratory:** Perform early airway assessment; intubate for progressive hoarseness or stridor. Treat bronchospasm with a bronchodilator (e.g., salbutamol). Consider bronchoscopy to clear airway debris if needed.
- **Ocular:** Topical anesthetic if needed to facilitate irrigation. Treat corneal lesions with topical antibiotics and consider mydriatics in consultation with ophthalmology. All patients with ocular exposure require ophthalmology follow-up; refer early for abnormal slit-lamp findings or persistent symptoms.
- **Dermal/Pain:** Manage wounds as burns; consider debridement of bullae. Provide adequate analgesia and arrange follow-up with a burn specialist (e.g., plastic surgery).
- **Observation:** All patients with a suspected exposure must be observed for a minimum of 24 hrs from the time of exposure. Due to the delayed onset of cellular injury from mustard, patients who appear well at presentation may deteriorate.

This fact sheet is part of a just-in-time resource series for first receivers and was co-authored by Public Health Ontario (PHO) and Ontario Poison Centre (OPC). Contact OPC for 24/7 clinical guidance: 1-800-268-9017. See the CBRN Reference List for the full list of references used in these fact sheets.

The information in this document is current as of June 2026.