



R7DHRE
Hazardous
Materials
Guideline:
Methyl
Isocyanate



REGION VII DISASTER HEALTH RESPONSE ECOSYSTEM (R7DHRE) CHEMICAL SPECIALTY TEAM

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

Hazardous Materials Guideline: Methyl Isocyanate

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

1.0 BACKGROUND

1.1 Description: Methyl Isocyanate (MIC) is a colorless liquid at temperatures below 39°C (102°F). The liquid is very flammable, potentially explosive, and reacts violently with water. Above 39°C, MIC liquid readily evaporates. MIC vapors are heavier than air, and can accumulate in poorly ventilated, enclosed, or low-lying areas. MIC has a pungent odor, but most people can only smell MIC vapors at concentrations which are Immediately Dangerous to Life and Health (IDLH). Therefore, detection of MIC's odor does not provide an adequate warning of a hazardous concentration of the gas.

1.2 Mechanism of Injury: MIC is both an irritant and a corrosive. The mechanism of toxicity has not been clearly elucidated but does NOT involve cyanide toxicity. Persistent respiratory and ocular effects after an acute exposure may reflect methyl isocyanate-induced immunologic effects since antibodies specific to MIC have been demonstrated in the blood of exposed patients.

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

2.0 PROVIDER SAFETY

2.1 Personal Protective Equipment (PPE) – Decontamination Team: Methyl isocyanate is a highly toxic systemic poison that is well absorbed by inhalation and through the skin. 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 methyl isocyanate.
- 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 methyl isocyanate which would overwhelm the filter.

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.

2.2.1 The vomitus from persons who have ingested MIC liquid is hazardous because it may off-gas MIC vapors or contaminate those coming in contact with the vomit. Prepare treatment areas for rapid clean up in case the patient vomits.

2.3 Patient Decontamination:

2.3.1 Persons exposed to only methyl isocyanate gas and have no skin or eye irritation, dry skin, and dry clothes generally do not need decontamination since they do not pose a significant risk of secondary contamination. Those persons contaminated with liquid MIC do pose a risk of secondary contamination from off-gassing of MIC vapors and direct contact with the liquid.

2.3.2 If there is concern for a presence of solid (non-methyl isocyanate) substances, brush any powder or solids from the skin, hair, and clothes of victims.

2.3.3 Remove ALL clothing and jewelry. Double bag clothing and jewelry to prevent off-gassing.

2.3.4 Decontamination is best accomplished by irrigation with copious amounts of water.

2.3.4.1 Wash skin and hair with plain water for a minimum of 5 minutes and then wash twice with soap after washing with plain water. Washing with water alone (for a longer period of time) is acceptable if soap is not available.

2.3.5 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).

2.3.6 Watch for hypothermia in children and the elderly, when decontamination is done with un-heated water, or during cold weather.

3.0 SIGNS & SYMPTOMS

3.1 Severity of symptoms will depend upon the concentration of the methyl isocyanate to which the person is exposed and the duration of exposure.

3.2 Inhalation: Symptoms include respiratory irritation, cough, chest pain, dyspnea, pulmonary edema, and bronchospasm. Pulmonary edema may be delayed in onset (in some cases, up to 72 hours post-exposure).

3.2.1 MIC is extremely irritating and corrosive to the respiratory tract and is readily absorbed through the lungs. The onset of symptoms is usually immediate, and respiratory injury can evolve and progress for hours to days post-exposure.

3.2.2 Survivors of acute exposures may exhibit long-term respiratory effects. MIC may be a respiratory sensitizer.

3.2.3 High vapor concentrations may cause severe pulmonary edema, diffuse alveolar damage and death. Vomiting and diarrhea have occurred with inhalation of MIC.

3.3 Dermal: Dermal effects can be caused by either the liquid or concentrated vapors of MIC. MIC is corrosive to the skin and can cause dermal irritation or chemical burns. MIC may be absorbed through the skin, and MIC may be a dermal sensitizer.

3.4 Ocular: MIC is extremely irritating and corrosive, and direct contact with MIC liquid or concentrated vapors may cause rapid eye irritation or severe corneal damage. Symptoms include eye pain, lacrimation, photophobia, profuse lid edema, and corneal ulcerations. Survivors of acute exposures may exhibit long-term or permanent eye damage.

3.5 Ingestion: Although unlikely, ingestion of liquid methyl isocyanate could produce severe gastrointestinal irritation or burns, leading to nausea, vomiting, hematemesis, and abdominal pain. Of note, nausea, vomiting, abdominal pain, and defecation have been reported after severe, acute exposure to methyl isocyanate vapors.

4.0 DIAGNOSTICS

4.1 Methyl isocyanate poisoning is a clinical diagnosis, but basic diagnostic tests may be helpful in a symptomatic patient.

5.0 TREATMENT

5.1 Follow standard Basic and Advanced Life Support Guidelines. There is no specific antidote for MIC poisoning.

5.2 Inhalation: Maintain the patient's airway, with endotracheal intubation or cricothyroidotomy if necessary. Endotracheal intubation should be performed only under direct visualization because of edema and potential damage to the oropharynx. Support oxygenation and ventilation as necessary. Use standard treatments for pulmonary edema (diuretics, PEEP, etc.) and bronchospasm (inhaled bronchodilators; consider corticosteroids).

5.3 Dermal: Treatment is the same as that for thermal burns.

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.

5.5 Ingestion: Do NOT give activated charcoal or induce emesis. Consider dilution by giving 2 to 4 ounces of milk or water orally ONLY to patients who are conscious, able to swallow, and are able to protect their airway. Endoscopic evaluation may be necessary.

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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DO NOT REVISE. Contact Kathy Jacobitz at the Nebraska Regional Poison Center (kjacobitz@nebraskamed.com) for permission to modify or to provide suggestions for updates. Check <https://www.regionviidhre.com/chemical-team> for the latest version.

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