Isocyanates A 1

Information and recommendations for first responders

- **These guidelines are based on information about the diisocyanates toluene diisocyanate (TDI), diphenylmethane diisocyanate (MDI), and hexamethylene diisocyanate (HDI). Recommendations for other isocyanates might be similar. However, these guidelines do not cover special features potentially related to other isocyanates.**
- **Before approaching the patient, the first responder must make sure that he does not risk exposing himself to diisocyanates.**
- **Patients exposed only to diisocyanate vapor do not pose a significant risk of secondary contamination. Patients whose clothing or skin is contaminated with liquid diisocyanates or solvents containing diisocyanates can secondarily contaminate rescue and medical personnel by direct contact or through evaporation of diisocyanates.**
- **Diisocyanates are severely irritating to all tissues, in particular to the respiratory tract. Exposure may result in eye and skin irritation, coughing, chest pain, dyspnea. Swelling of the throat and signs of accumulation of fluid in the lungs (shortness of breath, cyanosis, expectoration, cough) may occur.**
- **Asthmatic attacks (constriction of the bronchi with severe dyspnea) may occur after exposure to very low diisocyanate concentrations.**
- **There is no antidote to be administered to counteract the effects of diisocyanates. Treatment consists of supportive measures.**

1. Substance information

Diisocyanates: TDI - $CH_3C_6H_3[NCO]_2$, CAS 26471-62-5 (mixture), CAS 584-84-9 (2,4-isomer), CAS 91-08-7 (2,6-isomer);
MDI - $CH_2(C_6H_4[NCO])_2$, CAS 144490-96-0 (mixture), CAS 5873-54-1 (2,4'-isomer), CAS 101-68-8 (4,4'-isomer);
HDI - $C_6H_{12}(NCO)_2$, CAS 822-06-0
Synonyms: TDI, diisocyanatotoluene, tolylene diisocyanate;
MDI, methylenediphenyl diisocyanate, methylene bis(phenylisocyanate);
HDI, hexamethylene diisocyanate, diisocyanatohexane
At room temperature, TDI and HDI are colorless to straw-colored liquids while MDI monomer is a colorless solid. Diisocyanates have a fruity, pungent odor. Diisocyanates are highly reactive even to hydroxyl and amino groups in human body cells. When heated to decomposition, they emit toxic fumes of nitrogen oxides.
The major application of diisocyanates is the manufacture of polyurethane foams, various plastic materials, and elastomers. In addition, diisocyanates are used as hardeners for paints, coatings, and adhesives.

2. Routes of exposure

Inhalation

Inhalation is the major route of diisocyanate exposure. The odor does not provide adequate warning of hazardous diisocyanate concentrations. Irritation of the respiratory tract and asthmatic attacks (constriction of the bronchi with severe dyspnea) can occur even at very low concentrations.

Skin/eye contact

Direct contact with diisocyanate liquids and vapor can cause severe irritation to skin or eyes.

Ingestion

Involuntary ingestion of diisocyanates is unlikely but could cause chemical burns of the mouth, throat, esophagus, and stomach.

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3. Acute health effects

Diisocyanate exposure causes irritation of all tissues. However, often throat and lung irritation are predominant and may lead to chest tightness, coughing, shortness of breath, blood-streaked sputum. Inflammation and severe damage of the lungs can occur. Asthmatic attacks (constriction of the bronchi with severe dyspnea) may occur after exposure to very low diisocyanate concentrations.
CNS effects and muscle pain can occur after inhalation exposure.
Skin contact with diisocyanates can cause irritation and redness with blister formation.
Eye contact may result in severe irritation with immediate pain, lacrimation, swelling of the lids, and clouding of the eye surface.

4. Actions

Rescuer self-protection

If the zone which has to be entered by the rescuer is suspected of containing diisocyanates, pressure-demand, self-contained breathing apparatus and chemical-protective clothing shall be worn; do not use equipment that is contaminated itself.
Patients exposed only to diisocyanate vapor do not pose a significant risk of secondary contamination. Patients whose clothing or skin is contaminated with liquid diisocyanates or solvents containing diisocyanates can secondarily contaminate other people by direct contact or through evaporation of diisocyanates.

Patient recovery

Patients should be removed from the contaminated zone immediately. Patients who are unable to walk may be removed on backboards or stretchers; if these are not available, carefully remove/transport patients with appropriate action to a safe zone, taking into account your self-protection.

Immediate priorities must follow the “A, B, C’s” of resuscitation:

A) **Airway** (make sure the airway is not blocked by the tongue or by a foreign body)
B) **Breathing** (check to see if the patient is breathing, provide ventilations with use of appropriate barrier devices, e.g. with a pocket face mask, if breathing is absent)
C) **Circulation** (start CPR in any unresponsive person with absent or abnormal breathing)

Decontamination

Patients exposed only to diisocyanate vapor who have no evidence of skin or eye irritation do not need decontamination. All others require decontamination.
Patients who are able and cooperative may assist with their own decontamination. If the exposure involved liquid diisocyanates or solvents containing diisocyanates and if clothing is contaminated, remove and double-bag the clothing.
Flush exposed skin and hair with plain water for at least 15 minutes. Protect eyes during flushing of skin and hair. Continue other basic care during flushing.
Irrigate exposed or irritated eyes with plain water or saline for at least 15 minutes. Remove contact lenses if present and easily removable without additional trauma to the eye. Continue other basic care during flushing.

Further actions

Each potentially exposed person should seek immediate medical advice and treatment.

In this document BASF has made a diligent effort to ensure the accuracy and currency of the information presented but makes no claim that the document comprehensively addresses all possible situations related to this topic. This document is intended as an additional resource for first responders in assessing the condition and managing the treatment of patients exposed to diisocyanates. It is not, however, a substitute for the judgement of a first responder and must be interpreted in the light of specific information regarding the patient available to such a first responder and in conjunction with other sources of authority.

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