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## Information and recommendations for paramedics and doctors at the site

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- Patients exposed only to dimethyl sulfate vapor do not pose a significant risk of secondary contamination. Patients whose clothing or skin is contaminated with liquid dimethyl sulfate can secondarily contaminate rescue and medical personnel by direct contact or through evaporation of dimethyl sulfate.
  - Dimethyl sulfate can produce eye, skin, and respiratory tract irritation. Signs of pulmonary edema (shortness of breath, cyanosis, expectoration, cough) may evolve 12 hours or more after exposure. Skin reactions may be delayed and may heal very slowly.
  - Inhalation and skin contact may result in systemic absorption resulting in headache, nausea, vomiting, abdominal pain, lung, liver, and kidney damage.
  - There is no antidote to be administered to counteract the effects of dimethyl sulfate. Treatment consists of supportive measures.
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### 1. Substance information

Dimethyl sulfate, (CH<sub>3</sub>)<sub>2</sub>SO<sub>4</sub> CAS 77-78-1

Synonyms: DMS, sulfuric acid dimethyl ester.

Dimethyl sulfate is a color- and odorless (to faint onion odor) oily liquid with a melting point of about -32°C and a boiling point of 188 (-25,6°F, 370 °F respectively). It is not flammable and not explosive. The flash point is 83 °C 181 °F) and the vapor pressure is low with 65 Pa at 20 °C (68 °F). It is slightly soluble in water; soluble in alcohols, ether, and aromatic hydrocarbons. It rapidly hydrolyzes in the presence of water to produce sulfuric acid and methanol.

Dimethyl sulfate is mainly used as a chemical intermediate. Its major applications are as a methylating agent of many organic chemicals (e.g. amines, carbon acids, thiols and phenols) both in industry and in laboratories. DMS is used, for example, in the manufacturing of dyes, perfumes, pharmaceuticals, for the separation of mineral oils and for the analysis of automobile fluids. The substance has also sulphating properties.

### 2. Routes of exposure

#### *Inhalation*

**Inhalation is a major route of dimethyl sulfate exposure.** Dimethyl sulfate is odorless (to faint onion odor) and is considered to have poor warning properties of hazardous exposure.

#### *Skin/eye contact*

Dimethyl sulfate vapor or liquids may be absorbed through the skin and eyes; however, direct contact with dimethyl sulfate vapor or concentrated solutions may cause severe chemical burns.

#### *Ingestion*

Involuntary ingestion of dimethyl sulfate is unlikely.

### 3. Acute health effects

**Exposure to dimethyl sulfate concentrations of more than 1 ppm may produce irritation of the eyes, nose, and throat. Higher concentrations may cause pulmonary edema up to 12 hours or more after exposure.**

Skin contact with dimethyl sulfate vapor or liquid may cause irritation with redness of the skin, blistering, itching, and pain. **Skin reactions may have a 1 to 2 hour delay before onset of symptoms, and the full effects may be delayed up to 12 hours or more after exposure and may heal very slowly.**

**Dimethyl sulfate is a skin sensitizer.**

High vapor concentrations or splashes of concentrated solutions can cause tearing and redness of the eye, and corneal injury.

**Both inhalation and skin contact may lead to systemic absorption** causing severe headache, nausea, vomiting, abdominal pain, and lung, liver and kidney injury.

#### *Dose-effect relationships*

Dose-effect relationships are as follows:

<u>Dimethyl sulfate concentration</u>	<u>Effect</u>
0.1 ppm	- TLV-TWA (ACGIH, USA)
1 ppm	- PEL (OSHA, USA)
1 ppm	- Burning of eyes, nose, and throat, dyspnea, coughing
7 ppm	- IDLH (NIOSH, USA)
97 ppm	- LC <sub>Lo</sub> (10 min)

## 4. Actions

### *Rescuer self-protection*

**If the zone which has to be entered by the rescuer is suspected of containing dimethyl sulfate, pressure-demand, self-contained breathing apparatus and chemical-protective clothing shall be worn.**

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### *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.

### *Decontamination*

All patients exposed to dimethyl sulfate liquid or vapor, even in the absence of skin or eye irritation, need decontamination.

Patients who are able and cooperative may assist with their own decontamination. If the exposure involved liquid dimethyl sulfate and if clothing is contaminated, remove and double-bag the clothing.

**Assure that skin and hair exposed to liquid containing dimethyl sulfate have been flushed with plain water for at least 15 minutes.** If not, continue flushing during other basic care. Protect eyes during flushing of skin and hair.

**Assure that exposed or irritated eyes have been irrigated with plain water or saline for at least 15 minutes.** If not, continue eye irrigation during other basic care.

Remove contact lenses if present and easily removable without additional trauma to the eye.

### *Initial treatment*

Therapy will be empiric; there is no antidote to be administered to counteract the effects of dimethyl sulfate.

**All asymptomatic patients potentially exposed to an airborne dimethyl sulfate concentration of 0.1 ppm or more should take 8 puffs of beclomethasone (800 µg beclomethasone dipropionate) from a metered dose inhaler. Thereafter, administration of 4 puffs every 2 hours until arrival at hospital/emergency department.**

**The following measures are recommended if the airborne exposure concentration is 1 ppm or more and/or if patients have respiratory complaints or evidence of systemic toxic effects after inhalation of dimethyl sulfate:**

- Administration of oxygen
- Administration of 8 puffs of beclomethasone (800 µg beclomethasone dipropionate) from a metered dose inhaler.

**Patients with severe clinical respiratory symptoms (e.g. bronchospasms, stridor) should be treated as follows:**

a) Nebulization of adrenaline (epinephrine): 2 mg adrenaline (2 ml) with 3 ml NaCl 0.9% and inhale through a nebulizer mask.

b) Administration of a  $\beta$ 2-selective adrenoceptor agonist, e.g., four strokes of terbutaline or salbutamol or fenoterol (one stroke usually contains 0.25 mg of terbutaline sulfate; or 0.1 mg of salbutamol; or 0.2 mg of fenoterol); this may be repeated once after 10 minutes. Alternatively, 2.5 mg salbutamol and 0.5 mg atrovent may be administered by nebulizer mask. If inhalation is not possible, administration of terbutaline sulfate (0.25 mg to 0.5 mg) subcutaneously or salbutamol (0.2 mg to 0.4 mg over 15 minutes) intravenously.

c) Intravenous administration of 250 mg methylprednisolone (or equivalent steroid dose).

**Patients with clinical signs of a toxic lung edema (e.g. foamy sputum, wet crackles) should be treated as follows:**

- a) Start CPAP-therapy (Continuous Positive Airway Pressure Ventilation).
- b) Intravenous administration of 1000 mg methylprednisolone (or an equivalent steroid dose) is recommended.

**Intubation of the trachea or an alternative airway management should be considered in cases of respiratory compromise. When the patient's condition precludes this, consider cricothyrotomy if equipped and trained to do so.**

Note: Efficacy of corticosteroid administration has not yet been proven in controlled clinical studies.

If dimethyl sulfate was in contact with the skin, chemical burns may result; treat as thermal burns: adequate fluid resuscitation and administration of analgesics, maintenance of the body temperature, covering of the burn with a sterile pad or clean sheet.

**After eye exposure chemical burns may result; treat as thermal burns. Immediately consult an ophthalmologist.**

**Patients exposed to an airborne concentration of 7 ppm or greater or with ingestion of dimethyl sulfate as well as patients without available exposure measurements but suspected of being exposed to concentrations of 7 ppm or greater should be immediately transferred to a hospital/emergency department.**

*Patient release/  
follow-up instructions*

Patients who have a **normal examination and no signs or symptoms of toxicity after observation for 12 hours** or who have been exposed to an airborne concentration **less than 1 ppm as well as patients who have no signs or symptoms of toxicity may be discharged after an appropriate observation period in the following circumstances:**

- a) The evaluating physician is experienced in the evaluation of individuals with dimethyl sulfate exposure.
- b) Information and recommendations for patients with follow-up instructions are provided verbally and in writing. Patients are advised to seek medical care promptly if symptoms develop or recur.
- c) The physician is comfortable that the patient understands the health effects of dimethyl sulfate and the provided follow-up instructions.
- d) Site medical is notified, so that the patient may be contacted at regular intervals in the 24-hour period following release.
- e) Heavy physical work should be precluded for up to 24 hours.
- f) Exposure to cigarette smoke should be avoided for 72 hours; the smoke may worsen the condition of the lungs.

Patients who have eye exposures should be reexamined after 24 hours.

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 paramedics or doctors in assessing the condition and managing the treatment of patients exposed to dimethyl sulfate. It is not, however, a substitute for the professional judgement of a paramedic or doctor and must be interpreted in the light of specific information regarding the patient available to such a paramedic or doctor and in conjunction with other sources of authority.

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