

Tetrahydrofuran (C<sub>4</sub>H<sub>8</sub>O)

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

- Patients exposed only to tetrahydrofuran vapor do not pose a significant risk of secondary contamination. Patients whose clothing or skin is contaminated with liquid tetrahydrofuran (boiling point 66°C, 150.8°F respectively) can secondarily contaminate rescue and medical personnel by direct contact or evaporation of tetrahydrofuran.
- Tetrahydrofuran is irritating (defatting) when it comes in contact with the eyes, skin, nose and throat and causes headache, nausea, vertigo, dizziness, weakness, disorientation, and unconsciousness. Central and peripheral neuropathy has been noted.
- There is no antidote to be administered to counteract the effects of tetrahydrofuran. Treatment consists of supportive measures.

## 1. Substance information

Tetrahydrofuran (C<sub>4</sub>H<sub>8</sub>O), CAS 109-99-9

Synonymes: Cyclotetramethylene oxide, THF, tetramethylene oxide

Tetrahydrofuran is, at room temperature, a clear, colorless liquid with a boiling point of 66°C, 150.8°F, respectively. Both vapor and liquid are potential fire and explosion hazards. Tetrahydrofuran has an acetone or ether-like odor and an odor threshold of 2 – 7.4 ppm. It is miscible with water and common organic solvents. Tetrahydrofuran may decompose into explosive peroxides and carbon monoxide.

Tetrahydrofuran is an organic solvent for natural and synthetic polymers and resins. It is used in the manufacture of lacquers, glues, paint, and ink and wetting and dispersing agents in textile processing.

## 2. Routes of exposure

*Inhalation*

**Most exposures occur by inhalation.** Tetrahydrofuran is readily absorbed by the respiratory tract.

*Skin/eye contact*

It is absorbed through the skin causing systemic effects.

*Ingestion*

Tetrahydrofuran is readily absorbed from the gastrointestinal tract. Ingestion is uncommon in occupational settings but may be aspirated.

## 3. Acute health effects

*Systemic*

**Tetrahydrofuran causes headache, nausea, vertigo, dizziness, weakness, disorientation, and unconsciousness.** Acute exposure to high concentrations may produce signs of upper respiratory irritation, followed by asphyxia, muscular weakness, cardiac arrhythmia, coma and death from respiratory paralysis. Central and peripheral neuropathy and alterations in liver enzymes have been noted after long-term exposure.

*Respiratory*

Tetrahydrofuran is irritating to the upper respiratory tract.

*Dermal*

Irritation of the skin may be caused by direct contact to liquid tetrahydrofuran.

*Ocular*

Eye contact to vapor or liquid tetrahydrofuran causes burning discomfort, spasmodic blinking or involuntary closing of the eyelids, redness, and tearing.

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<i>Dose-effect relationships</i>	Dose-effect relationships are as follows:
<u>Tetrahydrofuran concentration</u>	<u>Effect</u>
2 – 7.4 ppm	- Odor threshold
50 ppm	- Limit value 8 hours (European Union)
100 ppm	- Limit value short term (European Union)
200 ppm	- Limit value 8 hours (USA - NIOSH, OSHA)
250 ppm	- Limit value short term (USA - NIOSH)
2,000 ppm	- IDLH (NIOSH)
25,000 ppm	- anesthesia

### 4. Actions

#### *Rescuer self-protection*

**In response situations that involve exposure to potentially unsafe levels of tetrahydrofuran (see below), pressure-demand, self-contained breathing apparatus and chemical-protective clothing shall be worn.**

Patients whose clothing or skin is contaminated with tetrahydrofuran can secondarily contaminate other people by direct contact or evaporation of tetrahydrofuran.

#### *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" (Airway, Breathing, Circulation) of resuscitation.

#### *Decontamination*

Patients exposed to tetrahydrofuran require decontamination.

Patients who are able and cooperative may assist with their own decontamination. If clothing is contaminated, remove and double-bag the clothing.

**Assure that exposed or irritated eyes have been irrigated with plain water or saline for at least 20 minutes.** If not, continue eye irrigation during other basic care and transport.

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

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

Assure that following ingestion mouth and then drink 200-300 ml of water. Emesis is not recommended due to the potential for esophageal irritation and aspiration.

#### *Initial treatment*

Therapy will be empiric; there is no specific antidote to counteract the effects of tetrahydrofuran.

Patients with an exposure concentration of 50-200 ppm or greater (for 15 minutes or more) and patients without available exposure measurements but suspected of being exposed to concentrations of 50-200 ppm or greater (for 15 minutes or more) should be transferred to a hospital/emergency department.

The following measures are recommended if exposure by inhalation is 50-200 ppm (for 15 minutes or more), if symptoms, e. g. eye irritation or pulmonary symptoms have developed, or if no exposure concentration can be estimated but exposure has possibly occurred:

- **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 liquid tetrahydrofuran has been in contact with the skin, irritations may result, treat as thermal burns.

After eye exposure, irritation may result; treat as thermal burns. Consult an ophthalmologist.

*Patient release/  
follow-up instructions*

**Asymptomatic patients** with an exposure concentration of **less than 100-250 ppm** (and less than 15 minutes) or minor direct contact to liquid tetrahydrofuran **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 tetrahydrofuran 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 Tetrahydrofuran 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) Drinking of alcohol beverages should be forbidden for at least 72 hours.
- f) Heavy physical work should be precluded for 24 hours.
- g) Exposure to cigarette smoke should be avoided for 72 hours; the smoke may worsen the condition of the lungs.

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 and doctors at the site in assessing the condition and managing the treatment of patients exposed to tetrahydrofuran. It is not, however, a substitute for the professional judgement of a paramedic or a 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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