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 Information and recommendations for paramedics and doctors at the site
 

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- Before approaching the patient, the paramedics and doctors at the site must make sure that they do not risk exposing themselves to hydrazine.
  - Patients exposed only to hydrazine vapor do not pose a significant risk of secondary contamination. Patients whose clothing or skin is contaminated with hydrazine liquid can secondarily contaminate rescue and medical personnel by direct contact or through off-gassing hydrazine.
  - Hydrazine vapor or liquid is irritating and can cause corrosive burns to eyes or skin.
  - Inhalation of the vapor can result in rhinorrhea, coughing, and dyspnea. Laryngospasm and signs of pulmonary edema (shortness of breath, cyanosis, expectoration, coughing) may occur.
  - Systemic toxicity comprises of nausea, vomiting, abdominal pain, CNS depression, trembling, ataxia, seizure, and methemoglobinemia.
  - Treatment consists of symptomatic and supportive measures. In case of neurological symptoms, pyridoxine can be used as antidote. Symptomatic methemoglobinemia is treated with toluidine blue or methylene blue.
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## 1. Substance information

Hydrazine (NH<sub>2</sub>-NH<sub>2</sub>), CAS 302-01-2  
 Hydrazine hydrate (N<sub>2</sub>H<sub>4</sub>-H<sub>2</sub>O), CAS : 10217-52-4  
 (contains 55% Hydrazine w/w); CAS : 7803-57-8 (contains 64% Hydrazine w/w)  
 Synonymes: diamide, diamine, nitrogen hydride (anhydrous)  
 Hydrazine is at room temperature a colorless, fuming, oily liquid with an ammonia-like or fishy odor. The substance decomposes producing ammonia fumes, hydrogen and nitrogen oxides, causing fire and explosion hazard (boiling point 113.5 °C, flash point 37.8 °C). Hydrazine has been used as a rocket fuel, for corrosion prevention, as chemical reactant, and in the urethane coating production.

## 2. Routes of exposure

*Inhalation*

**Inhalation is a significant route of exposure.** Hydrazine's odor and irritant properties may provide adequate warning of hazardous concentrations. Swelling of the throat and signs of pulmonary edema (shortness of breath, cyanosis, expectoration, coughing) may occur.

*Skin/eye contact*

Rapid and significant absorption may occur. **Direct contact with liquid hydrazine or concentrated vapor on skin or eyes causes irritation/chemical burns.** Hypersensitivity reactions have also been reported with dermal exposures.

*Ingestion*

Accidental ingestion of hydrazine is unlikely. Hydrazine solutions may cause corrosive injury to the mouth, throat, and stomach if ingested.

## 3. Acute health effects

**Hydrazine exposure usually causes eye and nose irritation.** Breathing hydrazine for short periods may cause coughing and irritation of the throat and lungs, convulsions, tremors, seizure, or methemoglobinemia. Breathing hydrazine for long periods may cause liver and kidney damage. Hydrazine is a sensitizer and a suspected carcinogen.

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### Dose-effect relationships

Dose-effect relationships are as follows:

Hydrazine concentration	Limit Values	
1 ppm	-	PEL-TWA (OSHA)
3 - 4 ppm	-	Odor detection
50 ppm	-	IDLH (NIOSH)
AEGL1	10 min 0,1ppm	30 min 0,1 ppm
AEGL2	10 min 23 ppm	30 min 16 ppm
AEGL3	10 min 64ppm	30 min 45 ppm

## 4. Actions

### Rescuer self-protection

**In response situations that involve exposure to potentially unsafe levels of hydrazine (>1 ppm), pressure-demand, self-contained breathing apparatus and chemical-protective clothing shall be worn.**

Patients exposed only to hydrazine vapor do not pose a significant risk of secondary contamination. Patients whose clothing or skin is contaminated with hydrazine-containing liquids can secondarily contaminate other people by direct contact or through off-gassing hydrazine.

### 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 only to hydrazine vapor who have no evidence of skin or eye irritation do not need decontamination. All others require decontamination. Hydrazine can spontaneously ignite upon contact with cloth; clothing should be removed immediately.

Patients who are able and cooperative may assist with their own decontamination. If the exposure involved liquid hydrazine and 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, and that the pH of the conjunctival fluid has returned to normal (7.0).** If not, continue eye irrigation during other basic care and transport. If eye irrigation is impaired by blepharospasm, one to two drops of oxybuprocaine 0.4% may be instilled into affected eyes to allow adequate irrigation. 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.

### Initial treatment

**The following measures are recommended if the exposure concentration is 1 ppm or greater and if symptoms, e. g. eye irritation or pulmonary symptoms, have developed:**

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

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

If inhalation exposure has occurred, humidified air or oxygen should be provided. If signs of hypoxemia are present, humidified supplemental oxygen should be administered.

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.

If hydrazine has been 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.**

Note: Any facial exposure to liquid hydrazine should be considered as a serious exposure.

**Symptomatic patients exposed to a concentration of 1 ppm or greater should be transferred to a hospital/emergency department.**

*Antidotal treatment*

**In case of neurological symptoms: Initially, establishment of intravenous access and intravenous administration of pyridoxine (vitamin B6) over 5 to 10 minutes (25 mg/kg body weight).**

Pyridoxine 25 mg/kg IM or IV given in conjunction with a benzodiazepine has been advocated for treating seizure, CNS depression, and lactic acidosis associated with hydrazine exposure. Repeat as necessary, until up to 5 g per day of pyridoxine has been given. Adverse effects in acute dosing are rare. CNS depression may occur if greater than 5 g per day of pyridoxine is given using 1 mL vials due to the presence of the diluent chlorobutanol.

**Transfer the patient to a hospital/emergency department immediately.**

Treat symptomatic methemoglobinemia with toluidine blue or methylene blue, if G-6-PD deficiency is not present. Toluidine blue dosage is 2 to 4 mg/kg intravenously over 5 minutes. Dose may be repeated in 30 minutes. Methylene blue dosage is 1 mg/kg IV over 5 to 30 minutes; a repeat dose of up to 1 mg/kg may be repeated in 1 hour. Dosage should

*Patient release/  
follow-up instructions*

be repeated if methemoglobin levels remain greater than 30% or if signs and symptoms persist.

**Asymptomatic patients and patients exposed to a 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 hydrazine 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 hydrazine 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 24 hours.
- f) 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 hydrazine. 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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Reviewed: 2022  
Code: E042-004