

Chemical Emergency Medical Guideline

Information and recommendations for healthcare professionals

Acrylic acid

CAS No: 79-10-7

GHS symbols:



GHS05
Corrosive



GHS07
Acute toxicity

Signal word: Danger

Hazard statements:

- H314 Causes severe skin burns and serious eye damage.
 H317 May cause allergic skin reactions.
 H302+H312+H332 Harmful if swallowed, in contact with skin or if inhaled.

Overview

- A patient who is covered in liquid acrylic acid or whose clothing is contaminated with liquid acrylic acid may endanger other people through direct contact or through acrylic acid vapors. There is no danger from contact with patients who have only been exposed to acrylic acid vapors.
- Acrylic acid is highly corrosive to all tissues. Exposure to the eyes can cause severe burns and permanent damage to the eye. Skin contact can cause severe burns, which may occur with a delay. Vapors irritate the skin, eyes, nose, throat and respiratory tract, causing irritation, coughing, chest pain and breathing difficulties. Bronchospasm and pulmonary oedema (shortness of breath, cyanosis, sputum, coughing) may occur.
- There is no known specific antidote. Treatment depends on the extent of exposure and the symptoms.

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1. Information about the substance

Acrylic acid (C₃H₄O₂), CAS 79-10-7

Synonyms: Propionic acid

At room temperature, acrylic acid is a yellowish liquid with a pungent odor. Acrylic acid is the basic building block to produce acrylic resins, especially acrylates. Polymer emulsions are used in leather processing, in paints, polishes and adhesives, and as binders and for surface treatment.

2. Exposition

2.1. Inhalation

Inhalation is a possible route of exposure. The odor of acrylic acid and its irritating effect on the upper respiratory tract provide a clear warning of dangerous concentrations.

2.2. Skin/eye contact

Exposure to acrylic acid occurs mainly through direct contact with the skin and eyes. Skin and eye contact causes severe burns, which may also occur with a delay.

2.3. Ingestion

Ingestion of acrylic acid causes severe burns to the mucous membranes in the throat and esophagus.

3. Acute health effects

3.1. Dose-response relationship

<u>Acrylic acid concentration</u>	<u>Effect/effects</u>
1 ppm	- Odor perception
1.5 ppm	- AEGL-1 (10 minutes, USA, EPA)
68 ppm	- AEGL-2 (10 minutes, USA, EPA)
480 ppm	- AEGL-3 (10 minutes, USA, EPA)

AEGL-1 (acute exposure guideline levels): Guideline values for acute exposure. Concentration of a substance in the air above which the general population, including sensitive individuals, may experience noticeable discomfort, irritation or certain asymptomatic, non-sensory effects. However, the effects are not disabling and are temporary and reversible after exposure has ended.

AEGL-2: Concentration of a substance in the air above which the general population, including sensitive individuals, can be expected to suffer irreversible or other serious and long-lasting health effects or to be impaired in their ability to escape.

AEGL-3: Concentration of a substance in the air above which life-threatening health effects or death are expected to occur in the general population, including sensitive individuals.

EPA: Environmental Protection Agency

3.2. Respiratory tract

Acrylic acid usually causes irritation of the eyes and mucous membranes, throat irritation and coughing. It can quickly lead to breathing difficulties with chest pain, shortness of breath, laryngospasm and pulmonary oedema (shortness of breath, cyanosis, sputum, coughing). The symptoms may increase over several hours. Exposure to acrylic acid can lead to respiratory failure. The irritant or corrosive effect of liquid or vapors is the main concern; systemic absorption is of secondary importance.

3.3. Skin/eye contact

Direct exposure to liquid acrylic acid causes severe burns to the skin and mucous membranes, which can lead to scarring. Low vapor concentration or mists can cause pain, redness, inflammation and blistering. Direct eye contact causes irritation, tearing and severe burns. Permanent damage to the eye is possible.

3.4. Possible consequences

If the patient survives the first 48 hours after exposure, further improvement in symptoms can be expected. After acute exposure, lung function usually returns to normal within 7 to 14 days. Complete recovery is common, but symptoms and impaired lung function may persist. Increased sensitivity to irritants may persist and cause bronchospasms or chronic bronchitis. Destruction of lung tissue or scarring can lead to chronic dilation of the bronchi and increased susceptibility to infection. Chronic or prolonged exposure may result in an increased risk of chronic bronchitis.

4. Measures

4.1. Self-protection of first aiders

If there is a suspicion that the area the helper must enter contains acrylic acid, a self-contained breathing apparatus and a chemical protection suit must be worn. Contaminated equipment should not be used.

A patient who is wet with liquid acrylic acid or whose clothing is wet with liquid acrylic acid may endanger other people through direct contact or through acrylic acid vapors. There is no danger from contact with patients who have only been exposed to acrylic acid vapors.

4.2. Rescue

Patients should be removed from the danger zone immediately. If they are unable to walk unaided, they should be removed from the danger zone quickly using appropriate means, taking care to protect yourself. The "A, B, C procedure" has absolute priority.

- A) Clear the airways** (check for blockages caused by the tongue or foreign objects)
- B) Ventilation** (check the patient's breathing, if necessary, begin ventilation with adequate self-protection, e.g. breathing mask)
- C) Circulation** (begin resuscitation for any person who does not respond to verbal commands and is not breathing normally)

4.3. Cleaning

Patients who have only been exposed to acrylic acid vapors and show no signs of skin or eye irritation do not require any special cleaning measures, unlike all others. If possible, patients should assist with their own cleaning. If liquid acrylic acid has been exposed and clothing is contaminated, it must be removed immediately, securely wrapped and disposed of.

It must be ensured that, in the event of exposure to acrylic acid, the eyes have been rinsed with water or neutral saline solution for at least 15 minutes and that the pH value of the tear fluid has returned to normal (pH 7). If eye rinsing is impeded by spasmodic eyelid closure, the use of a local anesthetic solution (e.g. lidocaine, oxybuprocaine) may be considered. Remove any contact lenses, if possible, without additional risk to the eye.

Rinse affected skin and hair with water for at least 15 minutes. Other important emergency measures must be continued during this time. Protect the eyes during rinsing.

4.4. Initial treatment (preclinical or clinical)

Treatment depends on the extent of exposure and the symptoms. No specific antidote is known. The following measures are recommended if the acrylic acid concentration is 50ppm or more (depending on the duration of exposure), if symptoms are present (e.g. irritation of the eyes or upper respiratory tract) or if no concentration can be estimated but a relevant exposure is assumed:

- Oxygen administration
- Administration of 8 sprays of beclomethasone (800µg beclomethasone dipropionate) from a metered dose inhaler.

If there are signs of airway constriction (e.g. bronchospasm or stridor)

- Nebulization of adrenalin (epinephrine): Mix 2mg adrenalin (2ml) with 3ml NaCl 0.9% and administer via a nebulizer mask.
- Administration of a β 2-selective adrenoceptor agonist, e.g. four puffs of terbutaline or salbutamol or fenoterol (one puff usually contains 0.25mg terbutaline sulphate; or 0.1mg salbutamol; or 0.2mg fenoterol); this can be repeated once after 10 minutes.

Alternatively, 2.5mg of salbutamol and 0.5mg of ipratropium bromide can be administered via a nebulizer mask.

If inhalation is not possible, administer terbutaline sulphate (0.25mg to 0.5mg) subcutaneously or salbutamol (0.2mg to 0.4mg over 15 minutes) intravenously.

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

If there are signs of toxic pulmonary oedema (e.g. frothy sputum, moist rales)

- CPAP therapy
- Intravenous administration of 1000mg methylprednisolone (or an equivalent steroid dose)
- In case of (increasing) respiratory insufficiency, advanced airway management, e.g. endotracheal intubation or coniotomy if necessary.

Note: The efficacy of corticosteroid administration has not yet been proven in controlled clinical trials.

Patients with an exposure concentration of 50ppm or more (depending on the duration of exposure) and patients for whom no exposure dose can be estimated but who are likely to have been exposed to 50ppm or more should be transported immediately to a hospital with intensive care facilities.

Skin contact with acrylic acid can cause severe damage; this should be treated as a burn: adequate fluid administration, analgesic therapy, maintenance of body temperature, covering the affected skin area with a sterile dressing.

Exposure to the eyes can also cause severe damage; this should also be treated as a burn. An ophthalmologist should be consulted immediately.

Note: Any contact with liquid acrylic acid in the facial area can have serious consequences.

4.5. Further procedure and treatment

In addition to taking medical history, performing a physical examination and checking vital signs, pulse oximetry, a chest X-ray and spirometry should be carried out. Routine laboratory tests should include complete blood count and blood sugar and electrolyte determination.

Radiological signs of pulmonary oedema – enlargement of the hilar regions, typical, centrally accentuated, patchy shadows on the chest X-ray – are late signs that only become apparent 6 to 8 hours or even later after exposure. The X-ray is typically still normal at the initial presentation at the hospital, even after inhalation of a relevant dose.

Patients with possible exposure should be monitored for an appropriate period and re-examined repeatedly before any consequential damage to health can be ruled out. In cases of mild irritation of the upper respiratory tract that subsides quickly, no long-term effects are usually to be expected.

If oxygen saturation falls below 90%, arterial blood gas concentrations must be checked immediately and the chest X-ray repeated.

If blood gas concentrations deteriorate and/or the chest X-ray shows signs of toxic pulmonary oedema, oxygen should be administered via a mask. If deterioration manifests (especially in the case of tachypnoea (>30/min) and a simultaneous decrease in carbon dioxide partial pressure), CPAP therapy should be started within the first 24 hours after exposure.

In the event of pulmonary oedema developing, fluid intake and excretion as well as electrolytes should be closely monitored. A positive balance should be avoided. To optimize fluid management, the placement of a central venous catheter should be considered. If signs of pulmonary oedema persist, intravenous administration of methylprednisolone (or an equivalent steroid) should be continued at intervals of 8 to 12 hours.

Prophylactic antibiotic administration is not routinely recommended but may be indicated based on the results of sputum cultures. Pneumonia may occur as a complication of severe pulmonary edema.

4.6. Discharge of the patient / instructions for further rules of conduct

Clinically asymptomatic patients who have been exposed to an acrylic acid concentration of less than 50 ppm (depending on the duration of exposure) and who show no abnormal clinical findings and no signs of toxic effects after an appropriate follow-up period may be discharged under the following circumstances:

- Information and recommendations for patients with instructions for further action were provided verbally and in writing. The patient was advised to seek immediate medical attention if any health problems arise.
- The attending physician has been informed that regular contact between the patient and the physician is possible in the following 24 hours.
- No heavy physical work for the next 24 hours.
- Do not smoke or be exposed to cigarette smoke for at least 72 hours; smoke can impair lung function.
- Patients with serious skin or eye injuries should be re-examined after 24 hours.
- Spirometry should be repeated at regular intervals after discharge until the values have normalized to the patient's baseline values prior to exposure.

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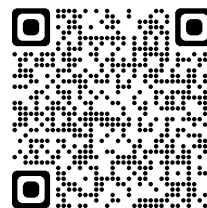
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Administrative Information

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