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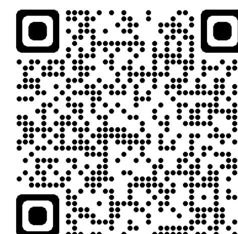

Chemical Emergency Medical Guideline

Information and recommendations for healthcare professionals

Epichlorohydrin

CAS No.: 106-89-8

GHS symbols:

GHS05
Corrosive

GHS06
Acute toxicity

GHS08
Health hazard

Signal word: Danger

Hazard statements:

H314	Causes severe skin burns and serious eye damage.
H317	May cause allergic skin reactions.
H350	May cause cancer.
H361	May damage fertility or the unborn child.
H301+H311+H331	Toxic if swallowed, in contact with skin or if inhaled.

Overview

- There is no danger from contact with patients who have only been exposed to epichlorohydrin vapors. However, a patient who is wet with liquid epichlorohydrin or whose clothing is wet with liquid epichlorohydrin may endanger other persons through direct contact or through evaporating epichlorohydrin.
- Epichlorohydrin can cause irritation to the eyes, skin and respiratory tract. Signs of pulmonary oedema (shortness of breath, cyanosis, sputum, coughing) may occur more than 12 hours after exposure. Skin reactions may also occur with a delay and heal very slowly.
- Inhalation and skin contact can lead to systemic absorption of epichlorohydrin, resulting in headaches, nausea, vomiting, abdominal pain, and lung, liver and kidney damage.
- There is no known specific antidote. Treatment depends on the extent of exposure and the symptoms.

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1. Information on the substance

Epichlorohydrin: (C_3H_5ClO), CAS 106-89-8
Synonyms: 1-chloro-2,3-epoxypropane, 3-chloro-1,2-epoxypropane, 1-chloropropene oxide, 3-chloropropene oxide

Epichlorohydrin is a colorless liquid that is flammable at room temperature (boiling point 116°C) and has an odor like chloroform. Nevertheless, epichlorohydrin can pose a hazard even at concentrations below the perception threshold. Epichlorohydrin vapors are heavier than air and can form an explosive mixture with air; exposure may therefore be greater in poorly ventilated, low-lying or enclosed spaces. Epichlorohydrin is slightly soluble in water. It is used in the manufacture of epoxy and phenoxy resins, glycerin, surface-active substances, medicines, insecticides, coatings, adhesives, solvents and other chemicals. It is also used as a solvent in the rubber and paper industry.

2. Exposition

2.1. Inhalation

Exposure to epichlorohydrin occurs mainly through inhalation. The odor of epichlorohydrin does not provide sufficient warning of dangerous exposure.

2.2. Skin/eye contact

Epichlorohydrin can be absorbed through the skin or eyes as a vapor or liquid. Direct contact with epichlorohydrin vapors or concentrated solutions can cause severe chemical burns.

2.3. Ingestion

Accidental ingestion of epichlorohydrin is unlikely.

3. Acute health effects

3.1. Dose-response relationship

Concentration of epichlorohydrin		Effect/effects
1 ppm	-	Odor threshold
10 - 20ppm	-	Mild temporary irritation of the mucous membranes
40 ppm	-	Burning sensation in the eyes, nose and throat, dyspnea, coughing; symptoms may persist for several days
over 100 ppm	-	Toxic pneumonia and pulmonary oedema. Kidney damage
> 50mg/kg body weight orally (p.o.)	-	Potentially fatal

3.2. Respiratory tract

Exposure to epichlorohydrin concentrations of more than 10 to 20ppm may cause irritation of the eyes, nose and throat. Concentrations above 100ppm may cause pulmonary edema even more than 12 hours after exposure.

3.3. Skin contact

Skin contact with epichlorohydrin as a vapor or liquid can cause irritation with reddening of the skin, blistering, itching and pain. Skin reactions may occur more than 12 hours after exposure and heal very slowly. Epichlorohydrin is a potent skin allergen. High concentrations of vapors or splashes of concentrated solutions may cause tearing and redness of the eyes, as well as corneal damage.

3.4. Other

Both inhalation and skin contact can cause systemic absorption, which can lead to severe headaches, nausea, vomiting, abdominal pain, lungs, liver, and kidney damage.

3.5. Possible consequences

Survivors of severe inhalation damage may be left with chronic lung disease and a predisposition to repeat respiratory infections. After pronounced systemic exposure, liver or kidney damage may remain.

3.6. Carcinogenicity

According to Directive EC 1272/2008, epichlorohydrin is classified as follows: Carc. 1B (probably carcinogenic to humans; suspected based on animal studies).

4. Measures

4.1. Self-protection of first aiders

If there is suspicion that the area the helper must enter contains epichlorohydrin, a self-contained breathing apparatus and a chemical protection suit must be worn.
There is no danger from contact with patients who have only been exposed to epichlorohydrin vapors. A patient who is wet with liquid epichlorohydrin or whose clothing is wet with liquid epichlorohydrin may endanger other persons through direct contact or through epichlorohydrin gas emissions.

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 suitable means, taking care to protect themselves. 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 epichlorohydrin 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 in their own cleaning. If liquid epichlorohydrin has been exposed and clothing is contaminated, it must be removed and securely wrapped.
Rinse affected skin and hair with water for at least 15 minutes. Protect eyes while rinsing.
In case of exposure to epichlorohydrin, rinse eyes with water or neutral saline solution for at least 15 minutes. Remove contact lenses, if present and if possible, without additional risk to the eye. Continue other important emergency measures in the meantime.

4.4. Initial treatment (preclinical or clinical)

Empirical therapy; no specific antidote available.
All asymptomatic patients who may have been exposed to epichlorohydrin concentrations of 40ppm or more should be given 8 sprays of beclomethasone (800µg beclomethasone dipropionate) from a metered dose inhaler. Patients should be monitored and re-examined for an appropriate period.

The following measures are recommended if the exposure concentration is 40ppm or more, if symptoms such as eye irritation or pulmonary symptoms are present, or if the exposure concentration cannot be estimated but exposure to epichlorohydrin is highly likely:

- 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 ß2-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 salbutamol and 0.5mg 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, if necessary, coniotomy.

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

Skin contact with epichlorohydrin can cause severe damage; this should be treated as burns: adequate fluid administration, analgesic therapy, maintenance of body temperature, covering the affected skin area with a sterile dressing.
Exposure of the eyes can also result in severe damage; this should also be treated as a burn. Consult an ophthalmologist immediately.

Patients who have been exposed to a concentration of 40ppm or more or who have swallowed epichlorohydrin, as well as patients without exposure measurements but with a high degree of suspicion of relevant exposure to a concentration of 40ppm or more, should be transported immediately to a hospital with intensive care facilities.

4.5. Further action and treatment

In addition to medical history, physical examination and vital signs, pulse oximetry, a p.a. chest X-ray and spirometry should be performed.

Routine laboratory tests should include a complete blood count, liver and kidney function parameters, glucose and electrolytes. Inpatient observation of patients with signs of systemic toxicity should be considered regardless of the route of exposure.
Radiologically clear signs of pulmonary oedema – enlargement of the hili, typical, centrally emphasized, patchy shadows on the chest X-ray – are late signs that only become apparent 12 hours or more after exposure. The chest X-ray is typically unremarkable on initial presentation at the hospital, even after inhalation of a large dose.
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 becomes apparent (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 insertion 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 considered based on the results of sputum cultures. Pneumonia may occur as a complication of severe pulmonary edema.

In the event of significant systemic absorption of epichlorohydrin with impaired liver and/or kidney function, hemodialysis may be considered.

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

Clinically asymptomatic patients who have been exposed to epichlorohydrin concentrations of less than 40ppm (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 patient is aware of and understands the toxic effects of epichlorohydrin.
- The attending physician has been informed that regular contact between the patient and the physician is possible in the following 24 hours.
- Heavy physical work should not be done in the following 24 hours.
- Do not smoke and avoid cigarette smoke for at least 72 hours; smoke can impair lung function.
- Patients with eye exposure should be re-examined after 24 hours.
- Spirometry should be repeated at regular intervals after discharge until the values have returned to the patient's baseline values prior to exposure.

5. References

American Conference of Governmental Industrial Hygienists, Inc, ed. Documentation of the Threshold Limit Values and Biological Exposure Indicies. 6th ed. Cincinnati, 1991: 550-555.

Beratergremium für umweltrelevante Altstoffe (BUA) der Gesellschaft Deutscher Chemiker, Hrsg. Epichlorhydrin. Stuttgart: S. Hirzel Wissenschaftliche Verlagsgesellschaft, 1992. (BUA-Stoffbericht 90)

Berufsgenossenschaft der chemischen Industrie, Hrsg. Epichlorhydrin. Heidelberg: Jedermann-Verlag, 1985. (Merkblätter für gefährliche Arbeitsstoffe; M 012.)

Buttgereit F, Dimmeler S, Neugebauer E, Burmester GR. Wirkungsmechanismen der hochdosierten Glucocorticoidtherapie. Dtsch Med Wschr 1996; 121: 248-252.

Diller WF. Anmerkungen zum Unglück in Bhopal. Dtsch Med Wschr 1985; 110: 1749-1751.

Ellenhorn MJ, Schonwald S, Ordog G, Wasserberger J. Ellenhorn’s Medical Toxicology: Diagnosis and Treatment of Human Poisoning. 2nd ed. Baltimore: Williams & Wilkins, 1997: 1681.

Thiess AM. Vergiftungen durch Industriestoffe, Teil 1 + 2. Sicherheitsingenieur 1972; 4/72: 164-168, 5/72: 213-216.

U.S. Department of Health & Human Services - Agency for Toxic Substances and Disease Registry, ed. Epichlorohydrin. Atlanta, 1994. (Managing Hazardous Materials Incidents; vol III.)

World Health Organization (WHO), ed. Guidelines for Drinking-Water Quality. 2nd ed. vol. II Health Criteria and Other Supporting Information. Geneva, 1996: 547-554.

Foncerrada G et al, Safety of Nebulized Epinephrine in Smoke Inhalation Injury, J Burn Care Res 2017;38:396–402

Walker PGF et al, Diagnosis and management of inhalation injury: an updated review, Critical Care (2015) 19:351

Olasveengen TM, Semeraro F, et. Al: European Resuscitation Council Guidelines 2021: Basic Life Support. Resuscitation 2021, 161: 98-114

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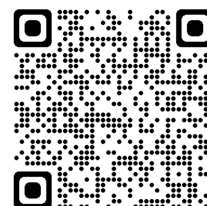

BASF has taken every possible care to ensure that the information presented in this document is accurate and up to date but does not claim that this document comprehensively covers all possible situations in this regard. This document is intended as an additional source of information for doctors in hospitals and is designed to assist in the assessment of the condition and treatment of patients exposed to epichlorohydrin. However, it does not replace the professional assessment of the respective situation by physicians in hospitals and must be interpreted in accordance with legal regulations and provisions as well as specific information available about the respective patients.