BASF
We create chemistry

Chemical Emergency Medical Guideline

Information and recommendations for healthcare professionals

Chloroacetyl chloride

CAS No.: 79-04-9

GHS symbols:

GHS05
Corrosive

GHS06
Acute toxicity

GHS08
Health hazard

Signal word: Danger

Hazard statements:

H314	Causes severe skin burns and serious eye damage.
H372	Damages organs (respiratory system) through prolonged or repeated exposure.
H301+H311+H331	Toxic if swallowed, in contact with skin or if inhaled.

Overview

- Before paramedics/emergency doctors approach a patient, who has been or is exposed to chloracetyl chloride, they must ensure that there is no danger to themselves from chloracetyl chloride.
- There is no danger from contact with patients who have only been exposed to chloracetyl chloride gases. A patient who is wet with liquid chloracetyl chloride or chloracetyl chloride-containing solvents, or whose clothing is wet with these substances, may endanger other people through direct contact or through chloracetyl chloride outgassing.
- Chloroacetyl chloride causes severe irritation of the eyes and lungs. Due to slow hydrolysis in the alveoli, symptoms and severe lung damage may still occur 24 hours after exposure. Signs of toxic pulmonary oedema (shortness of breath, cyanosis, sputum, coughing) usually only appear several hours after exposure, even in cases of severe exposure.
- There is no known specific antidote. Treatment depends on the extent of exposure and the symptoms.

Table of Contents

1. Information on the substance

Chloroacetyl chloride ($ClCH_2COCl$), CAS 79-04-9
Synonyms: chloroacetic acid chloride, CAC
Chloracetyl chloride is a colorless or white liquid at room temperature with a melting point of -22°C and a boiling point of 106°C. It has a sharp, pungent odor and is decomposed in moisture to form chloroacetic acid and hydrochloric acid.
Chloroacetyl chloride is used as an intermediate in the manufacture of many chemicals such as adrenaline, diazepam, chloroacetophenone, chloroacetic acid esters and chloroacetic anhydride.

2. Exposition

2.1. Inhalation

Exposure to chloroacetyl chloride occurs mainly through inhalation or skin/eye contact. The odor of chloroacetyl chloride is insufficient as a warning. The irritant effect can be mild and delayed, allowing chloroacetyl chloride to remain undetected for a long time. Chloroacetyl chloride is heavier than air and spreads along the ground.

2.2. Skin/eye contact

Chloroacetyl chloride can cause irritation and chemical burns to the skin or eyes. Absorption through the skin is possible.

2.3. Ingestion

Ingestion of chloracetyl chloride can cause irritation of the mouth, throat and stomach.

3. Acute health effects

3.1. Dose-response relationship

Chloroacetyl chloride		Effect
0.023 ppm	-	Odor threshold
0.05 ppm	-	Occupational exposure limit (TWA) (ACGIH)
0.15 ppm	-	Short-term exposure limit (ACGIH)
0.05 ppm	-	ERPG-1 (AIHA)
0.5 ppm	-	ERPG-2 (AIHA)
10 ppm	-	ERPG-3 (AIHA)
0.04 ppm	-	AEGL-1 (10 min, 30 min, 60 min, USA, EPA)
2.9 ppm	-	AEGL-2 (10 minutes, USA, EPA)
2.0 ppm	-	AEGL-2 (30 minutes, USA, EPA)
1.6 ppm	-	AEGL-2 (60 minutes, USA, EPA)
95 ppm	-	AEGL-3 (10 minutes, USA, EPA)
66 ppm	-	AEGL-3 (30 minutes, USA, EPA)
52 ppm	-	AEGL-3 (60 minutes, USA, EPA)

TWA: Time Weighted Average. Concentration for a conventional 8-hour working day and a 40-hour working week, to which workers can be repeatedly exposed on a daily basis without adverse effects, according to general opinion.
ACGIH: American Conference of Governmental Industrial Hygienists
ERPG-1 is the maximum concentration in the air below which it is generally considered that people can be exposed for up to one hour without experiencing any slight temporary health effects or perceiving a clearly defined, unpleasant odour.
ERPG-2 is the maximum concentration in the air below which it is assumed that people can be exposed for up to one hour without developing irreversible, serious health effects or symptoms that could impair a person's ability to take protective measures.
ERPG-3 is the maximum concentration in the air below which it is assumed that individuals can be exposed for up to one hour without developing life-threatening health effects.
ERPG: Emergency Response Planning Guidelines

AIHA: American Industrial Hygiene Association
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 ceases.
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

Chloroacetyl chloride usually causes irritation of the eyes, nose, throat and stomach. Symptoms immediately after exposure to chloracetyl chloride due to irritation of the upper respiratory tract may be mild (throat burning, coughing, pressure sensation), but severe lung damage with fluid accumulation in the lungs (pulmonary oedema) may occur up to 24 hours after exposure. Chloracetyl chloride can lead to respiratory and cardiovascular failure .

3.3. Skin contact

Skin contact with gaseous chloracetyl chloride may cause skin irritation or redness.

3.4. Eye contact

High gas concentrations can cause redness and tearing of the eyes. Eye contact with liquid chloracetyl chloride can result in clouding of the surface of the eye and later in permanent damage.

3.5. Possible consequences

If the patient survives the first 48 hours after exposure, further improvement in symptoms can be expected. Increased sensitivity to irritants may persist and cause bronchospasm or chronic bronchitis. Resulting lung parenchyma damage and scarring may also lead to chronic bronchial dilation and increased susceptibility to pulmonary infections.

4. Measures

4.1. Self-protection of first aiders

If there is a suspicion that the area the helper must enter contains chloracetyl chloride, a self-contained breathing apparatus and a chemical protection suit must be worn. Do not use contaminated equipment.
There is no danger from contact with patients who have only been exposed to chloracetyl chloride gases. A patient who is wet with liquid chloracetyl chloride or chloracetyl chloride-containing solvents, or whose clothing is wet with these substances, may endanger other persons through direct contact or through chloracetyl chloride outgassing.

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 on any person who does not respond to verbal commands and is not breathing normally)

4.3. Cleaning

Patients who have only been exposed to chloracetyl chloride gases 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 decontamination. If liquid chloracetyl chloride or solvents containing chloracetyl chloride have contaminated clothing, this must be removed and securely wrapped.
Ensure that affected skin and hair areas are rinsed with water for at least 15 minutes. Continue other important first aid measures during this time. Protect eyes while rinsing.
In case of exposure, 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 first aid measures during this time.

4.4. Estimation of inhaled dose

Patients exposed to concentrations of ERPG-2 (0.5ppm) or higher, and patients who are likely to have been exposed but whose dose cannot be reliably estimated, should be transported immediately to a hospital with intensive care facilities.

4.5. Initial treatment (preclinical or clinical)

Empirical therapy; no specific antidote available.
The following measures are recommended if exposure reaches or exceeds ERPG-2, symptoms are present, or if the exposure dose cannot be estimated but exposure is likely to have occurred:

- 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 coniotomy if necessary.

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

Skin contact with chloroacetyl chloride can result in 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.

Serious damage may also result from exposure to the eyes; this should also be treated as a burn. Consult an ophthalmologist immediately.
Note: Any exposure to liquid chloroacetic chloride in the facial area can have serious consequences.

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

Patients with possible exposure should be monitored for an appropriate period and re-examined repeatedly before ruling out any damage to their health.
If oxygen saturation falls below 90%, arterial blood gas concentrations should 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 insertion of a central venous catheter should be considered.
As long as 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.

4.7. Discharge of the patient / instructions for further treatment

Clinically asymptomatic patients who have been exposed to a **chloracetyl chloride concentration of less than 0.5ppm** (ERPG-2 value) (depending on the duration of exposure) and patients who show normal clinical examination 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 is aware of and understands the toxic effects of chloracetyl chloride.
- The local doctor has been informed that regular contact between the patient and the doctor 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 whose **exposure** has **exceeded the ERPG-2 (0.5ppm) value** but who show no abnormal examination findings and no signs of toxic effects after an appropriate follow-up period may be discharged under the following circumstances:

- The attending physician is experienced in assessing patients with chloracetyl chloride exposure.
- Even if the patient's clinical condition has not deteriorated, a further chest X-ray should be performed before discharge. The patient should not be discharged if this shows even the slightest indication of pulmonary oedema.
- Information and recommendations for patients with instructions for further action have been provided verbally and in writing.
- The patient is aware of and understands the toxic effects of chloracetyl chloride.
- The local doctor has been informed that regular contact between the patient and the doctor 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 injuries 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

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

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

Documentation of the TLVs ® and BEIs ®: Chloroacetyl chloride, ACGIH, 2001.

HAZARDTEXT® – Hazard Management: Chloroacetyl chloride, 15 pp, 2014.

HAZMAP: Chloroacetyl chloride, NLM/NIH, 2014.

HSDB® - Hazard Substances Data Bank: Chloroacetyl chloride, 25 pp, 2014.

ICSC – International Safety Cards: No. 0845, Chloroacetyl chloride, WHO/IPCS/ILO, 1998.

RTECS: Acetyl chloride, Chloro-, No. AO6475000, CDC/NIOSH, 2009.

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

Administrative Information

Document Type	Chemical Emergency Medical Guideline
Number of Version	DE.1.0.0
Initial Publication	01.01.2026
Next Revision	2029
Responsible Unit (Author)	ESG/CH ESG/AS
Contact	ESG/CH: Dr. M. Conzelmann, T. Schröck ESG/AS: Dr. D. Frambach

BASF SE
Corporate Health Management
Carl-Bosch-Straße 38
67056 Ludwigshafen
Germany