



UK Health
Security
Agency

Dichloromethane

Incident management

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Key points

Fire

Dichloromethane is a combustible liquid with a sweet odour.

It reacts violently with metals such as aluminium powder, magnesium powder, strong bases and strong oxidants, causing a fire and explosion hazard.

It emits toxic fumes of phosgene, carbon monoxide and hydrogen chloride when heated to decomposition or involved in combustion.

Health

Ingestion may cause gastrointestinal burns, haemorrhage and necrosis.

Inhalation causes dyspnoea, cough, respiratory tract irritation, pulmonary oedema and pneumonitis with bilateral exudative pleural effusions.

Dermal contact causes a burning sensation, numbness, coldness and pain.

Ingestion, inhalation and extensive or prolonged dermal contact can cause systemic effects including headache, light-headedness, blurred vision, fatigue, disorientation, confusion, drowsiness, agitation, ataxia, arthropathy, rash, skin flushing.

Eye contact with vapour can cause irritation, and with liquid may cause corneal burns.

Casualty decontamination at the scene

Following disrobe, improvised dry decontamination should be considered for an incident involving dichloromethane, unless casualties are demonstrating signs or symptoms of exposure to caustic or corrosive substances.


Environment

Inform the Environment Agency where appropriate.


Spillages and decontamination run-off should be prevented from entering drains and watercourses.

Hazard identification

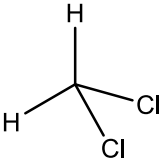
Standard (UK) dangerous goods emergency action codes

| | | | | |
|---|------------------|------|--|---|
| UN | | 1593 | Dichloromethane | |
| EAC | | 2Z | Use fine water spray. Wear normal fire kit in combination with breathing apparatus*. Spillages and decontamination run-off should be prevented from entering drains and watercourses | |
| APP | | – | – | |
| Hazards | Class | 6.1 | Toxic substance |  |
| | Sub-risks | – | – | |
| HIN | | 60 | Toxic or slightly toxic substance | |
| <p>UN – United Nations number, EAC – emergency action code, APP – additional personal protection, HIN – hazard identification number</p> <p>* Normal firefighting clothing is appropriate, that is breathing apparatus conforming to BS EN 137 worn in combination with fire kit conforming to BS EN 469, firefighters' gloves conforming to BS EN 659 and firefighters' boots conforming to home office specification A29 or A30</p> <p>Reference</p> <p>Dangerous Goods Emergency Action Code List, National Chemical Emergency Centre (NCEC), Part of Ricardo-AEA. The Stationery Office 2021</p> | | | | |

Classification, labelling and packaging (CLP)*

| | | | |
|--|---------|-----------------------------|---|
| Hazard class and category | Carc. 2 | Carcinogenicity, category 2 |  |
| Hazard statement | H351 | Suspected of causing cancer | |
| Signal words | WARNING | | |
| <p>* Implemented in the EU on 20 January 2009</p> <p>Reference</p> <p>European Commission. Harmonised classification – Annexe VI to Regulation (EC) No. 1272/2008 on Classification, Labelling and Packaging of Substances and Mixtures (viewed in June 2021)</p> | | | |

Physicochemical properties

| | |
|---|---|
| CAS number | 75-09-2 |
| Molecular weight | 84.9 |
| Formula | CH ₂ Cl ₂ |
| Common synonyms | Methylene chloride, DCM |
| State at room temperature | Clear, colourless liquid |
| Volatility | Vapour pressure: 440 mm Hg at 25 °C |
| Specific gravity | 1.3 (water = 1) |
| Vapour density | 2.9 (air = 1) |
| Flammability | Combustible liquid |
| Lower explosive limit | 13% |
| Upper explosive limit | 19% |
| Water solubility | Moderately soluble |
| Reactivity | Reacts violently with metals such as aluminium powder, magnesium powder, strong bases and strong oxidants, causing a fire and explosion hazard. Attacks some forms of plastic rubber and coatings |
| Reaction or degradation products | Decomposes on heating or on burning and on contact with hot surfaces, producing toxic and corrosive fumes including hydrogen chloride, phosgene and carbon monoxide |
| Odour | Sweet ether-like odour |
| Structure |  |
| References | <p>International Programme on Chemical Safety. International Chemical Safety Card entry for dichloromethane. ICSC 0058, 2021. World Health Organization: Geneva.</p> <p>CAMEO Chemicals version 2.7.1 rev 3. Dichloromethane chemical factsheet National Oceanic and Atmospheric Administration's Office of Response and Restoration in partnership with the Environmental Protection Agency's Office of Emergency Management (viewed in July 2021)</p> |

Reported effect levels from authoritative sources

Exposure by inhalation

| ppm | mg/m ³ | Exposure duration | Signs and symptoms | Reference |
|--------------|-------------------|----------------------|---|-----------|
| 300–800 | 1,042–2,778 | 40 minutes | Psychomotor and sensory impairment | b |
| 500–1,000 | 1,736–3,472 | 1–2 hours | Light-headedness and alterations in visual reflexes | b |
| 2,300 | 7,987 | 5 minutes | Irritation and dizziness | b |
| 2,300 | 7,987 | 30 minutes | Nausea | b |
| 5,000 | 17,362 | Acute | Headache, fatigue and irritation | b |
| 7,200 | 24,290–34,700 | 8 minutes | Paraesthesia and eye irritation | b |
| 8,000–20,000 | 27,779–69,447 | 30 minutes – 4 hours | Narcosis | a, b |
| >50,000 | >173,620 | Acute | Immediate danger to life or health | b |

These values give an indication of levels of exposure that can cause adverse effects. They are not health protective standards or guideline values

References

a. International Programme on Chemical Safety. Methylene Chloride. Environmental Health Criteria 164, 2nd Edition, 1996. World Health Organization: Geneva

b. International Programme on Chemical Safety. Methylene Chloride. Poisons Information Monograph 343, 1997. World Health Organization: Geneva. [IPCS INCHEM – Poisons Information Monographs Archive \(PIMs, 1989 to 2002\)](#)

Exposure by ingestion

| mL | Signs and symptoms | Reference |
|---|----------------------------|-----------|
| 25 | Estimated adult fatal dose | a |
| <p>These values give an indication of levels of exposure that can cause adverse effects. They are not health protective standards or guideline values</p> <p>Reference</p> <p>a. International Programme on Chemical Safety. Methylene Chloride. Poisons Information Monograph 343, 1997. World Health Organization: Geneva. IPCS INCHEM - Poisons Information Monographs Archive (PIMs, 1989 to 2002)</p> | | |

Published emergency response guidelines

Acute exposure guideline levels (AEGLs) (interim)

| | ppm | | | | |
|----------------|------------|------------|------------|-----------|-----------|
| | 10 min | 30 min | 60 min | 4 hours | 8 hours |
| AEGL-1* | 290 | 230 | 200 | NR | NR |
| AEGL-2† | 1,700 | 1,200 | 560 | 100 | 60 |
| AEGL-3‡ | 12,000 | 8,500 | 6,900 | 4,900 | 2,100 |

* Level of the chemical in air at or above which the general population could experience notable discomfort

† Level of the chemical in air at or above which there may be irreversible or other serious long-lasting effects or impaired ability to escape

‡ Level of the chemical in air at or above which the general population could experience life-threatening health effects or death

NR Not recommended due to insufficient data

Reference

US Environmental Protection Agency. [Acute Exposure Guideline Levels](#) (viewed in July 2021)

Exposure standards, guidelines or regulations

Occupational standards

| | LTEL (8-hour reference period) | | STEL (15-min reference period) | |
|---|--------------------------------|-------------------|--------------------------------|-------------------|
| | ppm | mg/m ³ | ppm | mg/m ³ |
| WEL | 100 | 353 | 200 | 706 |
| <p>WEL – workplace exposure limit, LTEL – long-term exposure limit, STEL – short-term exposure limit</p> <p>Reference HSE. EH40/2005 Workplace Exposure Limits, 4th Edition, 2020</p> | | | | |

Public health guidelines

| | |
|---|--|
| WHO drinking water guideline | 0.02 mg/L |
| Air quality guideline | 3 mg/m ³ (24-hour guideline) 0.45 mg/m ³ (weekly average concentration) |
| <p>References</p> <p>WHO. Guidelines for Drinking-Water Quality, 4th Edition incorporating the 1st addendum, 2017. World Health Organization: Geneva</p> <p>WHO. Air Quality Guidelines for Europe. WHO Regional Publications, European Series No. 91, 2nd Edition, 2000. World Health Organization Regional Office for Europe: Copenhagen</p> | |

Health effects

Major route of exposure

Dichloromethane has direct solvent toxicity and may be toxic due to its carbon monoxide, formaldehyde, formic acid and carbon dioxide metabolites.

Inhalation is the most common cause of toxicity.

Immediate signs or symptoms of acute exposure

| Route | Signs and symptoms |
|---|--|
| Inhalation | Inhalation causes dyspnoea, cough, upper respiratory tract irritation. Pulmonary oedema and pneumonitis with bilateral exudative pleural effusions have been documented. Systemic features may also develop |
| Ingestion | Ingestion may cause gastrointestinal burns, haemorrhage and necrosis. Acute pancreatitis has been reported. Systemic features may occur |
| Dermal | Dermal contact causes a burning sensation, numbness, coldness and pain. Second- and third-degree burns have been reported. Absorption leading to systemic features may occur if exposure is prolonged or extensive |
| Ocular | Eye contact with vapours causes irritation. Contact with liquid dichloromethane may cause corneal burns |
| Systemic | <p>Systemic features include GI upset, headache, light-headedness, blurred vision, fatigue, confusion, drowsiness, agitation, ataxia, hypotonia, rash, arthropathy, skin flushing and diaphoresis.. Cardiovascular effects include syncope, bradycardia, tachycardia, hypotension and/or hypertension. Optic neuropathy and hearing loss have been recorded</p> <p>Elevated carboxyhaemoglobin concentrations are common. Metabolic acidosis, electrolyte disturbances (hypernatraemia, hypokalaemia/hyperkalaemia, hypocalcaemia), hyperglycaemia,, leukocytosis, raised liver enzymes and elevated creatine phosphokinase concentration can occur</p> <p>In severe cases, hypotension, respiratory depression, coma, convulsions, pulmonary and cerebral oedema, acute kidney injury, cardiac arrhythmias and cardiac arrest may occur</p> |
| References | |
| TOXBASE . Methylene Chloride (Dichloromethane), June 2019 (viewed in July 2021) | |

Decontamination at the scene

Chemical specific advice

The approach used for decontamination at the scene will depend upon the incident, location of the casualties and the chemicals involved. Therefore, a risk assessment should be conducted to decide on the most appropriate method of decontamination.

Following disrobe, improvised dry decontamination should be considered for an incident involving dichloromethane, unless casualties are demonstrating signs or symptoms of exposure to caustic or corrosive substances.

People who are processed through improvised decontamination should subsequently be moved to a safe location, triaged and subject to health and scientific advice. Based on the outcome of the assessment, they may require further decontamination.

Emergency services and public health professionals can obtain further advice from UK Health Security Agency (Radiation, Chemicals and Environment Directorate) using the 24 hour chemical hotline number: 0344 892 0555.

Disrobe

The disrobe process is highly effective at reducing exposure to HAZMAT/CBRN material when performed within 15 minutes of exposure.

Therefore, disrobe must be considered the primary action following evacuation from a contaminated area.

Where possible, disrobe at the scene should be conducted by the casualty themselves and should be systematic to avoid transferring any contamination from clothing to the skin. Consideration should be given to ensuring the welfare and dignity of casualties as far as possible.

Improvised decontamination

Improvised decontamination is an immediate method of decontamination prior to the use of specialised resources. This should be performed on all contaminated casualties, unless medical advice is received to the contrary. Improvised dry decontamination should be considered for an incident involving chemicals unless the agent appears to be corrosive or caustic.

Improvised dry decontamination

Any available dry absorbent material can be used such as kitchen towel, paper tissues (for example blue roll) and clean cloth.

Exposed skin surfaces should be blotted and rubbed, starting with the face, head and neck and moving down and away from the body.

Rubbing and blotting should not be too aggressive, or it could drive contamination further into the skin.

All waste material arising from decontamination should be left in situ, and ideally bagged, for disposal at a later stage.

Improvised wet decontamination

Water should only be used for decontamination where casualty signs and symptoms are consistent with exposure to caustic or corrosive substances such as acids or alkalis.

Wet decontamination may be performed using any available source of water such as taps, showers, fixed installation hose-reels and sprinklers.

When using water, it is important to try and limit the duration of decontamination to between 45 and 90 seconds and, ideally, to use a washing aid such as cloth or sponge.

Improvised decontamination should not involve overly aggressive methods to remove contamination as this could drive the contamination further into the skin.

Where appropriate, seek professional advice on how to dispose of contaminated water and prevent run-off going into the water system.

Additional notes

Following improvised decontamination, remain cautious and observe for signs and symptoms in the decontaminated person and in unprotected staff.

If water is used to decontaminate casualties this may be contaminated, and therefore hazardous, and a potential source of further contamination spread.

All materials (paper tissues and so on) used in this process may also be contaminated and, where possible, should not be used on new casualties.

The risk from hypothermia should be considered when disrobe and any form of wet decontamination is carried out.

People who are contaminated should not eat, drink or smoke before or during the decontamination process and should avoid touching their face.

Consideration should be given to ensuring the welfare and dignity of casualties as far as possible. Immediately after decontamination the opportunity should be provided to dry and dress in clean robes/clothes.

Interim wet decontamination

Interim decontamination is the use of standard fire and rescue service (FRS) equipment to provide a planned and structured decontamination process prior to the availability of purpose-designed decontamination equipment.

Decontamination at the scene references

Home Office. Initial operational response to a CBRN incident. Version 2.0, July 2015

NHS England. Emergency Preparedness, Resilience and Response (EPRR). Guidance for the initial management of self-presenters from incidents involving hazardous materials. February 2019

Clinical decontamination and first aid

Clinical decontamination is the process where trained healthcare professionals using purpose designed decontamination equipment treat contaminated persons individually.

Detailed information on clinical management can be found on [TOXBASE](#).

Important notes

Once body surface contaminants have been removed or if your patient was exposed by ingestion or inhalation, the risk that secondary care givers may become contaminated is very low. Secondary carers should wear standard hospital PPE as a precaution against secondary contamination from vomit and body fluids.

If the patient has not been decontaminated following surface contamination, secondary carers must wear appropriate NHS PPE for chemical exposure to avoid contaminating themselves. The area should be well ventilated.

Clinical decontamination following surface contamination

Carry out decontamination after resuscitation.

This should be performed in a well-ventilated area, preferably with its own ventilation system.

Contaminated clothing should be removed, double-bagged, sealed and stored safely.

Decontaminate open wounds first and avoid contamination of unexposed skin.

Any particulate matter adherent to skin should be removed and the patient washed with copious amounts of water under low pressure for at least 10 to 15 minutes, or until the pH of the skin is normal (pH of the skin is 4.5 to 6, although it may be closer to 7 in children, or after irrigation). The earlier irrigation begins, the greater the benefit.

Pay particular attention to mucous membranes, moist areas such as skin folds, fingernails and ears.

Dermal exposure

Decontaminate (as above) following surface contamination.

Decontaminate (as above) the patient following surface contamination.

Following decontamination recheck the pH of affected areas after a period of 15 to 20 minutes and repeat irrigation if abnormal. Burns with strong solutions may require irrigation for several hours or more. Attention should be paid to avoiding hypothermia during prolonged irrigation with cool fluids.

Once the pH is normal and stabilised, treat as for a thermal injury.

Other measures as indicated by the patient's clinical condition.

If features of systemic toxicity present, manage as per ingestion.

Other supportive measures as indicated by the patient's clinical condition.

Ocular exposure

Remove contact lenses if present.

Anaesthetise the eye with a topical local anaesthetic (for example oxybuprocaine, amethocaine or similar); however, do not delay irrigation if local anaesthetic is not immediately available.

Immediately irrigate the affected eye thoroughly with 1,000 mL 0.9% saline or equivalent crystalloid (for example by an infusion bag with a giving set) for a minimum of 10 to 15 minutes irrespective of initial conjunctival pH. A Morgan Lens may be used if anaesthetic has been given. Aim for a neutral conjunctival pH of 7.5 to 8.0. The conjunctivae may be tested with indicator paper. Retest 20 minutes after irrigation and use further irrigation if necessary.

Any particles lodged in the conjunctival recesses should be removed.

Repeated instillation of local anaesthetics may reduce discomfort and help more thorough decontamination; however, prolonged use of concentrated local anaesthetics is damaging to the cornea.

Patients with corneal damage, those who have been exposed to strong acids or alkalis and those whose symptoms do not resolve rapidly should be discussed urgently with an ophthalmologist.

Other supportive measures as indicated by the patient's clinical condition.

Inhalation/ingestion/systemic toxicity

Maintain a clear airway and ensure adequate ventilation.

Administer oxygen to achieve adequate oxygenation.

In the event of cardiac arrest in hospital or witnessed out of hospital cardiac arrest with prompt bystander CPR, resuscitation should be usually continued for at least 1 hour and only stopped after discussion with a senior clinician.

In severely affected patients, especially those with tachypnoea, stridor or upper airway damage, critical care input is essential with urgent assessment of the airway. A supraglottic-epiglottic burn with erythema and oedema is usually a sign that further oedema will occur that may lead to airway obstruction. Children are of increased risk of airway obstruction

Do not attempt gastric lavage.

Monitor vital signs and cardiac rhythm; check the capillary blood glucose; perform a 12-lead ECG in all patients who require assessment.

Measure COHb and arterial blood gases.

Other supportive measures as indicated by the patient's clinical condition.

Clinical decontamination and first aid references

[TOXBASE](#) (viewed in September 2021)

TOXBASE Methylene chloride (dichloromethane), 2019

TOXBASE Methylene chloride – features and management, 2019

TOXBASE Chemicals splashed or sprayed into the eyes, 2020

About the UK Health Security Agency

The [UK Health Security Agency](#) is an executive agency, sponsored by the [Department of Health and Social Care](#).

This document from the UKHSA Radiation, Chemicals and Environment Directorate reflects understanding and evaluation of the current scientific evidence as presented and referenced here.

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First published: January 2016

Update: November 2016 Health Effects, Decontamination at the Scene and Clinical Decontamination and First Aid

Full document update: September 2021

For queries relating to this document, please contact:
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Published: December 2021

Publishing reference: GOV-10567

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