

Uses

Carbon disulfide is used as an industrial solvent and has been used, in the vapour form, as an insecticide.

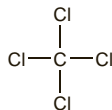
Carbon Tetrachloride

Tetracloruro de carbono; Wegła tetrachlorek. Tetrachloromethane.

Четырѐххлористый Углерод

$\text{CCl}_4 = 153.8$.

CAS — 56-23-5.



Description. Carbon tetrachloride is a clear, colourless, mobile, liquid with a chloroform-like odour. Sp. gr. 1.588 to 1.590. B.p. 76° to 78°. Practically insoluble in water; miscible with alcohol, chloroform, ether, petroleum spirit, and fixed and volatile oils. Store in airtight containers at a temperature not exceeding 30°. Protect from light.

Handling. Avoid contact with carbon tetrachloride; the vapour and liquid are poisonous. Care should be taken not to vaporise carbon tetrachloride in the presence of a flame because of the production of harmful gases, mainly phosgene.

Adverse Effects

Individual response to carbon tetrachloride varies widely; inhalation or ingestion of a few mL of carbon tetrachloride has proved fatal and its toxicity appears to be increased by alcohol. Poisoning may follow inhalation, ingestion, or topical application but develops more rapidly after inhalation.

Carbon tetrachloride is irritant; repeated application of carbon tetrachloride to the skin may result in dermatitis. Aspiration may result in pulmonary oedema.

Adverse effects after acute exposure from any route include gastrointestinal disturbances such as nausea, vomiting, and abdominal pain, and CNS disturbances such as headache, dizziness, and drowsiness, with progression to convulsions, coma, and death from respiratory depression or circulatory collapse. Death may also occur as a result of ventricular arrhythmia. Hepatic and renal cellular necrosis can occur and are associated with free radical production; symptoms usually begin a few days or up to 2 weeks after acute exposure to carbon tetrachloride. Renal damage may present as oliguria, progressing to proteinuria, anuria, weight gain, and oedema. Symptoms of hepatic damage include anorexia, jaundice, and hepatomegaly. If hepatorenal necrosis is not fatal recovery is eventually complete.

Symptoms of chronic poisoning are similar to those of acute poisoning; in addition, paraesthesias, visual disturbances, anaemia, and aplastic anaemia have occurred. Carcinogenicity has been demonstrated in animals.

References.

- Melamed E, Lavy S. Parkinsonism associated with chronic inhalation of carbon tetrachloride. *Lancet* 1977; **i**: 1015.
- Johnson BP, et al. Cerebellar dysfunction after acute carbon tetrachloride poisoning. *Lancet* 1983; **ii**: 968.
- Perez AJ, et al. Acute renal failure after topical application of carbon tetrachloride. *Lancet* 1987; **i**: 515–6.
- Health and Safety Executive. Carbon tetrachloride, chloroform. *Toxicity Review* 23. London: HMSO, 1992.
- Manno M, Rezzadore M. Critical role of ethanol abuse in carbon tetrachloride poisoning. *Lancet* 1994; **343**: 232.
- WHO. Carbon tetrachloride health and safety guide. *IPCS Health and Safety Guide* 108. Geneva: WHO, 1998. Available at: <http://www.inchem.org/documents/hsg/hsg/hsg108.htm> (accessed 29/06/04)

Treatment of Adverse Effects

If carbon tetrachloride vapour has been inhaled the patient should be removed to the fresh air. Clothing contaminated by liquid should be removed and the skin washed. If carbon tetrachloride has been ingested gastric lavage may be performed if the patient presents within 1 hour and activated charcoal may be given.

The usual symptomatic and supportive measures should be instituted. Hepatic and renal function should be monitored closely. Haemodialysis or peritoneal dialysis may be needed if renal function is impaired. Adrenaline or other sympathomimetics should be avoided because of the risk of precipitating cardiac arrhythmias.

Acetylcysteine (p.1550) may be given to patients recently exposed to carbon tetrachloride in an attempt to prevent or modify hepatic and renal damage.

Pharmacokinetics

Carbon tetrachloride is readily absorbed after inhalation and ingestion. It is also absorbed through the skin. Metabolism to reactive free radicals is thought to account for the hepatorenal toxicity of carbon tetrachloride.

Carbon tetrachloride is slowly excreted from the body via the lungs and the urine.

Uses

Carbon tetrachloride is employed in industry as a solvent and defoamer. It was formerly used in certain types of fire extinguisher and as an industrial and domestic dry cleaner but has been largely replaced for this purpose by less toxic substances. Carbon tetrachloride has also been used for the fumigation of cereals.

Carbon tetrachloride was formerly given orally as an anthelmintic but it has been superseded by equally effective and less toxic drugs.

Cyclohexane

Ciclohexano; Cykloheksan; Hexahydrobenzene; Hexamethylen.

Циклогексан

$\text{C}_6\text{H}_{12} = 84.16$.

CAS — 110-82-7.



Description. Cyclohexane is a colourless, flammable liquid. Wt per mL about 0.78 g. B.p. about 81°. Store in airtight containers.

Adverse Effects

Cyclohexane is irritant, and may also have effects on the CNS.

◇ Reviews of the toxicity of cyclohexane.

- Health and Safety Executive. Cyclohexane, cumene, para-dichlorobenzene (p-DCB), chlorodifluoromethane (CFC 22). *Toxicity Review* 25. London: HMSO, 1991.

Uses

Cyclohexane is used as an industrial solvent.

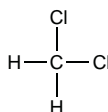
Dichloromethane

Cloruro de metileno; Dichlormethan; Diclorometano; Diklórmetán; Methylene Chloride; Méthylène, chlorure de; Methyleni chloridum; Metileno chloridas; Metylenkloridi; Metylenklorid; Metyleni chlorek.

Дихлорметан

$\text{CH}_2\text{Cl}_2 = 84.93$.

CAS — 75-09-2.



Pharmacopoeias. In *Eur.* (see p.vii). Also in *USNF*.

Ph. Eur. 6.2 (Methylene Chloride; Dichloromethane BP 2008). A clear, colourless, volatile liquid. Relative density 1.320 to 1.332. It may contain not more than 2% of alcohol and/or not more than 0.03% of 2-methylbut-2-ene as stabiliser. Sparingly soluble in water; miscible with alcohol. Store in airtight containers. Protect from light.

USNF 26 (Methylene Chloride). A clear, colourless, mobile liquid having an odour resembling chloroform. Sp. gr. 1.318 to 1.322. Miscible with alcohol, with ether, and with fixed and volatile oils. Store in airtight containers.

Stability. Phosgene is produced on heating of dichloromethane.

Adverse Effects and Treatment

Acute exposure to dichloromethane vapour may depress the CNS; symptoms progress from headache and dizziness to coma and death in severe cases. Pulmonary oedema has been reported. Significant exposure may result in raised blood concentrations of carboxyhaemoglobin and symptoms of carbon monoxide poisoning. Cardiovascular effects have been attributed to hypoxia secondary to carboxyhaemoglobinaemia. There has been a report of haemolysis after acute ingestion of dichloromethane.

Chronic occupational exposure to dichloromethane vapour has produced gastrointestinal disturbances in addition to symptoms observed after acute poisoning. Dichloromethane is a common constituent of paint strippers and may be implicated in volatile substance abuse (p.2019).

The liquid is irritant and high concentrations of the vapour are irritant to the eyes.

Treatment of acute poisoning consists of removal from exposure and supportive and symptomatic measures. Carboxyhaemoglobinaemia should be managed as for carbon monoxide poisoning (p.1688) by giving 100% oxygen; hyperbaric oxygen may be indicated. After ingestion gastric lavage or activated charcoal are generally contra-indicated, although gastric aspiration may be considered in serious cases if the airway can be protected. Adrenaline and other sympathomimetics should also be avoided because of the risk of precipitating cardiac arrhythmias.

References.

- WHO. Methylene Chloride. *Environmental Health Criteria* 32. Geneva: WHO, 1984. Available at: <http://www.inchem.org/documents/ehc/ehc32.htm> (accessed 29/06/04)
- Health and Safety Executive. Dichloromethane (methylene chloride). *Toxicity Review* 12. London: HMSO, 1985.
- WHO. Methylene chloride health and safety guide. *IPCS Health and Safety Guide* 6. Geneva: WHO, 1987. Available at: <http://www.inchem.org/documents/hsg/hsg/hsg006.htm> (accessed 29/06/04)
- Rioux JP, Myers RAM. Methylene chloride poisoning: a paradigmatic review. *J Emerg Med* 1988; **6**: 227–38.
- Manno M, et al. Double fatal inhalation of dichloromethane. *Hum Exp Toxicol* 1992; **11**: 540–5.
- Dhillon S, Von Burg R. Methylene chloride. *J Appl Toxicol* 1995; **15**: 329–35.
- Chang YL, et al. Diverse manifestations of oral methylene chloride poisoning: report of 6 cases. *J Toxicol Clin Toxicol* 1999; **37**: 497–504.
- Jacobovich RM, et al. Facial nerve palsy after acute exposure to dichloromethane. *Am J Ind Med* 2005; **48**: 389–92.

Pharmacokinetics

Dichloromethane is rapidly absorbed after inhalation and is also absorbed after ingestion and slowly through intact skin. It appears to be partially metabolised to carbon dioxide and carbon monoxide which are exhaled, although significant blood-carboxyhaemoglobin concentrations may be attained. Some unchanged dichloromethane is exhaled and small amounts are excreted in the urine.

Uses

Dichloromethane is used as a pharmaceutical and industrial solvent. It is also employed as an extraction solvent in food processing.

Dichloromethane is widely used in paint strippers.

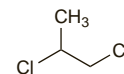
Dichloropropane

Dicloropropano; Propylene Dichloride. 1,2-Dichloropropane.

Дихлорпропан

$\text{C}_3\text{H}_6\text{Cl}_2 = 113.0$.

CAS — 78-87-5.



Description. Dichloropropane is a colourless, mobile, flammable liquid. Wt per mL about 1.16 g. B.p. about 96°. Store in airtight containers.

Adverse Effects

Dichloropropane is irritant; high concentrations may result in CNS depression.

◇ Acute renal failure, haemolytic anaemia, acute liver disease, and disseminated intravascular coagulation has been reported¹ after intentional inhalation of a stain remover containing dichloropropane; the patient recovered after blood transfusions and haemodialysis.

- Locatelli F, Pozzi C. Relapsing haemolytic-uraemic syndrome after organic solvent sniffing. *Lancet* 1983; **ii**: 220.

Uses

Dichloropropane is used as an industrial solvent, dry cleaning agent, and agricultural defumigant.

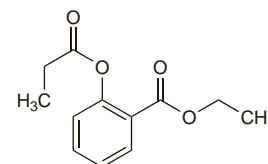
Diethyl Phthalate

Diéthyle, phtalate de; Diethyl-ftalát; Diethylis phthalas; Diethyl-ftalát; Dietilo ftalatas; Dietylftalat; Dietylyiftalaatti; Ethyl Phthalate; Ftalato de dietilo. Benzene-1,2-dicarboxylic acid diethyl ester.

Диэтилфталат

$\text{C}_{12}\text{H}_{14}\text{O}_4 = 222.2$.

CAS — 84-66-2.



Pharmacopoeias. In *Eur.* (see p.vii) and *Viet.* Also in *USNF*.

Ph. Eur. 6.2 (Diethyl Phthalate). A clear, colourless or very slightly yellow, oily liquid. Relative density 1.117 to 1.121. Practically insoluble in water; miscible with alcohol. Store in airtight containers.

USNF 26 (Diethyl Phthalate). A colourless, practically odourless, oily liquid. Sp. gr. 1.118 to 1.122 at 20°. Insoluble in water; miscible with alcohol, with ether, and with other usual organic solvents. Store in airtight containers.