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Health and Safety Guide No. 108

CARBON TETRACHLORIDE

HEALTH AND SAFETY GUIDE

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WORLD HEALTH ORGANIZATION, GENEVA 1998

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Health and Safety Guide No. 108

CARBON TETRACHLORIDE HEALTH AND SAFETY GUIDE

This is a companion volume to
Environmental Health Criteria 208: Carbon tetrachloride

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INTRODUCTION

The Environmental Health Criteria (EHC) monographs produced by the International Programme on Chemical Safety include an assessment of the effects on the environment and on human health of exposure to a chemical or combination of chemicals, or physical or biological agents. They also provide guidelines for setting exposure limits.

The purpose of a Health and Safety Guide is to facilitate the application of these guidelines in national chemical safety programmes. The first three sections of a Health and Safety Guide highlight the relevant technical information in the corresponding EHC. Section 4 includes advice on preventive and protective measures and emergency action; health workers should be thoroughly familiar with the medical information to ensure that they can act efficiently in an emergency. Within the Guide is a Summary of Chemical Safety Information which should be readily available, and should be clearly explained, to all who could come into contact with the chemical. The section on regulatory information has been extracted from the legal file of the International Register of Potentially Toxic Chemicals (IRPTC) and from other United Nations sources.

The target readership includes occupational health services, those in ministries, governmental agencies, industry, and trade unions who are involved in the safe use of chemicals and the avoidance of environmental health hazards, and those wanting more information on this topic. An attempt has been made to use only terms that will be familiar to the intended user. However, sections 1 and 2 inevitably contain some technical terms. A bibliography has been included for readers who require further background information.

Revision of the information in this Guide will take place in due course, and the eventual aim is to use standardized terminology. Comments on any difficulties encountered in using the Guide would be very helpful and should be addressed to:

The Director
International Programme on Chemical Safety
World Health Organization
1211 Geneva 27
Switzerland

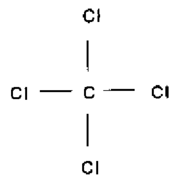
THE INFORMATION IN THIS GUIDE SHOULD BE CONSIDERED AS A STARTING POINT TO A COMPREHENSIVE HEALTH AND SAFETY PROGRAMME

1. PRODUCT IDENTITY AND USES

1.1 Identity

Chemical formula: CCl_4

Chemical structure:



Common name: carbon tetrachloride

Common synonyms: Carbona, carbon chloride, tetrachloromethane, carbon tet, methane tetrachloride, perchloromethane, tetrachlorocarbon

Trade names: Benzinoform, Fasciolin, Freon 10, Halon 104, Tetraform, Tetrafinol

CAS chemical name: tetrachloromethane

CAS registry number: 56-23-5

RTECS registry number: FG 4900000

Conversion factor: 1 ppm = 6.41 mg carbon tetrachloride/m^3 air
1 mg carbon tetrachloride/m^3 air = 0.156 ppm
at 20 °C and 101.3 kPa (760 mmHg).

1.2 Physical and chemical properties

Carbon tetrachloride is a volatile, colourless, clear, heavy liquid with a characteristic sweet, non-irritant odour. The odour threshold in water is 0.52 mg/litre, and in air it is >64.1 mg/m^3 (10 ppm). Carbon tetrachloride is miscible with most aliphatic solvents and it is a solvent itself. The solubility in water is low. It is non-flammable and fairly stable in the presence of air and light. Decomposition of carbon terachloride forms phosgene, carbon dioxide and hydrochloric acid. It reacts explosively with aluminium powder and some other reactive metals, and, in the presence of peroxides or light, with unsaturated compounds.

The most important physical and chemical properties of carbon tetrachloride are presented in the Summary of Chemical Safety Information (section 6).

1.3 Analysis

Several sufficiently sensitive and accurate analytical methods for determining carbon tetrachloride in air, water and biological samples are available. The majority of these methods are based on direct injection into a gas chromatograph or adsorption on activated charcoal, then desorption or evaporation and subsequent gas chromatographic detection. For air and water, detection limits of 0.003 $\mu g/m^3$ and 0.001 μg/litre, respectively, can be achieved.

1.4 Production and uses

Most of the carbon tetrachloride produced is used in the production of chlorofluorocarbons (CFCs) and other chlorinated hydrocarbons. The global production of carbon tetrachloride amounted to 960 000 tonnes in 1987. However, since 1990 the use and consequently the production of carbon tetrachloride has decreased and will continue to decrease in future owing to the gradual phase-out, established by the Montreal Protocol and its amendments, of CFCs and carbon tetrachloride.

Carbon tetrachloride has been mainly manufactured by the chlorination of methane or carbon disulfide.

2. SUMMARY AND EVALUATION

Nearly all carbon tetrachloride released to the environment will ultimately be present in the atmosphere, owing to its volatility. Since the atmospheric residence time of carbon tetrachloride is long, it is widely distributed. During the period 1980–1990, atmospheric levels were around 0.5–1.0 $\mu g/m^3$. Estimates of atmospheric lifetime are variable, but 45–50 years is accepted as the most reasonable value. Carbon tetrachloride contributes both to ozone depletion and to global warming. It is in general resistant to aerobic biodegradation but less so to anaerobic. Acclimation increases biodegradation rates. Although the octanol-water partition coefficient indicates moderate potential for bioaccumulation, short tissue lifetime reduces this tendency.

In water, reports have indicated levels of less than 10 ng/litre in the ocean and generally less than 1 µg/litre in fresh water, but much higher values close to release sites. Levels of up to 60 µg/kg have been recorded in foods processed with carbon tetrachloride, but this practice has now ceased.

The general population is exposed to carbon tetrachloride mainly via air. On the basis of the reported concentrations in ambient air, foodstuffs and drinking-water, a daily carbon tetrachloride intake of around 1 µg/kg body weight has been estimated. This estimate is probably rather high for the present day, because the use of carbon tetrachloride as a fumigant of grain has stopped and the carbon tetrachloride values reported for food and used in the calculation were especially those found in fatty and grain-based foods. Values of 0.1 to 0.27 µg/kg body weight for daily exposure of the general population have been reported elsewhere. Exposure to higher levels of carbon tetrachloride can occur in the workplace as a result of accidental spillage.

Carbon tetrachloride is well absorbed from the gastrointestinal and respiratory tract in animals and humans. Dermal absorption of liquid carbon tetrachloride is possible, but dermal absorption of the vapour is slow.

Carbon tetrachloride is distributed throughout the whole body, with highest concentrations in liver, brain, kidney, muscle, fat and blood. The parent compound is eliminated primarily in exhaled air, while minimal amounts are excreted in the faeces and urine.

The first step in the biotransformation of carbon tetrachloride is catalysed by cytochrome P-450 enzymes, leading to the formation of the reactive trichloromethyl radical. Oxidative biotransformation is the most important pathway in the elimination of the radical, forming the even more reactive trichloromethylperoxyl radical, which can react further to form phosgene. Phosgene may be detoxified by reaction with water to produce carbon dioxide or with glutathione or cysteine. Formation of chloroform and dichlorocarbene occurs under anaerobic conditions.

Covalent binding to macromolecules and lipid peroxidation occur via metabolic intermediates of carbon tetrachloride.

The liver and kidney are target organs for carbon tetrachloride toxicity. The severity of the effects on the liver depends on a number of factors such as species susceptibility, route and mode of exposure, diet or co-exposure to other compounds, in particular ethanol. Furthermore, it appears that pretreatment with various compounds, such as phenobarbital and vitamin A, enhances hepatotoxicity, while other compounds, such as vitamin E, reduce the hepato-toxic action of carbon tetrachloride.

Moderate irritation after dermal application was seen on the skins of rabbits and guinea-pigs, and there was a mild reaction after application into the rabbit eye.

The lowest LD_{50} of 2391 mg/kg body weight (14-day period) was reported in a study on dogs involving intraperitoneal administration. In rats the LD_{50} values ranged from 2821 to 10 054 mg/kg body weight.

In a 12-week oral study on rats (5 days/week), the no-observed-adverse-effect level (NOAEL) was 1 mg/kg body weight. The lowest-observed-adverse-effect level (LOAEL) reported in this study was 10 mg/kg body weight, showing a slight, but significant increase in sorbitol dehydrogenase (SDH) activity and mild hepatic centrilobular vacuolization. A similar NOAEL of 1.2 mg/kg body weight (5 days/ week) was found in a 90-day oral study on mice, with a LOAEL of 12 mg/kg body weight, where hepatotoxicity occurred.

When rats were exposed to carbon tetrachloride by inhalation for approximately 6 months, 5 days/week, 7 h/day, a NOAEL of 32 mg/m^3 was reported. The LOAEL, based on changes in the liver morphology, was reported to be 63 mg/m^3. In another 90-day study on rats, a NOAEL of 6.1

mg/m^3 was found after continuous exposure to carbon tetrachloride. The lowest exposure level of 32 mg/m^3 (the lowest concentration studied) in a 2-year inhalation study on rats caused marginal effects.

The only oral long-term toxicity study available was a 2-year study in rats, which were exposed to 0, 80 or 200 mg carbon tetrachloride/kg feed. Owing to chronic respiratory disease in all animals beginning at 14 months, which resulted in increased mortality, the results reported upon necropsy at 2 years are inadequate for a health risk evaluation.

It was concluded that carbon tetrachloride can induce embryotoxic and embryolethal effects, but only at doses that are maternally toxic, as observed in inhalation studies in rats and mice. Carbon tetrachloride is not teratogenic.

Many genotoxicity assays have been conducted with carbon tetrachloride. On the basis of available data, carbon tetrachloride can be considered as a non-genotoxic compound.

Carbon tetrachloride induces hepatomas and hepatocellular carcinomas in mice and rats. The doses inducing hepatic tumours are higher than those inducing cell toxicity.

In humans, acute symptoms after carbon tetrachloride exposure are independent of the route of intake and are characterized by gastrointestinal and neurological symptoms, such as nausea, vomiting, headache, dizziness, dyspnoea and death. Liver damage appears after 24 h or more. Kidney damage is evident often only 2 to 3 weeks following the poisoning.

Epidemiological studies have not established an association between carbon tetrachloride exposure and increased risk of mortality, neoplasia or liver disease. Some studies have suggested an association with increased risk of non-Hodgkin's lymphoma and, in one study, with mortality and liver cirrhosis. However, not all of these studies pinpointed specific exposure to carbon tetrachloride, and the statistical associations were not strong.

In general carbon tetrachloride appears to be of low toxicity to bacteria, protozoa and algae; the lowest toxic concentration reported was for methanogenic bacteria with an IC_{50} of 6.4 mg/litre. For aquatic invertebrates acute LC_{50} values range from 28 to > 770 mg/litre. In freshwater fish the lowest acute LC_{50} value of 13 mg/litre was found in the golden orfe (*Leuciscus idus melanotus*), and for marine species an LC_{50} value of 50 mg/litre was reported for the dab (*Limanda limanda*). Carbon tetrachloride appears to be more toxic to embryo-larval stages of fish and amphibians than to adults. The common bullfrog (*Rana catesbeiara*) is the most susceptible species, the LC_{50} being 0.92 mg/litre (fertilization to 4 days after hatching).

The available data indicate that hepatic tumours are induced by a non-genotoxic mechanism, and it therefore seems acceptable to develop a tolerable daily intake (TDI) and a tolerable daily concentration in air (TC) for carbon tetrachloride.

On the basis of the study of Bruckner et al. (1986), in which a NOAEL of 1 mg/kg body weight was observed in a 12-week oral study on rats, and incorporating a conversion factor of 5/7 for daily dosing and applying an uncertainty factor of 500 (100 for inter- and intraspecies variation, 10 for duration of the study, and modifying factor 0.5 because it was a bolus study), a TDI of 1.42 µg/kg body weight is obtained.

On the basis of a 90-day inhalation study on rats (Prendergast et al., 1967), in which a NOAEL of 6.1 mg/m^3 was reported, a TC of 6.1 µg/m^3 was calculated using the factors 7/24 and 5/7 to convert to continuous exposure and an uncertainty factor of 1000 (100 for inter- and intraspecies variation and 10 for the duration of the study). This TC corresponds to a TDI of 0.85 µg/kg body weight.

Comparing the estimated upper limit of prevailing human daily intake of 0.2 µg/kg body weight with the lowest TDI value (0.85 µg/kg body weight), the conclusion can be drawn that the currently prevailing exposure of the general population to carbon tetrachloride from all sources is unlikely to cause excessive intake of the chemical.

In general, the risk to aquatic organisms from carbon tetrachloride is low. However, it may present a risk to embryo-larval stages at, or near, sites of industrial discharges or spills.

3. CONCLUSIONS

The general population is generally exposed to only low levels of carbon tetrachloride via air, drinking-water and food (total daily uptake is estimated to be 0.2 μg/kg body weight; see chapter 2).

Carbon tetrachloride can induce embryotoxic and embryolethal effects at maternally toxic doses, but it is not teratogenic. The liver is the target organ for carbon-tetrachloride-induced toxicity. Carbon tetrachloride can produce hepatic tumours at dose levels that are higher than those producing toxic effects in the liver. The weight of evidence indicates that carbon tetrachloride has no genotoxic properties. On the basis of this fact and the fact that the induced hepatoxicity appears to be of major importance for its carcinogenicity, carbon tetrachloride can be considered as a compound with carcinogenic properties. A tolerable daily intake (TDI) of 0.85 μg/kg body weight and a tolerable daily concentration (TC) in air of 6.1 $\mu g/m^3$ have been derived.

Because carbon tetrachloride does not remain in water, due to its high volatility and low solubility, it is likely that it will present a risk only to the embryo-larval stages of some sensitive amphibians at times of industrial discharges or spills.

4. HUMAN HEALTH HAZARDS, PREVENTION AND PROTECTION, EMERGENCY RESPONSE

4.1 Human health hazards, prevention and protection, first aid

The human health hazards associated with exposure to carbon tetrachloride, together with preventive and protective measures, and first-aid recommendations, are listed in the Summary of Chemical Safety Information in section 6.

4.2 Advice to physicians

If carbon tetrachloride has been ingested, vomiting should not be induced. The patient should drink water to delay absorption, but not oil or milk. If the patient has been exposed to carbon tetrachloride vapour he should immediately be moved to fresh air (or given artificial respiration) and kept under observation. Special attention must be paid to the use of alcoholic beverages in combination with exposure to carbon tetrachloride, because the toxic effects are enhanced by ingestion of alcohol.

4.3 Health surveillance advice

Workers frequently exposed to carbon tetrachloride should be examined periodically and appropriate measures should be taken. Replacement and periodic examinations should include appropriate tests for liver and kidney functions, and special attention should be given to any history of alcoholism. In all cases of accidental exposure a medical practitioner should be immediately consulted.

4.4 Explosion and fire hazards, prevention

4.4.1 *Explosion and fire hazards*

Carbon tetrachloride vapour is invisible, heavier than air and spreads along the ground. Carbon tetrachloride is non-flammable, but it can generate phosgene and similar toxic gases when heated to high temperatures or when involved in a fire. Carbon tetrachloride reacts explosively when mixed with unsaturated compounds in the presence of peroxides or light.

Carbon tetrachloride reacts vigorously or explosively with chemically active metals (lithium, potassium, barium, aluminium, magnesium, zinc and uranium) or fluorine. Violent reactions occur between carbon tetrachloride and *N,N*-dimethylacetamide or *N,N*-dimethylformamide in the presence of iron. Explosions have been reported with carbon tetrachloride and aluminium alkyls, boranes and carbaboranes, calcium disilicide, calcium hypochlorite, chlorine trifluoride, allyl alcohol, ethylene, liquid oxygen, nitrogen dioxide and silanes.

4.4.2 *Prevention*

If large closed containers with carbon tetrachloride are exposed to heat or fire, they must be kept cool by spraying with water.

Work with carbon tetrachloride should be carried out with adequate ventilation. Breathing the vapour and skin contact should be avoided. Chemical protective clothing, masks and gloves made from materials that provide a high degree of permeation resistance and eye protection should be used. Note that rubber is not a suitable protective material since carbon tetrachloride migrates through it.

4.5 Storage

Carbon tetrachloride should be stored in labelled, airtight containers in a well-ventilated place protected from light and at a temperature below 30 °C. It must be stored separated from chemically active metals.

4.6 Transport

In case of accident, stop the engine. Notify police and fire brigade immediately, keep public away from danger area, mark roads and warn other road users. Do not smoke, do not use naked lights and keep upwind.

In case of spillage or fire, the advice given in sections 4.8 and 4.4, respectively, should be followed.

In case of poisoning, the advice in the Summary of Chemical Safety Information should be followed.

4.7 Disposal

Small quantities of carbon tetrachloride may be disposed of by evaporation in a fume cupboard or in a safe, open area. Incineration is not recommended due to the non-flammability of carbon tetrachloride and to the formation of phosgene, hydrogen chloride and other toxic gases on heating.

4.8 Spillage

In case of spillage of carbon tetrachloride, ensure personel protection (protective clothing, safety goggles, rubber gloves and respiratory protective device) and carefully shut off leaks. Adsorb the spilt carbon tetrachloride in earth, sand or inert absorbent and remove to a safe place. Prevent liquid from entering sewers, basements and workpits because the vapour may create a toxic atmosphere.

If carbon tetrachloride has entered a water course or sewer or if it has contaminated soil or vegetation, the police should be warned.

5. HAZARDS FOR THE ENVIRONMENT AND THEIR PREVENTION

In view of the toxicity of carbon tetrachloride for embryo-larval stages of some aquatic organisms, it may present a hazard to these organisms at, or near, sites of industrial discharges or spills.

Contamination of the environment can be minimized by proper methods of storage, handling, transport and protection.

In case of spillage, the methods recommended in section 4.8 should be used.

6. SUMMARY OF CHEMICAL SAFETY INFORMATION

This summary should be easily available to all health workers concerned with, and users of, carbon tetrachloride. It should be displayed at, or near, entrances to areas where there is potential exposure to carbon tetrachloride, and on processing equipment and containers. The summary should be translated into the appropriate language(s). All persons potentially exposed to the chemical should also have the instructions in the summary clearly explained.

SUMMARY OF CHEMICAL SAFETY INFORMATION

Carbon tetrachloride
CCl_4; CAS Registry No. 56-23-5

PHYSICAL PROPERTIES		OTHER CHARACTERISTICS
Melting point (°C)	-22.92	Carbon tetrachloride is a clear, volatile, colourless, heavy liquid, with a characteristic sweet, non-irritant odour. Although non-flammable, it decomposes in fire or in heat, giving off toxic fumes (phosgene and hydrochloric acid). Owing to its low conductivity, vapour electrostatic charges may be generated through flow, movement etc. It reacts violently with chemically active metals (such as aluminium, magnesium, sodium, lithium, potassium, iron, zinc). It reacts explosively when mixed with unsaturated compounds in the presence of peroxides or light.
Boiling point (°C)	76.72	
Relative molecular mass	153.8	
Density (20 °C)	1.59 g/ml	
Ignition temperature (°C)	>1000	
Water solubility (25 °C)	785 mg/litre	
Vapour pressure (0 °C)	4.4 kPa	
Vapour pressure (20 °C)	12.2 kPa	
Vapour density (101.3 kPa; 0 °C)	5.3 kg/m^3	
n-octanol-water partition coefficient (log P_{ow})	2.64	
Henry's law constant (24.8°C)	365 kJ/mole	
Flash point (°C)	none	
Explosive limits	none	

HAZARDS/SYMPTOMS	PREVENTION AND PROTECTION	FIRST AID
SKIN: redness, pain, blisters; may be absorbed	Protective gloves and clothing	Remove contaminated clothing and wash skin with plenty of water; obtain medical attention
EYES: redness, pain	Safety goggles or face shield in combination with breathing protection (organic filter)	Wash the eyes with plenty of water or neutral saline solution for several minutes (remove contact lenses if possible) or blow out with an air stream; obtain medical attention

SUMMARY OF CHEMICAL SAFETY INFORMATION		
INHALATION: dizziness, drowsiness, headache, nausea, unconsciousness	Apply ventilation, use in an exhaust hood or use personal breathing protection (organic filter)	Remove victim to fresh air, apply artificial respiration if indicated; obtain medical attention or move if necessary to hospital
INGESTION: abdominal pain, diarrhoea, dizziness, drowsiness, nausea, vomiting, unconsciousness	Do not eat, drink, chew or smoke during work; do not keep food in areas with potential exposure; keep out of reach of children	Rinse mouth; do not induce vomiting, let victim drink water and refer for medical attention
ENVIRONMENT: may present a hazard to embryo-larval stages of some aquatic organisms at discharges or spills	Minimize contamination of water, soil and atmosphere by proper methods of storage, handling, transport and waste disposal	
SPILLAGE	STORAGE	FIRE AND EXPLOSION
Ensure personal protection; shut off leaks if without risk; collect leaking liquid in closed containers; absorb spilt carbon tetrachloride in earth, sand or inert absorbent and remove to a safe place; prevent entry into a sewer	Store separately from chemically active metals in a cool place; do not store in aluminium containers; ventilate along the floor	CCl_4 is not combustible, but gives off irritating toxic fumes in a fire. All types of extinguishing agents can be used when there is a fire in the direct environment; in case of fire, keep containers cool by spraying with water
WASTE DISPOSAL	**NATIONAL INFORMATION**	
Incineration is not recommended due to non-flammability and formation of phosgene, hydrogen chloride and other toxic gases on heating	National occupational exposure limit: National Poison Control Centre:	

7. CURRENT REGULATIONS, GUIDELINES AND STANDARDS

The information in this section has been extracted from the International Register of Potentially Toxic Chemicals (IRPTC) legal file. Its intention is to give the reader an overview of current regulations, guidelines and standards.

Regulatory decisions about chemicals, taken in a certain country, can only be fully understood within the framework of the legislation of that country. Furthermore, the regulations and guidelines of all countries are subject to change and should always be verified with the appropriate regulatory authorities before application.

7.1 Exposure limit values

Some exposure limit values are given in the table. When no effective date appears in the IRPTC legal file, the year of the reference from which the data are taken is indicated by (r).

7.2 Specific restrictions/requirements

7.2.1 *USA*

In the USA carbon tetrachloride and any mixture containing it is banned as a hazardous product because it posesses such a degree of hazard that adequate cautionary labelling cannot be written and public health can only be served by keeping it out of interstate commerce. This does not apply to unavoidable manufacturing residues in other chemicals if any reasonable use does not result in atmospheric concentrations of more than 63 mg/m^3 (reference date, 1982).

7.2.2 *Canada*

In Canada it is illegal to sell, advertise or import products that consist of or contain carbon tetrachloride where it is packaged as a consumer product (effective date, 1971).

CURRENT REGULATIONS, GUIDELINES AND STANDARDS

Exposure limit values

Medium	Specification	Country/organization	Exposure limit description	Value	Effective date
AIR	Occupational	Australia	Threshold limit value (TLV)		1983 (r)
			- Time-weighted average (TWA)	30 mg/m^3	
			- Short-term exposure limit (STEL)	125 mg/m^3	
		Belgium	Threshold limit value (TLV)		1984 (r)
			- Time-weighted average (TWA)	30 mg/m^3	
		Canada	Threshold limit value (TLV)		1980
			- Time-weighted average (TWA)	30 mg/m^3	
		Finland	Maximum permissible concentration		1982 (r)
			- Time-weighted average (TWA)	33 mg/m^3	
			- Short-term exposure limit (STEL) (15 min)	66 mg/m^3	
		Germany	Maximum acceptable concentration		1987 (r)
			- Short-term exposure limit (STEL)	20 mg/m^3	
		Hungary	Maximum limit	10 mg/m^3	1988
		Italy	Threshold limit value (TLV)	65 mg/m^3	1978 (r)
		Japan	- Threshold limit value (TLV) (Skin adsorption)	31 mg/m^3	1991
		The Netherlands	Maximum limit (MXL)		1986 (r)
			- Time-weighted average (TWA)	12.6 mg/m^3	

CURRENT REGULATIONS, GUIDELINES AND STANDARDS

Poland	Maximum permissible concentration		1982 (r)
	- Time-weighted average (TWA)	20 mg/m^3	
	- Short-term exposure limit (30 min TWA)	100 mg/m^3	
Romania	Maximum permissible concentration		1975 (r)
	- Time-weighted average (TWA)	50 mg/m^3	
	- Ceiling limit value (CLV)	100 mg/m^3	
Russia	Time-weighted average (TWA)	20 mg/m^3	1988
Sweden	Hygienic limit value (HLV)		1988
	- Time-weighted average (TWA)	13 mg/m^3	
	- Short-term exposure limit (STEL) (15-min TWA)	19 mg/m^3	
Switzerland	Maximum acceptable concentration		1987 (r)
	- Time-weighted average (TWA)	30 mg/m^3	
United Kingdom	Time-weighted average (TWA)	65 mg/m^3	1987 (r)
	- Short-term exposure limit (STEL) (10-min TWA)	130 mg/m^3	
USA/ACGIH	Threshold limit value (TLV)		1987 (r)
	- Time-weighted average (TWA)	31 mg/m^3	
	- Short-term exposure limit (STEL)	63 mg/m^3	
USA	Permissible exposure limit (PEL)		1974
	- Time-weighted average (TWA)	63 mg/m^3	
	- Ceiling limit value (CLV)	160 mg/m^3	

7.2.3 *EEC*

a) In case of exposure to carbon tetrachloride, Member States shall, in addition to other general measures, ensure: 1) medical surveillance of workers prior to and/or during exposure; 2) access for workers to their individual and anonymus collective results. The general measures are in order to keep exposure as low as reasonably practicable (effective date, 1983).

b) Carbon tetrachloride must not form part of the composition of cosmetic products. The marketing of cosmetic products containing the substance is prohibited (effective date, 1988).

c) Carbon tetrachloride may not be used in ornamental objects intended to produce light or colour effects by means of different phases, for example in ornamental lamps and ashtrays (effective date, 1987)

7.3 Labelling, packaging and transport

7.3.1 *USA*

In the USA it is permitted to use carbon tetrachloride as a component of adhesives in articles intended for use in packaging, transporting or holding food (reference date, 1981).

7.3.2 *EEC*

Carbon tetrachloride is considered to be a harmful substance. Member States shall ensure that dangerous preparations (solvents) are not placed on the market unless their packages and fastenings and labels comply with the EEC requirements (effective date, 1984).

7.3.3 *United Kingdom*

Labelling of road tankers: toxic substance (emergency action code, 2Z) (effective date, 1979).

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