FOREWORD INTRODUCTION

1,1',2-TRICHLOROETHANE

CAS N°: 79-00-5

COVER PAGE
SIDS Initial Assessment Report
for
10th SIAM
(Tokyo, March 15 – 17, 2000)

Chemical Name: 1,1,2-Trichloroethane,
CAS No: 79-00-5
Sponsor Country: Japan

National SIDS Contact Point in Sponsor Country: Mr. Kazuhide Ishikawa
Ministry of Foreign Affairs, Japan

HISTORY:

SIDS Testing Plan were reviewed in SIDS Review Process, where the following SIDS Testing Plan was agreed:

no testing	(X)
testing	( )

Conclusions and Recommendations on Environment were agreed and a part of Human Health was discussed at SIAM 8 and SIAM 9.

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(To all National SIDS Contact Points and the OECD Secretariat)

SIDS INITIAL ASSESSMENT PROFILE

CAS NO.	79-00-5
CHEMICAL NAME	1,1,2-Trichloroethane
STRUCTURAL FORMULA	$Cl_2CH\text{-}CH_2Cl$

RECOMMENDATION

The chemical is candidate for further work.

SUMMARY CONCLUSIONS OF THE SIAR

Human Health Hazards

The acute toxicity (LD_{50}) of 1,1,2-trichloroethane is 837 mg/kg by oral administration in rats, 9 g/m^3 /6 hr by inhalation in rats and 5.38 g/kg by dermal administration in rabbits. This chemical is considered as irritating to the skin, eyes, upper respiratory tract and stomach. There is no available information on skin sensitisation. In a 90 days drinking water study of mice at the concentration of 0, 20, 200, or 2,000 mg/l, reduction of P-450 contents in the liver were observed and the NOEL was considered as 3.9 mg/kg/day. Repeated inhalation exposure (7 hours/day, 5 days/week) to 83 mg/m^3 air for 6 months did not lead to any chemical-related changes in the rat, guinea pig and rabbit. The daily intake is equivalent to roughly 11 mg/kg/day in rat, 7.4 mg/kg/day in guinea pig, and 25 mg/kg/day in rabbit. In a developmental toxicity study, the chemical was administered by gavage to mice on days 8 through 12 of gestation at dose of only 350 mg/kg/day. No changes including teratogenicity and embryo/fetal viability, and/or postnatal growth and viability were observed. Therefore, NOEL for developmental toxicity was considered to be 350 mg/kg/day. In humans, this chemical was reported to act as a narcotic in low concentration, and irritate the conjunctiva, the mucosa of the respiratory tract and the external skin. Moreover, gastrointestinal tract complaints, fatty degeneration of the kidneys and lung damage by prolonged exposure were reported.

Carcinogenicity study of this chemical by gavage showed hepatocellular carcinomas and pheochromocytomas in mice but no carcinogenicity in rats. Initiation/promotion screening studies on male rat liver demonstrated that this chemical has neither initiation nor promotion activity. A carcinogenicity study in skin of rats given 0, 2.05 or 6.24 mg by subcutaneous injection once a week for two years indicated no chemical related changes.

Bacterial mutagenicity study showed negative results in all strains of *Salmonella typhimurium* TA1535, TA1537, TA1538, TA98, TA100 with and without metabolic activation. Unscheduled DNA synthesis was not observed in livers of treated mice. On the other hand, mutation study in *Saccharomyces serevisiae* and *in vitro* micronucleus test of human lymphocytes showed positive. Although the above core genotoxicity studies demonstrate negative results, the genotoxicity of this chemical is inconclusive because of some positive results in non-core *in vitro* studies.

Hazards to the Environment

1,1,2-Trichloroethane is a stable liquid and is classified as a not readily biodegradable chemical (OECD TG 301C). Bioconcentration factors range from 0.7 – 4.0 (OECD TG 305C).

As the lowest acute toxicity data to each of algae, zooplankton and fish, 96 h-EC50 of *Phaeodactylum tricornutum* (60 mg/l), 48 h EC50 of *Daphnia magna* (18 mg/l) and 7 d LC50 of *Poecilia reticulata* (40 mg/l) were selected, respectively. As the lowest chronic toxicity data to algae, zooplankton and fish, 72 h NOEC (growth) of *Selenastrum capricornutum* (51.4 mg/l), 21d NOEC (reproduction) of *Daphnia magna* (32 mg/l) and 56d NOEC (mortality in early life stage) of *Pleuronectes platessa* (3.0 mg/l) were adopted, respectively. Assessment factor of 10 was used together with chronic toxicity data to determine the PNEC of 0.3 mg/l.

Exposure

The production volume of this chemical was ca. 153,000 tonnes/year in 1996 in Japan. This chemical is used as an intermediate for vinylidene chloride and is not included in consumer products in the Sponsor county. The potential environmental distribution of 1,1,2-trichloroethane obtained from a generic fugacity model (Mackey level III) showed this chemical would be distributed mainly to air and water. The main route of human exposure is inhalation with a limited number of workers potentially exposed during sampling, subsequent analysis, tank filling and maintenance operations.

NATURE OF FURTHER WORK RECOMMENDED

An *in vivo* genotoxicity study such as an *in vivo* micronucleus test is recommended because some non-core genotoxicity studies indicate positive results.

FULL SIDS SUMMARY

CAS NO: 79-00-5		SPECIES	PROTOCOL	RESULTS
PHYSICAL-CHEMICAL				
2.1	Melting Point			-35.5°C
2.2	Boiling Point			113.7 °C
2.3	Density			
2.4	Vapour Pressure		unknown	1.0 x 10^4 Pa at 50°C
2.5	Partition Coefficient (Log Pow)		OECD TG 107	2.05 at 25°C
2.6 A.	Water Solubility			3.5 g/L at 25°C
B.	pH			
	pKa			No Ionizable Functional Group
2.12	Oxidation: Reduction Potential			
ENVIRONMENTAL FATE AND PATHWAY				
3.1.1	Photodegradation			
3.1.2	Stability in Water			Stable at pH 4 and 7 at 25 °C 85.0 days at pH 9 at 25 °C
3.2	Monitoring Data			In surface water :ND In sediment : ND In biota : ND
3.3	Transport and Distribution			
3.5	Biodegradation		OECD TG 301C	Not readily biodegradable
3.7	Bioaccumulation	Carp	OECD TG 305C	BCF 0.7 – 2.6 at 0.3 m/L 2.9 – 4.0 at 0.03 mg/L
ECOTOXICOLOGY				
4.1	Acute/Prolonged Toxicity to Fish	*Poecilia reculata*	Other (TNO, 1980)	LC_{50}(7d)= 40 mg/l
		Pleuronectes platessa	Other (TNO, 1980)	NOEC (56d)=3.0 mg/l
4.2	Acute Toxicity to Aquatic Invertebrates *Daphnia*	*Daphnia magna*	OECD TG 202	EC_{50}(48hr)= 64mg/l
4.3	Toxicity to Aquatic Plants e.g. Algae	*Phaeodactylum tricornutum*	Other (TNO,1980)	EC_{50}(96hr)= 60 mg/l
		Selenastrumcapricornutum	OECD TG 201	NOEC (72hr)= 51.4 mg/l
4.5.2	Chronic Toxicity to Aquatic Invertebrates (*Daphnia*)	*Daphnia magna*	USEPA	LC50 (48hr)= 18 mg/l
			OECD TG 202	EC_{50}(21d, Repro)=43 mg/l NOEC= 32 mg/l
4.6.1	Toxicity to Soil Dwelling Organisms			
4.6.2	Toxicity to Terrestrial Plants			

CAS NO: 79-00-5		SPECIES	PROTOCOL	RESULTS
4.6.3	Toxicity to Other Non-Mammalian Terrestrial Species (Including Birds)	*Eisenia foetida*	Unknown	LC_{50}(48hr)=0.035-0.049mg/cm^2
TOXICOLOGY				
5.1.1	Acute Oral Toxicity	Rat	Other (unknown)	LD_{50} = 837 mg/kg
5.1.2	Acute Inhalation Toxicity	Rat	Other (unknown)	LC_{50} = 9 g/m^3/6 hr
5.1.3	Acute Dermal Toxicity	Rabbit	Other (unknown)	LD_{50} = 5.38 g/kg
5.2.1	Skin Irritation/Corrosion	Rabbit	Other (unknown)	Slightly irritation
5.2.2	Eye Irritation/Corrosion	Rabbit	Other (unknown)	Slightly irritation
5.4	Repeated Dose Toxicity	Mouse	Other (unknown)	NOEL = 3.9 mg/kg/day
5.5	Genetic Toxicity In Vitro			
A.	Bacterial Test (Gene mutation)	*S. typhimurium*	Other (unknown)	- (With metabolic activation) - (Without metabolic activation)
B.	Non-Bacterial In Vitro Test (Micronucleus test)			
	(Comet assay)	Human lymphocyte	Other (unknown)	+ (With metabolic activation) + (Without metabolic activation)
		Human lymphocyte	Other (unknown)	+ (With metabolic activation) + (Without metabolic activation)
5.6	Genetic Toxicity In Vivo			
	(unscheduled DNA assay)	Mouse	Other (unknown)	-
	(Strong S-phase assay)	Mouse	Other (unknown)	+
5.7	Carcinogenicity	Rat	Other (oral)	Not carcinogenic
		Mouse	Other (oral)	Carcinogenic in liver and adrenals
5.8	Toxicity to Reproduction			No data
5.9	Developmental Toxicity/ Teratogenicity	Mouse	Other (unknown)	NOEL = 350 mg/kg/day
5.11	Experience with Human Exposure		Other	No information on toxic effects

[Note] Data beyond SIDS requirements can be added if the items are relevant to the assessment of the chemical, e.g. corrosiveness/irritation, carcinogenicity.

SIDS INITIAL ASSESSMENT REPORT

1,1,2-Trichloroethane (**CAS No. 79-00-5**)

1. IDENTITY

- OECD Name: Ethane, 1,1,2-trichloro-
- Synonym: beta-Trichloroethane; 1,2,2-Trichloroethane; Ethane trichloride
- CAS Number: 79-00-5
- Empirical Formula: $C_2H_3Cl_3$
- Structural Formula: $Cl_2CH\text{-}CH_2Cl$
- Degree of Purity: > 96 %
- Major Impurity: Ethylene dichloride, Tetrachloroethane, Trichloroethylene, Perchloroethylene
- Essential Additives: None
- Physical-chemical properties
  - Melting Point: -35.5 °C
  - Vapour pressure: 1.0 x 10^4 °C at 50 °C
  - Water solubility: ca. 3.5 g/l
  - Log Pow: 2.05

2. GENERAL INFORMATION ON EXPOSURE

2.1 Production and import

153,321 tonnes/year in 1996 in Japan
Six producers of this chemical are known.

2.2 Use pattern

Intermediate in closed system.
Intermediate for vinylidene chloride.

2.3 Other information

1 ppm equals to 5.45 mg/m^3 at 25 degree.

3. ENVIRONMENT

3.1 Environmental Exposure

3.1.1 General Discussion

1,1,2-Trichloroethane is not readily biodegradable (OECD 301C: 5% after 28d). 1,1,2-trichloroethane is hydrolyzed at alkaline condition. Direct photodegradation is not expected because 1,1,2-trichloroethane has not absorption band in UV and visual region.

1,1,2-Trichloroethane is low bioaccumulative based on Log Pow (2.05 at 25 °C).

The potential environmental distribution of 1,1,2-trichloroethane obtained from a generic Mackay level III fugacity model is shown in Table 1. Parameters used for this model are shown as Annex to this report. The results show that, if 1,1,2-trichloroethane is released into air, it is unlikely to be distributed into other compartment. If 1,1,2-trichloroethane is released into water or soil, it is likely to be transported to air.

Table 1
Environmental distribution of 1,1,2-trichloroethane
Using a generic level III fugacity model.

Compartment	Release 100% to air	Release 100% to water	Release 100% to soil
Air	98.7 %	31.3 %	37.0 %
Water	1.0 %	68.1 %	1.4 %
Soil	0.3 %	0.1 %	61.5 %
Sediment	0.0 %	0.6 %	0.0 %

As this chemical is used in closed system as an intermediate and is not included in consumer products, its release to the environment may occur only from the production cite.

3.1.2 Predicted Environmental Concentration

As 1,1,2-trichloroethane is produced under the well controlled closed system, amount of release to air phase is negligibly small. The waste of 1,1,2-trichloroethane from the production system is released to water phase after treated its own wastewater treatment plant. Therefore, Predicted Environmental Concentration (PEC) will be calculated only for the water environment.

Local exposure

a) According to report from a Japanese manufacturer (A), 1 kg/year (measured) of 1,1,2-trichloroethane are released with 1.8×10^9 L/year of effluent into bay. Local Predicted Environmental Concentration (PEC_{local}) is calculated to be 1.0×10^{-7} mg/L, employing the following calculation model and dilution factor of 5,500.(See Appendix 1)

$$\frac{\text{Amount of release } (1 \times 10^6 \text{ mg/y})}{\text{Volume of effluent } (1.8 \times 10^9 \text{ L/y}) \times \text{Dilution Factor } (5{,}500)}$$

b) According to report from a Japanese manufacturer (B), 21 kg/year (measured) of 1,1,2-trichloroethane are released with 0.8×10^9 L/year of effluent into bay. Local Predicted Environmental Concentration (PEC_{local}) is calculated to be 2.2×10^{-6} mg/L, employing the following calculation model and dilution factor of 12,000. (See Appendix 1)

$$\frac{\text{Amount of release } (21 \times 10^6 \text{ mg/y})}{\text{Volume of effluent } (0.8 \times 10^9 \text{ L/y}) \times \text{Dilution Factor } (12{,}000)}$$

c) According to report from a Japanese manufacturer (C), 70 kg/year (measured) of 1,1,2-trichloroethane are released with 2.3×10^{10} L/year of effluent into river whose flow rate is 7.6×10^{10} L/year. Local Predicted Environmental Concentration (PEC_{local}) is calculated to be 1.3×10^{-3} mg/L, employing the following calculation model and dilution factor of 2.3.(See Appendix 1)

$$\frac{\text{Amount of release } (70 \times 10^6 \text{ mg/y})}{\text{Volume of effluent } (2.3 \times 10^{10} \text{ L/y}) \times \text{Dilution Factor } (2.3)}$$

d) According to report from a Japanese manufacturer (D), 170 kg/year (measured) of 1,1,2-trichloroethane are released with 5.9×10^9 L/year of effluent into river whose flow rate is 3.3×10^9 L/year. Local Predicted Environmental Concentration (PEC_{local}) is calculated to be 1.3×10^{-2} mg/L, employing the following calculation model and dilution factor of 23. (See Appendix 1)

$$\frac{\text{Amount of release } (170 \times 10^6 \text{ mg/y})}{\text{Volume of effluent } (5.9 \times 10^9 \text{ L/y}) \times \text{Dilution Factor } (1.2)}$$

3.2 Effects on the Environments

3.2.1 Effects on aquatic organisms

Acute and chronic toxicity data of 1,1,2-Trichloroethane to aquatic organisms are summarized in Table 1.

As the lowest acute toxicity data to each of algae, zooplankton and fish, 96 h EC50 of *Phaeodactylum tricornutum* (60 mg/l), 48 h LC50 of *Daphnia magna* (18 mg/l) and 7 d LC50 of *Poecilia reticulata* (40 mg/l) were selected, respectively. As the lowest chronic toxicity data to each of algae, zooplankton and fish, 72 h NOEC (growth) of *Selenastrum capricornutum* (51.4 mg/l), 21d NOEC (reproduction) of *Daphnia magna* (32 mg/l) and 56 d NOEC (mortality) of *Pleuronectes platessa* (3.0 mg/l) were selected, respectively.

An assessment factor of 10 was chosen and applied to the lowest chronic toxicity data (56 d NOEC of *P. platessa*; 3.0 mg/l) to determine PNEC, because chronic data for three trophic levels were available, according to the OECD Provisional Guidance for Initial Assessment of Aquatic Effects (EXCH/MANUAL/96-4-5.DOC/May 1996). Thus, PNEC of 1,1,2-trichloroethane is 0.3 mg/l.

Table 1
Acute and chronic toxicity data of 1,1,2-trichloroethane to aquatic organisms at different trophic levels.

Species	Endpoint	Conc. (mg/l)	Remarks
Selenastrum capricornutum (green algae)	Gro 72 h EC50	144.6	a, 1)
	Gro 72 h NOEC	51.4	c, 1), C)
Chlorella pyrenoidosa (green algae)	Gro 96 h EC50	170	a, 2)
Phaeodactylum tricornutum (diatom)	Gro 96 h EC50	60	a, 2), A)
Scenedesmus subspicatus (green algae)	Gro 96 h EC50	167	a, 3)
Artemia salina (Brine shrimp)	Mor 7 d LC50	36	a, 2)
Crangon crangon (shrimp)	Mor 7 d LC50	42	a, 2)
Daphnia magna (Water flea)	Imm 24 h EC50	75	a, 1)
	Mor 24 h LC50	19	a, 4)
	Imm 48 h EC50	64	c, 1)
	Mor 48 h LC50	18	a, 4), A
	Rep 21 d NOEC	32	a, 1), C

Oryzias latipes (fish, Medaka)	Mor 1 d LC50 Mor 2 d LC50 Mor 3 d LC50 Mor 4 d LC50	95 95 95 95	a, 1) a, 1) a, 1) a, 1)
Poecilia reticulata (Guppy)	Mor 1 d LC50 Mor 7 d LC50	43 40	a, 2) a, 2), A
Pleuronectes platessa (sand dab) (egg to larva)	Mor 56 d LC50 Mor 56 d NOEC	5.5 3.0	c, 2) c, 2), C

Notes: Gro; growth, Mor; mortality, Imm; immobilization, Rep; reproduction,

No. 1-5), reference number, A), C); selected as the lowest value respectively among the acute or chronic toxicity data of algae, cladocera (water flea) and fishes to determine PNEC of 1.1.2-trichloroethane.

Reference; 1) Environment Agency of Japan (1995), 2) Adema, D.M.M. and Vink, G.J. (1981), 3) Behechti, A., Ballhorn, L., abd Kettrup, A. (1995), 4) LeBlanc, G.A. (1980),

3.2.2 Terrestrial effects

Eisenia foetida (Worm, Annelida) 48 h-LC50 0.035- 0.049 mg/cm^2 (of filter paper) (Neuhauser et al., (1985) The toxicity of selected chemicals to the earthworm *Eisenia foetida*. J. Environ. Qual., 14 (3), 383-388.)

3.2.3 Other effects

No data are available

3.3 Initial Assessment for the Environment

1,1,2-trichloroethane is not readily biodegradable and relatively stable in aquatic environment, but its potential for bioaccumulation is low. The lowest acute and chronic toxicity values were 18 mg/l (48 h EC50 of *Daphnia magna*) and 3.0 mg/l (56 d NOEC of *Pleuronectes platessa*), respectively.

PNEC of this chemical for aquatic organisms was calculated as 0.3 mg/l. The highest PEC, calculated from a Japanese local exposure scenario (manufacturer D) is 2.4 x 10^{-2} mg/l. Thus,

$$PEC_{local} / PNEC = 2.4 \times 10^{-2} / 0.3 = 0.08 < 1$$

4. HUMAN HEALTH

4.1 Human Exposure

4.1.1 Occupational exposure

1,1,2-Trichloroethane is produced in closed systems and used as a solvent. The occupational exposures are expected through inhalation and dermal route. The atmospheric concentration was measured at a production site. The average concentrations, working schedules and EHEs for each operation are shown in the Table. Dermal exposure is also calculated, based on EASE model. The duration of dermal exposure is assumed to be 5 minutes. If a single worker (body weight; 70 kg,

respiratory volume; 1.25 m^3/hr) is assigned to implement all daily operation without protection, the highest daily intake (combined EHE) is calculated as 0.67 mg/kg/day as the worst case. Practically, workers always wear protective gloves and respiratory protective equipment (mask) during the operation.

	Frequency Times/day	Duration hr	Working hr/day	Average Concentration mg/m^3	Average EHE mg/kg/day	Combined EHE mg/kg/day
Lorry Filling	330/365	0.5	0.45	2.73	0.022	
Sampling	12	1/30	0.40	24.00	0.171	
Analysis	12	1/6	2.00	11.46	0.409	
Maintenance	1	1/4	0.01	37.64	0.006	
Dermal			0.08	1 *	0.063	0.67

* dermal exposure; mg/cm^2/day

EHE: Estimated Human Exposure

4.1.2 Consumer exposure

1,1,2-Trichloroethane is not used for consumer products in Sponsor country.

4.1.3 Indirect exposure via the environment

As 1,1,2-trichloroethane is persistent, and not bioaccumulative, the exposure to the general population via the environment would be possible through drinking water processed from surface water and through fish which may accumulate this chemical. The concentration in drinking water should be estimated to be equal to the highest predicted environmental concentration of 1.30×10^{-3} mg/l, as the worst case. The daily intake through drinking water is calculated as 4.33×10^{-5} mg/kg/day (2 l/day, 60 kg b.w.).

Using the maximum bioconcentration factor of 4.0 obtained by tests, the concentration of this chemical in fish can be calculated as follows:

$$PEC_{fish} = (1.30 \times 10^{-3} \text{ mg/l}) \times 4.0 = 5.20 \times 10^{-6} \text{ mg/g-wet}$$

As a daily intake of fish in Japan is estimated to be 90 g for 60 kg body weight person, a daily intake of this chemical will be 7.80×10^{-6} mg/kg/day.

4.2 Effects on Human Health

a) Acute toxicity

Oral:

Rats:	LD_{50}: 837 mg/kg [SIDS data]
Mice:	LD_{50}: male 378 mg/kg, female 491mg/kg
Dogs:	LD_{100}: 722 mg/kg
	LD_0: 433 mg/kg

Inhalation:

Rats:	LC_{50}: 9 g/m^3 (1654 ppm)/6 hr [SIDS data]
Mice:	LC_{50}: 2.3 g/m^3 (416 ppm)/6 hr

	LC_0: 4.42 g/m^3 (800 ppm)/3 hr Increase in serum GPT and hepatic triglyceride, and decrease in hepatic ATP and plasma triglycerides were observed.
Dermal:	
Rabbits:	LD_{50}: 5.38 g/kg (3.73 ml/kg) [SIDS data]
Guinea pigs:	LD_{100}: 232 mg/cm^2 (0.5 ml/3.1 cm^2) LD_{25}: 116 mg/cm^2 (0.25 ml/3.1 cm^2)
Intraperitoneal:	
Rats:	LD_{50}: 265 mg/kg At 1/16 of the LD_{50}, significant elevation of sorbitol dehydrogenase appeared.
Guinea pigs:	LD_{100}: 360mg (0.25 ml)/animal

b) Irritation

Three experiments showed that 1,1,2-trichloroethane was mild to severe irritating to the skin. Administration onto the rabbit skin showed mild irritation at 500 mg/24 hr and severe irritation at 810 mg/24 hr.

Eye irritation was investigated in two studies. These reports resulted in mild irritation. Dose levels were 500 mg/24 hr and 162 mg.

In the oral administration of acute toxicity study, gastric irritation was reported with 100 % of the mice at the 500 and 600 mg/kg dose levels (White et al.: 1985). The inhalation study showed that narcotic concentrations of 1,1,2-trichloroethane produced upper respiratory tract irritation (Lazarew: 1929, von Oettingen: 1955).

c) Sensitisation

There are no available data.

d) Repeated toxicity

[SIDS data] 1,1,2-Trichloroethane was given to male and female mice for 90 days in drinking water at the concentration of 0, 20, 200, or 2,000 mg/l (White et al.: 1985), based on the results of 14 days preliminary study. Daily intakes were estimated to be 0, 4.4, 46, and 305 mg/kg/day for males and 0, 3.9, 44, and 384 mg/kg/day for females.

Strongly low body weight gain was observed in males at 2,000 mg/l. In liver, glutathione level decreased significantly in males at 200 and 2,000 mg/l, and cytochrome P-450 contents and aniline hydroxylase activity were reduced in females at 200 and 2,000 mg/l. Increase of alkaline phosphatase activity in serum occurred in both sexes at 2,000 mg/l. Hematocrit and hemoglobin in blood were decreased in females at 2,000 mg/l. NOEL in females was 3.9 mg/kg/day (20 mg/l), based on reduction of cytochrome P-450 levels and aniline hydroxylase activity. In males, NOEL was 4.4 mg/kg/day (20 mg/l), based on reduction of liver glutathione. Unfortunately, histopathological examination was not conducted in this study.

Repeated inhalation exposure (7 hours/day, 5 days/week) to 83 mg of 1,1,2-trichloroethane/m^3 air for 6 months did not lead to substance-related histopathological, hematological and biochemical changes in the rat, guinea pig and rabbit. Body weight gain, organ weights and mortality remained unaffected. Therefore, NOEL was considered to be 83 mg/m^3, equivalent to roughly 11.1

mg/kg/day in the rat, 7.43 mg/kg/day in the guinea pig, and 24.9 mg/kg/day in the rabbit. (Beratergremium fuer umweltrelevante Altstoffe: 1995)

e) Reproductive/Developmental toxicity

[SIDS data] 1,1,2-Trichloroethane was administered by gavage to female mice on days 8 through 12 of gestation at dose of only 350 mg/kg/day with other developmental toxicity screening tests for fifty five chemicals (Seidenberg *et al.*: 1986). Dams were allowed to deliver, and the litter size and weight of pups on the day of birth and 2 days postpartum were recorded. There were no changes on any parameters such as teratogenic activity and embryo/fetal viability, and/or postnatal growth and viability. The NOEL was considered to be 350 mg/kg/day for developmental toxicity.

f) Genetic toxicity

[SIDS data] In vitro reverse mutation study in *Salmonella typhimurium* TA1535, TA1537, TA1538, TA98, TA100 demonstrated negative results with or without metabolic activation (Barber *et al.*: 1981). Unscheduled DNA synthesis was not observed in livers of treated mice (Mirsalis *et al.*: 1989).

On the other hand, positive result was reported in *Saccharomyces cerevisiae* (Bronzetti *et al.*: 1987). There is an indication of an aneuploidy-inducing effect from studies with *Aspergillus nidulans* (Crebelli *et al.*: 1988). This chemical showed positive results in micronucleus test *in vitro* and alkaline single cell gel electrophoresis test (comet assay) of human lymphocyte both with and without metabolic activation (Tafazoli and Krisch-Volders: 1996).

Computer analysis based on the chemical structure suggests the approximate 80 % positive prediction for both sister chromatid exchange and chromosomal aberration (Rosenkranz *et al.*, 1990).

In addition, several mechanistic studies of carcinogenesis were conducted. 1,1,2-Trichloroethane bound to calf thymus DNA *in vitro* (DiRenzo *et al.*: 1982) and to DNA, RNA and proteins of the liver, kidney, lung and stomach after intraperitoneal injection into rats and mice (Mazzullo *et al.*, 1986). The extent of interaction of 1,1,2-trichloroethane with mouse liver DNA was about 2.5 times higher than that with rat liver DNA. A cell transformation assay performed without metabolic activation on mouse BALB/c-3T3 cells resulted in weakly positive (Tu *et al.*: 1985). Strong S-phase induction was observed in livers of treated mice (Mirsalis *et al.*: 1989).

In summary, core genotoxicity studies such as reverse mutation in *Salmonella typhimurium* and unscheduled DNA synthesis *in vivo* demonstrate negative results. However, some uncertainties of genotoxic potential remain because non-core *in vitro* studies indicate positive results.

g) Carcinogenicity

In a bioassay conducted by NCI (1978), 1,1,2-trichloroethane was administered by gavage in corn oil to Osborne-Mendel rats and $B6C3F_1$ mice.

Low-dose and high-dose rats received respectively, 35 and 70 mg/kg b.w./day for 20 weeks, then 50 and 100 mg/kg b.w./day for 58 weeks (Time-weighted average doses: 33 and 66 mg/kg b.w./day). At least 50 % of the male rats in untreated control, low-dose and high-dose groups survived more than 96 weeks and 50 % of the females in the untreated control, low-dose and high-dose groups survived more than 105 weeks. Vehicle control groups had unexpectedly poor survival, with only 5 % (1/20) of males and 20 % (4/20) of females still alive at the end of the study. The authors did not,

therefore, include them in statistical comparisons. No statistically significant increase in tumour incidence was found, either in males or in female rats.

Low-dose and high-dose mice received 150 and 300 mg/kg b.w./day, respectively for eight weeks and then 200 and 400mg/kg b.w./day for 70 weeks (Time-weighted average doses: 139 and 278 mg/kg b.w./day). At least 50 % of the male mice in each group were alive at week 86. 50 % of the female mice were still alive after 90, 89, 58 and 81 weeks in the untreated control, vehicle control, low-dose and high-dose groups, respectively. The incidence of hepatocellular neoplasms [reported as carcinomas] was increased significantly ($p < 0.01$) in all treated groups: males--2/17 (untreated controls), 2/20 (vehicle controls), 18/49 (low-dose animals) and 37/49 (high-dose animals); in females--2/20 (untreated controls), 0/21 (vehicle controls), 16/48 (low-dose animals) and 40/45 (high-dose animals). Adrenal pheochromocytomas were present in 8/48 high-dose males and in 12/43 high-dose females, but not in the other groups.

Carcinogenicity in skin of rats was studied by Norpoth *et al*. (1988). In this study, male and female SD rats were given 0, 2.05 or 6.24 mg of 1,1,2-trichloroethane by subcutaneous injection once a week for two years. The median survival time was: males--untreated control, 100 weeks; vehicle control, 87 weeks; low-dose, 90 weeks; high-dose, 85 weeks; females--untreated control, 91 weeks; vehicle control, 95 weeks; low-dose, 86 weeks; high-dose, 83 weeks. Sarcomas occurred at various sites in none of the untreated controls, in 2/35 (male) and 3/50 (female) of vehicle control, in 4/50and 3/50 of low-dose and in 8/50 and 5/50 of high-dose rats. The proportion of low- or high-dose rats with sarcomas was not significantly larger than that of vehicle controls.

h) Toxicokinetics

Metabolic rate, hepatic protein binding and urinary metabolite patterns of carcinogenic and non-carcinogenic chlorinated hydrocarbons were similar in both mice and rats. The biochemical parameters measured provided no clue to differentiate the carcinogens from the non carcinogens. (Mitoma C *et al.*: 1985)

Following oral administration of radiolabeled 1,1,2-trichloroethane to rats and mice after the unlabeled repeated administration for four weeks, 72 % were eliminated in urine, 15 % in expired air in rats and 76 % in urine, 10 % in the expired air in mice. S-Carboxymethylcysteine, thiodiacetic acid and chloroacetic acid were the major urinary metabolites in both mice and rats. (IARC vol.52, p337-359, 1991)

From the above toxicokinetics information except the extent of hepatic DNA binding described in Section of genetic toxicity, it is not evident why 1,1,2-trichloroethane is carcinogenic in only mice but not rats.

i) Immunotoxicity

Oral administration of 1,1,2-trichloroethane dosed at 3.8 and 38 mg/kg/day to CD-1 male mice for 14 days revealed no alterations in immune system. Following oral administration at 20, 200, or 2000 mg/l in drinking water for 90 days, humoral immune status and phagocytosis activity were analysed (Sanders et al.: 1985). Weakly depressed humoral immune status such as hemagglutination titers occurred in both sexes at 200 and 2000 mg/l. Antibody forming cells to sheep erythrocytes (sRBC) were also affected but this change was not dose related and there was an enhancement of the response in some groups. Cell-mediated macrophage function was depressed only in males as indicated by the ability of thioglycolate-recruited peritoneal exudate cells to sRBC at the highest dose but this change was not dose related.

These results suggest that this chemical may have a weakly immunomodulating potential in mice.

4.3 Initial Assessment for Human Health

Non-cancer endpoint

General toxicity of 1,1,2-trichloroethane in subchronic study was the reduction of P-450 content and aniline hydroxylase in liver. NOEL was considered as 3.9 mg/kg/day. Developmental toxicity was not observed at 350 mg/kg/day. This chemical is considered as irritating to the skin, eyes, upper respiratory tract and stomach. In human, this chemical was reported to act as a narcotic in low concentration, and irritate the conjunctiva, the mucosa of the respiratory tract and the external skin. Moreover, gastrointestinal tract complaints, fatty degeneration of the kidneys and lung damage by prolonged exposure were reported (Hardie, 1964).

Occupational daily intake was estimated to be 0.67 mg/kg/day as the worst case and the margin of safety was calculated as 5.8. Although workers always wear masks and other protective equipment, non-cancer risk at the production site should be considered. As for indirect exposure via environment, the daily intakes through drinking water and fish were calculated as 4.33×10^{-5} mg/kg/day and 7.80×10^{-6} mg/kg/day, respectively, based on the highest predicted environmental concentration of 1.30×10^{-6} mg/l. As margin of safety for drinking water or fish is 9.00×10^{4} or 5.00×10^{5}, non-cancer risk via environmental exposure is considered to be low.

Cancer endpoint

In oral carcinogenicity studies, hepatocellular carcinomas and pheochromocytomas in one strain of mice were observed but carcinogenicity was not shown in rats. The initiation/promotion screening studies on male rat liver demonstrated that 1,1,2-trichloroethane has neither initiation nor promotion activity. In an assessment by USEPA, this chemical is classified to group C, a possible human carcinogen and is indicated to structurally related to 1,2-dichloroethane, a probable human carcinogen. On the other hand, International Agency for Research on Cancer (IARC) had evaluated in 1991 that 1,1,2-trichloroethane was not classifiable as its carcinogenicity to humans (Group 3) because of limited evidence for the carcinogenicity in experimental animals and no available data in humans.

Possibilities of cancer initiation and promotion in male Osborne-Mendel rats were studied using a marker of γ-glutamyltranspeptidase-positive foci in liver (Story *et al.*: 1986). In first study, 10 rats were given at a single dose of 69.4 mg/kg 1,1,2-trichloroethane by gavage 24 h following a two-thirds partial hepatectomy. Six days after partial hepatectomy, the rats were given 0.05 % (w/w) phenobarbital in the diet for seven weeks. They were then transferred to their regular diet for seven more days, at which time they were sacrificed. The number of foci/cm^2 liver in rats given 1,1,2-trichloroethane was not greater than that in the vehicle controls. In second study, 10 rats were given a dose of 30 mg/kg b.w. N-nitrosodiethylamine in 5 ml water or water alone by intraperitoneal injection 24 h after a two-thirds partial hepatectomy. Six days later, the rats were given 1,1,2-trichloroethane in corn oil or corn oil alone by gavage on five days per week for seven weeks. In rats initiated with N-nitrosodiethylamine, 1,1,2-trichloroethane significantly increased the incidence of γ-glutamyltranspeptidase-positive foci/cm^2 liver: control (N-nitrosodiethylamine plus corn oil), 1.6 ± 0.3 (SD); treated, 6.3 ± 2.2. In rats not initiated with N-nitrosodiethylamine, 1,1,2-trichloroethane also produced a significant increase in the number of foci/cm^2 liver: control (water plus corn oil), 0.4 ± 0.2; treated, 4.4 ± 1.3. However, when examined more closely, it was found that these increases occurred solely in the number of Type 2 foci, which do not appear to be preneoplastic.

Core genotoxicity studies such as bacterial mutagenicity in *Salmonella typhimurium* and unscheduled DNA synthesis *in vivo* demonstrate negative results. However, the genotoxicity potential is inconclusive because of some positive results in non-core *in vitro* genotoxicity study. The bound of this chemical to DNA of the liver, kidney, lung and stomach in rats and mice after intraperitoneal injection was observed, the extent with liver DNA in mice being about 2.5 times higher than in rats. Therefore, the mechanism of liver and adrenal carcinogenesis in mice is considered to be possibly caused by the adduct formation in nuclear DNA, although core genotoxicity studies indicate negative results. Another mechanism was proposed such as the formation of acyl chlorides and free radicals, which may play a role in cancer formation (Toxicological profile, 1989). The result of S-phase synthesis assay might support that the formation of tumors in mice does not take place exclusively according to a genotoxic mechanism. However, it remains whether this chemical has a genotoxicity potential *in vivo*.

5. CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

Exposure

The production volume of this chemical was ca. 153,000 tonnes/year in 1996 in Japan. This chemical is used as an intermediate for vinylidene chloride and is not included in consumer products in the Sponsor country. The potential environmental distribution of 1,1,2-trichloroethane obtained from a generic fugacity model (Mackey level III) showed this chemical would be distributed mainly to air and water. The main route of human exposure is inhalation with a limited numbers of workers potentially exposed during sampling, subsequent analysis, tank filling and maintenance operations.

Hazards to the Environment

1,1,2-Trichloroethane is a stable liquid and is classified as a not readily biodegradable chemical (OECD TG 301C). Bioconcentration factors range from 0.7 – 4.0 (OECD TG 305C).

As the lowest acute toxicity data to each of algae, zooplankton and fish, 96 h-EC50 of *Phaeodactylum tricornutum* (60 mg/l), 48 h EC50 of *Daphnia magna* (18 mg/l) and 7 d LC50 of *Poecilia reticulata* (40 mg/l) were selected, respectively. As the lowest chronic toxicity data to algae, zooplankton and fish, 72 h NOEC (growth) of *Selenastrum capricornutum* (51.4 mg/l), 21d NOEC (reproduction) of *Daphnia magna* (32 mg/l) and 56d NOEC (mortality in early life stage) of *Pleuronectes platessa* (3.0 mg/l) were adopted, respectively. Assessment factor of 10 was used to chronic toxicity data to determine PNEC, which is 0.3 mg/l in the present report.

Human Health Hazards

Acute toxicity (LD_{50}) of 1,1,2-trichloroethane is 837 mg/kg by oral administration in rats, 9 g/m^3 /6 hr by inhalation in rats and 5.38 g/kg by dermal administration in rabbits. This chemical is considered as irritating to the skin, eyes, upper respiratory tract and stomach. There is no available information on skin sensitisation. In a 90 days drinking water study of mice at the concentration of 0, 20, 200, or 2,000 mg/l, reduction of P-450 contents in liver were observed and NOEL was considered as 3.9 mg/kg/day. Repeated inhalation exposure (7 hours/day, 5 days/week) to 83 mg/m^3 air for 6 months did not lead to any chemical-related changes in the rat, guinea pig and rabbit. The daily intake is equivalent to roughly 11 mg/kg/day in rat, 7.4 mg/kg/day in guinea pig, and 25

mg/kg/day in rabbit. In a developmental toxicity study, the chemical was administered by gavage to mice on days 8 through 12 of gestation at dose of only 350 mg/kg/day. No changes including teratogenicity and embryo/fetal viability, and/or postnatal growth and viability were observed. Therefore, NOEL for developmental toxicity was considered to be 350 mg/kg/day. In human, this chemical was reported to act as a narcotic in low concentration, and irritate the conjunctiva, the mucosa of the respiratory tract and the external skin. Moreover, gastrointestinal tract complaints, fatty degeneration of the kidneys and lung damage by prolonged exposure were reported.

Carcinogenicity study of this chemical by gavage showed hepatocellular carcinomas and pheochromocytomas in mice but no carcinogenic in rats. The initiation/promotion screening studies on male rat liver demonstrated that this chemical has neither initiation nor promotion activity. Carcinogenicity study in skin of rats given 0, 2.05 or 6.24 mg by subcutaneous injection once a week for two years indicated no chemical related changes.

Bacterial mutagenicity study showed negative results in all strains of *Salmonella typhimurium* TA1535, TA1537, TA1538, TA98, TA100 with and without metabolic activation. Unscheduled DNA synthesis was not observed in livers of treated mice. On the other hand, mutation study in *Saccharomyces cerevisiae* and *in vitro* micronucleus test of human lymphocytes showed positive. Although the above core genotoxicity studies demonstrate negative results, the genotoxicity of this chemical is inconclusive because of some positive results in non-core *in vitro* studies.

5.2 Recommendations

Human health
In *vivo* genotoxicity study such as *in vivo* micronucleus test is recommended because some non-core genotoxicity studies indicate positive result.

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Appendix 1

Method for Prediction of Environmental Concentration of Pollutant in Surface Water

1. Predicted environmental concentration in the local environment (PEC_{local}) with effluent release into river

When decomposition, precipitation and vaporization of pollutant can be ignored, it is used that simplified equation by complete mixing model shown with equation (1) to calculate predicted environmental concentration in the local environment (PEC_{local}) as for release effluent into river.

$$PEC_{local}\ (mg/L) = \frac{Co\ Q + Cs\ Qs}{Q + Qs} \quad (1)$$

Where

Co: Concentration of pollutant in upper stream of release point (mg/L)
Cs: Concentration of pollutant in effluent (mg/L)
Q: Flow rate of river (m^3/day)
Qs: Flow rate of effluent released into river (m^3/ day)

At the equation (1), when Co can be considered as 0, dilution factor of pollutant in the river (R) can be shown with following equation.

$$R = Cs/C = (Q + Qs) / Qs \quad (2)$$

As the worst case, it is used to employ a flow rate at dry season as flow rate of river (Q). When flow rate at dry season is indistinct, it is estimated using the following equation in Japan.

$$\text{Flow rate at dry season} = \text{mean flow late} / 2.5 \quad (3)$$

2. Predicted environmental concentration in the local environment (PEC_{local}) with effluent release into sea

For prediction of concentration of pollutant in the sea water with effluent, it is employed generally Joseph-Sendner's equation (4). This equation is one of analytic solution led under the following conditions from diffusion equation.

1 It is adopted large area of sea or lake.
2 The flow rate of effluent and concentration of pollutant in the effluent are constant, and distribution of concentration is able to regard as equilibrium state.
3 Effluent is distributed uniformly to vertical direction, and it spreads in a semicircle or segment to horizontal direction.
4 Diffusion coefficient of pollutant at the sea is in proportion to distance from release point of effluent.
5 There is not any effect of tidal current.
6 Decomposition of pollutant can be ignored.

$$C(x) = (C_s - C(r))\left(1 - \exp\left(-\frac{Q_s}{\theta\, d\, p}\left(\frac{1}{x} - \frac{1}{r}\right)\right)\right) + C(r) \quad (4)$$

Where

C (x): Concentration of pollutant at distance x (m) from release point
Cs: Concentration of pollutant in effluent
C (r): Concentration of pollutant at distance r (m) from release point
Qs: Flow rate of effluent (m^3/day)
θ: Opening angle of seacoast (rad.)
d: Thickness of diffusion layer (m)
P: Diffusion velocity (m/day) (1.0 ± 0.5 cm/sec)

When C(x) is 0 at $r = \infty$ and density stratification is ignored for simplification, Joseph-Sendner's equation (4) is simplified to equation (5)

$$C(x) = C_s\left(1 - \exp\left(-\frac{Q_s}{\theta\, d\, p\, x}\right)\right) \quad (5)$$

Because of $Q_s/\theta\, d\, p\, x << 1$ except vicinity of release point, dilution factor in distance x from release point R(x) can be shown with equation (6).

$$R(x) = C_s/C(x) = \theta\, d\, p\, x/Q_s \quad (6)$$

When it is employed following parameters in equation (6) as default, dilution factor R can be shown with equation (7).

P = 1 cm/sec (860 m/day)
θ = 3.14
d = 10 m
x = 1000 m

$$R = 2.7 \times 10^7/Q_s \quad (7)$$

Qs: volume of effluent (m^3/day)

REVISED OECD HPV FORM 1

SIDS DOSSIER
ON THE HPV PHASE 4 CHEMICAL

1,1,2-Trichloroethane

CAS No. 79 - 00 -5

Sponsor Country: Japan

Date: December 1, 1999

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Appendix 1

Note: *;Data elements in the SIDS
†;Data elements specially required for inorganic chemicals

1. GENERAL INFORMATION

1.01 SUBSTANCE INFORMATION

***A. Cast number** 79 - 00 - 5

B. Name *(IUPAC name)*

***C. Name** *(OECD name)* Ethane, 1,1,2-trichloro

†D. CAS Descriptor

E. EINECS-Number 201-166-9

F. Molecular Formula $C_2H_3Cl_3$

***G. Structural Formula** $Cl_2CH\text{-}CH_2Cl$

H. Substance Group

I. Substance Remark

J. Molecular Weight 133.40

1.02 OECD INFORMATION

A. Sponsor Country: Japan

B. Lead Organisation:

Name of Lead Organisation: Ministry of Health and Welfare (MHW)
Ministry of International Trade and Industry (MITI)
Environmental Agency (EA)
Ministry of Labour (MOL)

Contact person: Mr. Kazuhide Ishikawa
Director, Second International Organization Bureau
Ministry of Forein Affairs

Address:

Street: 2-2-1 Kasumigaseki, Chiyoda-ku, Tokyo 100 Japan
Tel: 81-3-3581-0018
Fax: 81-3-3503-3136

C. Name of responder

Name: Same as above contact person

1.1 GENERAL SUBSTANCE INFORMATION

A. Type of Substance

element [ ]; inorganic [ ]; natural substance [ ]; organic [X]; organometallic [ ]; petroleum product [ ]

B. Physical State *(at 20°C and 1.013 hPa)*

gaseous [ ]; liquid [X]; solid **[ ]**

C. Purity

> 96%

1.2 SYNONYMS

beta-Trichloroethane; 1,2,2-Trichloroethane; Ethane trichloride

1.3 IMPURITIES

Name: Tetrachloroethane, Trichloroethylene, Perchloroethylene, Ethylene dichloride

1.4 ADDITIVES

None

***1.5 QUANTITY**

Remarks:	153,321 tonnes/year in 1996 6 producers
Reference:	MITI

1.6 LABELLING AND CLASSIFICATION

***1.7 USE PATTERN**

A. General

		Type of Use:	**Category:**
	(a)	main	Intermediate
		industrial	Intermediate in closed system
		use	Intermediate for vinylidene chloride
Remarks:	(a)	None	
Reference:		MITI	

1.8 OCCUPATIONAL EXPOSURE LIMIT

Occupational exposure limits for skin

10 ppm (55 mg/m^3)	Egypt, Australia, Belgium, Denmark, Finland, Germany, Hungary, Japan, Netherlands, United State, Russia, Switzerland and United Kingdom
100 ppm (550 mg/m^3)	Poland

Occupational short-term level for skin

20 ppm (110 mg/m^3)	Finland, Hungary, and United Kingdom
50 ppm (275 mg/m^3)	Switzerland

***1.9 SOURCES OF EXPOSURE**

In Japan, 1,1,2-trichloroethane is produced in 6 companies.

(a)
Source: Media of release: Bay
Quantities per media: 1 kg/year (measured)
Remarks:
Reference: MITI, Japan

(b)
Source: Media of release:.Bay
Quantities per media: 21 kg/year (measured)
Remarks:
Reference: MITI, Japan

(c)
Source: Media of release:.River
Quantities per media: 70 kg/year (measured)
Remarks:
Reference: MITI, Japan

(d)
Source: Media of release: River
Quantities per media: 170 kg.year (measured)
Remarks:
Reference: MITI, Japan

2. PHYSICAL-CHEMICAL DATA

*2.1 MELTING POINT

Value: -35.5°C
Decomposition: Yes **[ ]** No **[X]** Ambiguous **[ ]**
Sublimation: Yes **[ ]** No **[X]** Ambiguous **[ ]**
Method:
GLP: Yes **[ ]** No **[X]** ? **[ ]**
Remarks:
Reference: KAGAKU DAIJITENN

*2.2 BOILING POINT

Value: 113.7 °C
Pressure: at 1.013 hPa
Decomposition: Yes **[ ]** No **[X]** Ambiguous **[ ]**
Method:
GLP: Yes **[ ]** No **[X]** ? **[ ]**
Remarks:
Reference: KAGAKU DAIJITENN

*2.4 VAPOUR PRESSURE

Value: 1.0×10^4 Pa
Temperature: 50 °C
Method: calculated **[ ]**; measured **[X]**
GLP: Yes **[ ]** No **[ ]** ? **[X]**
Remarks:
Reference: LANG'S HANDBOOK OF CHEMISTRY (13th edition)

***2.5 PARTITION COEFFICIENT $log_{10}P_{ow}$**

Log Pow:	2.05
Temperature:	25 °C
Method:	calculated **[ ]**; measured **[** X **]**
	OECD TG 107
GLP:	Yes **[X]** No **[ ]** ? **[ ]**
Remarks:	
Reference:	MITI, JAPAN.

***2.6 WATER SOLUBILITY**

A. Solubility

Value:	3.5 g/L
Temperature:	25 °C
Description:	Miscible **[ ]**; Of very high solubility **[ ]**;
	Of high solubility **[ ]**; Soluble **[X]**; Slightly soluble **[ ]**;
	Of low solubility **[ ]**; Of very low solubility **[ ]**; Not soluble **[ ]**
Method:	OECD TG 105
GLP:	Yes **[X]** No **[ ]** ? **[ ]**
Remarks:	
Reference:	MITI, JAPAN.

B. pH Value, pKa Value

No ionizable Functional Group

3. ENVIRONMENTAL FATE AND PATHWAYS

3.1 STABILITY

***3.1.2 STABILITY IN WATER**

Type:	Abiotic (hydrolysis) **[X]**; biotic (sediment)**[ ]**
Half life:	Stable at pH 4 at 25 °C
	Stable at pH 7 at 25 °C
	85.0 days at pH 9 at 25 °C
Method:	OECD TG 111
GLP:	Yes **[X]** No **[ ]** ? **[ ]**
Test substance:	1,1,2-Trichloroethane, purity: 99%
Remarks:	
Reference:	MITI, JAPAN.

***3.2 MONITORING DATA (ENVIRONMENTAL)**

(a)

Type of Measurement:	Background **[ ]**; At contaminated site **[ ]**; Other **[x]**
Media:	Surface water (river)
Results:	ND (Detection limits: 0.004-0.05 mg/l) in 5 areas in Japan as of 1976
Remarks:	ND: Not detected
Reference:	Chemicals in the environment, EA, Japan (1977)

(b)

Type of Measurement: Background **[ ]**; At contaminated site **[ ]**; Other **[x]**
Media: Surface water (lake)
Results: ND (Detection limits: 0.006 mg/l) in 2 areas in Japan as of 1976
Remarks: ND: Not detected
Reference: Chemicals in the environment, EA, Japan (1977)

(c)

Type of Measurement: Background **[ ]**; At contaminated site **[ ]**; Other **[x]**
Media: Surface water (sea)
Results: ND (Detection limits: 0.004 mg/l) in 1 areas in Japan as of 1976
Remarks: ND: Not detected
Reference: Chemicals in the environment, EA, Japan (1977)

(d)

Type of Measurement: Background **[ ]**; At contaminated site **[ ]**; Other **[x]**
Media: Surface water (river, lake, estuary and sea)
Results: None of the excess data for environmental quality standard of Japan (*0.006 mg/l) at 10382 samples as of 1996 (maximum data: 0.004 mg/l, maximum mean data of each areas: 0.0015mg/l, detection limits: 0.0006 mg/l - 0.002 mg/l).
Remarks: Referenced document is an annual report of monitoring results on parameters which are enacted the environmental quality standards at surface water in Japan.
Reference: Monitoring results on surface water quality in Japan, EA, Japan (1997)

(e)

Type of Measurement: Background **[ ]**; At contaminated site **[ ]**; Other **[x]**
Media: Sediment (river)
Results: ND (Detection limits: 0.3-1 mg/kg-dry) in 5 areas in Japan as of 1976
Remarks: ND: Not detected
Reference: Chemicals in the environment, EA, Japan (1977)

(f)

Type of Measurement: Background **[ ]**; At contaminated site **[ ]**; Other **[x]**
Media: Sediment (lake)
Results: ND (Detection limits: 0.5 mg/kg-dry) in 2 areas in Japan as of 1976
Remarks: ND: Not detected
Reference: Chemicals in the environment, EA, Japan (1977)

(g)

Type of Measurement: Background **[ ]**; At contaminated site **[ ]**; Other **[x]**
Media: Sediment (sea)
Results: ND (Detection limit: 0.3 mg/kg-dry) in 1 area in Japan as of 1976
Remarks: ND: Not detected
Reference: Chemicals in the environment, EA, Japan (1977)

(h)

Type of Measurement: Background **[ ]**; At contaminated site **[ ]**; Other **[x]**
Media: Fish (Dace/ muscular tissue) /river
Results: ND (Detection limit: 0.4 mg/kg-wet) in a area in Japan as of 1976
Remarks: ND: Not detected
Reference: Chemicals in the environment, EA, Japan (1977)

(i)

Type of Measurement: Background **[ ]**; At contaminated site **[ ]**; Other **[x]**
Media: Fish (Grey mullet/ muscular tissue)/ sea
Results: ND (Detection limit: 0.4 mg/kg-wet) in a area in Japan as of 1976
Remarks: ND: Not detected
Reference: Chemicals in the environment, EA, Japan (1977)

3.3 TRANSPORT AND DISTRIBUTION BETWEEN ENVIRONMENTAL COMPARTMENTS INCLUDING ESTIMATED ENVIRONMENTAL CONCENTRATIONS AND DISTRIBUTION

*3.3.2 THEORETICAL DISTRIBUTION (FUGACITY CALCULATION)

Media: Air-biota **[ ]**; Air-biota-sediment-soil-water **[x]**; Soil-biota **[ ]**; Water-air **[ ]**; Water-biota **[ ]**; Water-soil **[ ]**; Other **[ ]**
Method: Fugacity level I **[ ]**; Fugacity level II **[ ]**; Fugacity level III **[x]**; Fugacity level IV **[ ]**; Other (calculation) **[ ]**; Other (measurement)**[ ]**
Results:

Compartment	Release 100% to air	Release 100% to water	Release 100% to soil
Air	98.7 %	31.3 %	37.0 %
Water	1.0 %	68.1 %	1.4 %
Soil	0.3 %	0.1 %	61.5 %
Sediment	0.0 %	0.6 %	0.0 %

Remarks: Appendix 1
Reference:

*3.5 BIODEGRADATION

Type: aerobic **[X]**; anaerobic **[ ]**
Inoculum: adapted **[ ]**; non-adapted **[X]**; .
Concentration of the chemical: related to COD **[ ]**; DOC **[ ]**; test substance **[X]**
Medium: water **[X];** water-sediment **[ ];** soil **[ ];** sewage treatment **[ ]**
Degradation: 5 % after 28 days
Results: readily biodeg. **[ ];** inherently biodeg. **[ ]**; under test condition no biodegradation observed **[X]**, other **[ ]**
Method: OECD TG 301C
GLP: Yes **[X]** No **[ ]** ? **[ ]**
Test substance: 1,1,2-Trichloroethane, purity: 99%
Remarks: BOD measurement could not be carried out, because the test substance reacts with CO2 adsorbent. Residual amount of test substance was measured by GC analysis.
Reference: MITI, JAPAN.

3.7 BIOACCUMULATION

Species: Carp (*Cyprinus carpio*)
Exposure period: 6 weeks
Temperature: 25 °C
Concentration: (1) 0.3 m/L
(2) 0.03 mg/L
BCF: (1) 0.7 – 2.6
(2) 2.9 – 4.0

Method:	OECD TG 305C
Type of test:	calculated **[ ]**; measured **[x]**
	static **[ ]**; semi-static **[ ]**; flow-through **[x]**; other *(e.g. field test)* **[ ]**
GLP:	Yes **[x]** No **[ ]** ? **[ ]**
Test substance:	1,1,2-Trichloroethane, purity: 99 %
Remarks:	
Reference:	MITI, JAPAN.

4. ECOTOXICITY

*4.1 ACUTE/PROLONGED TOXICITY TO FISH

(a)

Type of test:	static **[ ]**; semi-static **[X]**; flow-through **[ ]**; other *(e.g. field test)* **[ ]**
	open-system **[ ]**; closed-system **[X]**
Species:	Medaka (*Oryzias latipes*)
Exposure period:	96 h
Results:	LC_{50} (24h) = 95 mg/l
	LC_{50} (48h) = 95 mg/l
	LC_{50} (72h) = 95 mg/l
	LC_{50} (96h) = 95 mg/l
Analytical monitoring:	Yes **[ ]** No **[X]** ? **[ ]**
Method:	OECD TG 203 (1992)
GLP:	Yes **[ ]** No **[X]** ? **[ ]**
Test substance:	As prescribed by 1.1 - 1.4, purity: >98 %
Remarks:	Groups of ten Medaka were exposed to nominal concentrations of 10, 22, 46 and 100 mg/l. DMSO & HCO-40 (4:1 weight ratio mixture, 100 mg/l) were used as solubilizer. 100 mg/l solubilizer and dechlorinated tap water were used as control.
Reference:	Environment Agency of JAPAN (1995)

(b)

Type of test:	static **[ ]**; semi-static **[ ]**; flow-through **[ ]**; other *(e.g. field test)* **[ ]**
	open-system **[ ]**; closed-system **[ ]**
Species:	Sand dab (*Pleuronectes platessa*)
Exposure period:	56 d
Results:	LC_{50} (48h) = 125 mg/l
	LC_{50} (56d:egg to larva) = 5.5 mg/l
	NOEC (56d:egg to larva) = 3.0 mg/l
Analytical monitoring:	Yes **[X]** No **[ ]** ? **[ ]**
Method:	Other (TNO, 1980)
GLP:	Yes **[ ]** No **[ ]** ? **[X]**
Test substance:	Unknown
Remarks:	Concentration of the test chemical was >70% of the nominal value. Oxygen concentration was >70% of the saturation value.
Reference:	D. M. M. Adema & G. J. Vink (1981)

4.2 ACUTE TOXICITY TO AQUATIC INVERTEBRATES

*A. Daphnia

(a)

Type of test:	static **[ ]**; semi-static **[X]**; flow-through **[ ]**; other *(e.g. field test)* **[ ]**;
	open-system **[ ]**; closed-system **[X]**
Species:	*Daphnia magna*
Exposure period:	48 h
Results:	EC_{50} (24h) = 75 mg/l

	EC_{50} (48h) = 64 mg/l
	NOEC = 32 mg/l
Analytical monitoring:	Yes **[ ]** No **[X]** ? **[ ]**
Method:	OECD TG 202
GLP:	Yes **[ ]** No **[X]** ? **[ ]**
Test substance:	As prescribed by 1.1 - 1.4, purity: > 98 %
Remarks:	20 daphnids (4 replicates; 5 organisms per replicate) were exposed to nominal concentrations of 10, 18, 32, 56 and 100 mg/l. DMSO & HCO-40 (4:1 weight ratio mixture, 100 mg/l) were used as solubilizer. 100 mg/l solubilizer and dechlorinated tap water were use as control. The EC_{50} (48h) was determined to be 64 mg/l with a 95 % confidence level of 59 mg/l to 72 mg/l.
Reference:	Environment Agency of JAPAN (1995).

(b)

Type of test:	static **[ ]**; semi-static **[X]**; flow-through **[ ]**; other *(e.g. field test)* **[ ]**; open-system **[ ]**; closed-system **[X]**
Species:	*Daphnia magna*
Exposure period:	48 h
Results:	LC_{50} (24h) = 19 mg/l
	LC_{50} (48h) = 18 mg/l
Analytical monitoring:	Yes **[ ]** No **[X]** ? **[ ]**
Method:	US EPA : Methods for acute toxicity tests with fish, macro invertebrates and amphibians. Ecological Research Series (EPA-660/3-75-009), 61pp (1975)
GLP:	Yes **[ ]** No **[ ]** ? **[X]**
Test substance:	As prescribed by 1.1 - 1.4, purity: > 80 %
Remarks:	Groups of daphnids were placed to eight nominal concentrations, solubilizer (ethanol, acetone or DMF) control and deionized reconstituted well water. The LC_{50} (48h) was determined to be 18 mg/l with 95 % confidence limits of 11 mg/l to 32 mg/l.
Reference:	LeBlanc: 1980

B. Other aquatic organisms

***4.3 TOXICITY TO AQUATIC PLANTS, e.g. algae**

Species:	*Selenastrum capricornutum* ATCC 22662	
Endpoint:	Biomass **[X]**; Growth rate **[ ]**; Other **[ ]**	
Exposure period:	72 h	
Results:	Biomass	EC_{50} (72h) = 144.6 mg/l
		NOEC = 51.4 mg/l
Analytical monitoring:	Yes **[X]** No **[ ]** ? **[ ]**	
Method:	OECD TG 201 (1984)	
	open-system **[ ]**; closed-system **[X]**	
GLP:	Yes **[ ]** No **[X]** ? **[ ]**	
Test substance:	As prescribed by 1.1 - 1.4, purity: > 98 %	
Remarks:	Static test. The EC_{50} value for biomass change (% inhibition) was calculated based on 5 nominal concentrations (28.6, 51.4, 92.6, 167 and 300 mg/l). Minimal amount of Tween 80 - acetone (1:1) or DMSO - HCO-40 (9:1) is used as solubilizer.	
Reference:	Environment Agency of JAPAN (1995).	

4.4 TOXICITY TO BACTERIA

No data

4.5 CHRONIC TOXICITY TO AQUATIC ORGANISMS

4.5.1 CHRONIC TOXICITY TO FISH

(*)4.5.2 CHRONIC TOXICITY TO AQUATIC INVERTEBRATES

Type of test:	static **[ ]**; semi-static **[X]**; flow-through **[ ]**; other *(e.g. field test)* **[ ]**; open-system **[ ]**; closed-system **[X]**	
Species:	*Daphnia magna*.	
Endpoint:	Mortality **[ ]**; Reproduction rate **[X]**; Other **[X]**	
Exposure period:	21 d	
Results:	Reproduction rate:	EC_{50} (21 d) = 43 mg/l
	(Endpoint)	NOEC = 32 mg/l
		LOEC = 100 mg/l
	Immobility:	EC_{50} (96h) = 57 mg/l
	(Endpoint)	EC_{50} (21 d) = 46 mg/l
Analytical monitoring:	Yes **[ ]** No **[X]** ? **[ ]**	
Method:	OECD TG 202(1984)	
GLP:	Yes **[ ]** No **[X]** ? **[ ]**	
Test substance:	As prescribed by 1.1 - 1.4, purity: 94.9 %	
Remarks:	40 daphnids (4 replicates; 10 daphnids per replicate) were exposed to five concentrations (1.0, 3.2, 10, 32, 100 mg/l) in dechlorinated tap water (pH : 7.6 to 8.0; Hardness : 48 to 111 mg/l). DMSO and HCO-40 (4:1 mixture, 100 mg/l) were added as solubilizer.	
Reference:	Environment Agency of JAPAN (1995).	

4.6 TOXICITY TO TERRESTRIAL ORGANISMS

4.6.1 TOXICITY TO SOIL DWELLING ORGANISMS

No data

4.6.2 TOXICITY TO TERRESTRIAL PLANTS

No data

4.6.3 TOXICITY TO OTHER NON MAMMALIAN TERRESTRIAL SPECIES (INCLUDING AVIAN)

No data

4.7 BIOLOGICAL EFFECTS MONITORING (INCLUDING BIOMAGNIFICATION)

No data

4.8 BIOTRANSFORMATION AND KINETICS

No data

4.9 ADDITIONAL REMARKS

None

5. TOXICITY

*5.1 ACUTE TOXICITY

5.1.1 ACUTE ORAL TOXICITY

(a)

Type:	LD_0 **[ ]**; LD_{100} **[ ]**; LD_{50} **[X]**; LDL_0 **[ ]**; Other **[ ]**
Species/strain:	Mice/CD-1
Value:	Male: 378 mg/kg b.w. Female: 491 mg/kg b.w.
Method:	Other
GLP:	Yes **[ ]** No **[**X**]** ? **[ ]**
Test substance:	purity: 95 %
Remarks:	Sedation, gastric irritation, lung haemorrhage, liver and kidney damage.
Reference:	White, *et al.* : 1985

(b)

Type:	LD_0 **[ ]**; LD_{100} **[ ]**; LD_{50} **[X]**; LDL_0 **[ ]**; Other **[ ]**
Species/strain:	Rats
Value:	837 mg/kg (0.58 ml/kg)
Method:	Other
GLP:	Yes **[ ]** No **[**X**]** ? **[ ]**
Test substance:	purity: unknown
Remarks:	
Reference:	Smyth *et.al.*: 1969

(c)

Type:	LD_0 **[ ]**; LD_{100} **[X]**; LD_{50} **[ ]**; LDL_0 **[ ]**; Other **[ ]**
Species/strain:	Dogs
Value:	722 mg/kg
Method:	Other
GLP:	Yes **[ ]** No **[**X**]** ? **[ ]**
Test substance:	purity: unknown
Remarks:	All 5 dogs that received doses ranging from 144 to 433 mg/kg were drowsy but survived.
Reference:	Wright & Schaffer: 1932

5.1.2 ACUTE INHALATION TOXICITY

(a)

Type:	LC_0 **[ ]**; LC_{100} **[ ]**; LC_{50} **[X]**; LCL_0 **[ ]**; Other **[ ]**
Species/strain:	Rats/Crj:CD (SD) /male
Exposure time:	6 hours
Value:	1654 ppm (9 g/m^3)
Method:	Other
GLP:	Yes **[ ]** No **[X]** ? **[ ]**
Test substance:	purity: unknown
Remarks:	Somnolent
Reference:	Bonnet: 1980

(b)

Type:	LC_0 **[ ]**; LC_{100} **[ ]**; LC_{50} **[X]**; LCL_0 **[ ]**; Other **[ ]**
Species/strain:	Mice [sex and strain not specified]
Exposure time:	6 hours
Value:	416 ppm (2.3 g/m^3)
Method:	Other

GLP: Yes **[ ]** No **[X]** ? **[ ]**
Test substance: purity: unknown
Remarks:
Reference: Bonnet: 1980

(c)
Type: LC_0 **[X]**; LC_{100} **[ ]**; LC_{50} **[ ]**; LCL_0 **[ ]**; Other **[ ]**
Species/strain: Mice
Exposure time: 3 hours
Value: 800 ppm (4.42 g/m^3)
Method: Other
GLP: Yes **[ ]** No **[X]** ? **[ ]**
Test substance: purity: unknown
Remarks: Increase in serum GPT and hepatic triglycerides, and decrease in hepatic ATP and plasma triglycerides.
Reference: Takahara: 1986

(d)
Type: LC_0 **[X]**; LC_{100} **[ ]**; LC_{50} **[ ]**; LCL_0 **[ ]**; Other **[ ]**
Species/strain: Mice
Exposure time: 4 hours
Value: 418 ppm (2.3 g/m^3)
Method: Other
GLP: Yes **[ ]** No **[X]** ? **[ ]**
Test substance: purity: unknown
Remarks: CNS depression
Reference: De Ceaurriz: 1981

5.1.3 ACUTE DERMAL TOXICITY

(a)
Type: LD_0 **[ ]**; LD_{100} **[X]**; LD_{50} **[ ]**; LDL_0 **[ ]**; Other **[ ]**
Species/strain: Guinea pigs
Value: 232 mg/cm^2 (0.5 ml applied to a 3.1cm^2 area of the back)
Method: Other
GLP: Yes **[ ]** No **[X]** ? **[ ]**
Test substance: purity: unknown
Remarks: 25 % animals died by percutaneous applications at a dose of 116 mg/cm^2 (0.25 ml/3.1 cm^2 skin).
Reference: Wahlberg: 1979

(b)
Type: LD_0 **[ ]**; LD_{100} **[ ]**; LD_{50} **[X]**; LDL_0 **[ ]**; Other **[ ]**
Species/strain: Rabbits
Value: 5.38 g/kg b.w. (3.73 ml/kg)
Method: Other
GLP: Yes **[ ]** No **[X]** ? **[ ]**
Test substance: purity: unknown
Remarks:
Reference: Smyth: 1969

5.1.4 ACUTE TOXICITY, OTHER ROUTES OF ADMINISTRATION

(a)
Type: LD_0 **[ ]**; LD_{100} **[X]**; LD_{50} **[ ]**; LDL_0 **[ ]**; Other **[ ]**

Species/strain: Guinea pigs
Route of Administration: i.m. **[ ]**; i.p. **[X]**; i.v. **[ ]**; infusion **[ ]**; s.c. **[ ]**; other **[ ]**
Exposure time:
Value: 360 mg/animal (0.25 ml/animal)
Method: Other
GLP: Yes **[ ]** No **[X]** ? **[ ]**
Test substance: purity: unknown
Remarks:
Reference: Wahlberg: 1979

(b)
Type: LD_0 **[ ]**; LD_{100} **[ ]**; LD_{50} **[X]**; LDL_0 **[ ]**; Other **[ ]**
Species/strain: Rats/Crj:CD (SD)
Route of Administration: i.m. **[ ]**; i.p. **[X]**; i.v. **[ ]**; infusion **[ ]**; s.c. **[ ]**; other **[ ]**
Exposure time:
Value: 265 mg/kg b.w.
Method: Other
GLP: Yes **[ ]** No **[X]** ? **[ ]**
Test substance: purity: unknown
Remarks: At 1/16 of the LD_{50} values, significant elevations of sorbitol dehydrogenase appeared.
Reference: Lundberg: 1986

5.2 CORROSIVENESS/IRRITATION

5.2.1 SKIN IRRITATION/CORROSION

(a)
Species/strain: Rabbits
Results: Highly corrosive **[ ]**; Corrosive **[ ]**; Highly irritating **[ ]**; Irritating **[ ]**; Moderate irritating **[ ]**; Slightly irritating **[X]**; Not irritating **[ ]** ***Mild (RTECS)
Classification: Highly corrosive (causes severe burns) **[ ]**; Corrosive (causes burns) **[ ]**; Irritating **[ ]**; Not irritating **[ ]**
Method: Other
GLP: Yes **[ ]** No **[X]** ? **[ ]**
Test substance: purity: unknown
Remarks: Dose: 500 mg
Reference: *Union carbide Date Sheet*., 6, 28 (1972)

(b)
Species/strain: Rabbits
Results: Highly corrosive **[ ]**; Corrosive **[ ]**; Highly irritating **[X]**; Irritating **[ ]**; Moderate irritating **[ ]**; Slightly irritating **[ ]**; Not irritating **[ ]** ***Severe (RTECS)
Classification: Highly corrosive (causes severe burns) **[ ]**; Corrosive (causes burns) **[ ]**; Irritating **[ ]**; Not irritating **[ ]**
Method: Other
GLP: Yes **[ ]** No **[X]** ? **[ ]**
Test substance: purity: unknown
Remarks: Dose/duration: 810 mg/24 hr
Reference: *Eur.J.T.Environ.Hyg*., 9, 171 (1976)

(c)
Species/strain: Rabbits

Results: Highly corrosive **[ ]**; Corrosive **[ ]**; Highly irritating **[ ]**; Irritating **[ ]**; Moderate irritating **[ ]**; Slightly irritating **[X]**; Not irritating **[ ]** ***Mild (RTECS)
Classification: Highly corrosive (causes severe burns) **[ ]**; Corrosive (causes burns) **[ ]**; Irritating **[ ]**; Not irritating **[ ]**
Method: Other
GLP: Yes **[ ]** No **[X]** ? **[ ]**
Test substance: purity: unknown
Remarks: Dose/duration: 500 mg/24 hr
Reference: *"Prehled Prumyslove Toxikologie ; Organicke Latky."* p95 (1986)

5.2.2 EYE IRRITATION/CORROSION

(a)
Species/strain: Rabbits
Results: Highly corrosive **[ ]**; Corrosive **[ ]**; Highly irritating **[ ]**; Irritating **[ ]**; Moderate irritating **[ ]**; Slightly irritating **[X]**; Not irritating **[ ]** *Mild(RTECS)
Classification: Irritating **[ ]**; Not irritating **[ ]**; Risk of serious damage to eyes **[ ]**
Method: Other
GLP: Yes **[ ]** No **[X]** ? **[ ]**
Test substance: purity: unknown
Remarks: After application of 1,1,2-trichloroethane at 162 mg into the conjunctival sac of the rabbit eye, a weak catarrhalic conjunctivitis as well as epithelial abrasion were observed. In addition, a healing keratitis was observed after 7 days. These symptoms completely disappeared within 2 weeks.
Reference: Duprat et al.: 1976

(b)
Species/strain: Rabbits
Results: Highly corrosive **[ ]**; Corrosive **[ ]**; Highly irritating **[ ]**; Irritating **[ ]**; Moderate irritating **[ ]**; Slightly irritating **[X]**; Not irritating **[ ]** *Mild(RTECS)
Classification: Irritating **[ ]**; Not irritating **[ ]**; Risk of serious damage to eyes **[ ]**
Method: Other
GLP: Yes **[ ]** No **[X]** ? **[ ]**
Test substance: purity: unknown
Remarks: Dose/duration: 500 mg/24 hr
Reference: *"Prehled Prumyslove Toxikologie ; Organicke Latky."* p95 (1986)

5.3 SKIN SENSITISATION

No data

*5.4 REPEATED DOSE TOXICITY

(a)
Species/strain: Mice/CD-1
Sex: Female **[ ]**; Male **[ ]**; Male/Female **[X]**; No data **[ ]**
Route of Administration: Oral (by gavage in 10 % emulphor)
Exposure period: 14 days
Frequency of treatment: Daily
Post exposure observation period:
Dose: 38 or 3.8 mg/kg
Control group: Yes **[X]**; No **[ ]**; No data **[ ]**; 10 % emulphor

Concurrent no treatment **[ ]**; Concurrent vehicle **[X]**; Historical **[ ]**
NOEL: Male: 3.8 mg/kg
Female: 38 mg/kg
LOEL: Male: 38 mg/kg
Results: Only absolute weights of brain, thymus and testes increased significantly in male mice dosed at 38 mg/kg. But other toxicity parameters were not changed.
Method: Other
GLP: Yes **[ ]** No **[X]** ? **[ ]**
Test substance: purity: 95 %
Reference: White *et al.*: 1985

(b)
Species/strain: Mice/CD-1
Sex: Female **[ ]**; Male **[ ]**; Male/Female **[X]**; No data **[ ]**
Route of Administration: Oral (drinking water)
Exposure period: 90 days
Frequency of treatment: Continuously
Post exposure observation period:
Dose: 20, 200, 2000 mg/l
[calculated daily doses ; male: 4.4, 46 or 305 mg/kg b.w,
female: 3.9, 44 or 384 mg/kg b.w.]
Control group: Yes **[X]**; No **[ ]**; No data **[ ]**;
Concurrent no treatment **[ ]**; Concurrent vehicle **[X]**; Historical **[ ]**
NOEL: Male: 20 mg/l (4.4 mg/kg)
Female: 20 mg/l (3.9 mg/kg)
LOEL: Male: 200 mg/l (46 mg/kg)
Female: 200 mg/l (44 mg/kg)
Results: Strongly low body weight gain was observed in males at 2000 mg/l. In liver, glutathione content was reduced in males at 200 and 2000 mg/l, and cytochrome P-450 contents and aniline hydroxylase activities were reduced in females at 200 and 2000 mg/l. Increase of alkaline phosphatase activity in serum occurred in both sexes at 2000 mg/l. Hematocrit and hemoglobin were decreased in females at 2000 mg/l. Depressed humoral immune status such as hemagglutination titers occurred in both sexes at 200 and 2000 mg/l.
Method: Other
GLP: Yes **[ ]** No **[X]** ? **[ ]**
Test substance: purity: 95 %
Reference: White *et al.*: 1985

(c)
Species/strain: Rats
Sex: Female **[ ]**; Male **[ ]**; Male/Female **[X]**; No data **[ ]**
Route of Administration: Inhalation
Exposure period: 6 months
Frequency of treatment: 7 hours/day, 5 days/week
Post exposure observation period:
Dose: 15 ppm (83 mg/m^3, calculated daily dose; 11.1 mg/kg/day)
Control group: Yes **[ ]**; No **[ ]**; No data **[X]**;
Concurrent no treatment **[ ]**; Concurrent vehicle **[ ]**; Historical **[ ]**
NOEL: Male: 15 ppm (83 mg/m^3, calculated daily dose; 11.1 mg/kg/day)
Female: 15 ppm (83 mg/m^3, calculated daily dose; 11.1 mg/kg/day)
LOEL:

Results: No substance-related histopathological, hematological and biochemical changes were occurred. Body weight gain, organ weights and mortality remained unaffected.
Method: Other
GLP: Yes **[ ]** No **[X]** ? **[ ]**
Test substance: purity: unknown
Reference: Beratergremium fuer umweltrelevante Altstoffe (1995)

(d)
Species/strain: Guinea pigs
Sex: Female **[ ]**; Male **[ ]**; Male/Female **[X]**; No data **[ ]**
Route of Administration: Inhalation
Exposure period: 6 months
Frequency of treatment: 7 hours/day, 5 days/week
Post exposure observation period:
Dose: 15 ppm (83 mg/m^3, calculated daily dose; 7.43 mg/kg/day)
Control group: Yes **[ ]**; No **[ ]**; No data **[X]**;
Concurrent no treatment **[ ]**; Concurrent vehicle **[ ]**; Historical **[ ]**
NOEL: Male: 15 ppm (83 mg/m^3, calculated daily dose; 7.43 mg/kg/day)
Female: 15 ppm (83 mg/m^3, calculated daily dose; 7.43 mg/kg/day)
LOEL:
Results: No substance-related histopathological, hematological and biochemical changes were occurred. Body weight gain, organ weights and mortality remained unaffected.
Method: Other
GLP: Yes **[ ]** No **[X]** ? **[ ]**
Test substance: purity: unknown
Reference: Beratergremium fuer umweltrelevante Altstoffe (1995)

(e)
Species/strain: Rabbits
Sex: Female **[ ]**; Male **[ ]**; Male/Female **[X]**; No data **[ ]**
Route of Administration: Inhalation
Exposure period: 6 months
Frequency of treatment: 7 hours/day, 5 days/week
Post exposure observation period:
Dose: 15 ppm (83 mg/m^3, calculated daily dose; 24.9 mg/kg/day)
Control group: Yes **[ ]**; No **[ ]**; No data **[X]**;
Concurrent no treatment **[ ]**; Concurrent vehicle **[ ]**; Historical **[ ]**
NOEL: Male: 15 ppm (83 mg/m^3, calculated daily dose; 24.9 mg/kg/day)
Female: 15 ppm (83 mg/m^3, calculated daily dose; 24.9 mg/kg/day)
LOEL:
Results: No substance-related histopathological, hematological and biochemical changes were occurred. Body weight gain, organ weights and mortality remained unaffected.
Method: Other
GLP: Yes **[ ]** No **[X]** ? **[ ]**
Test substance: purity: unknown
Reference: Beratergremium fuer umweltrelevante Altstoffe (1995)

*5.5 GENETIC TOXICITY IN VITRO

A. BACTERIAL TEST

(a)

Type:	Bacterial reverse mutation assay
System of testing:	*Salmonella typhimurium* TA1535, TA1537, TA1538, TA98, TA100
Concentration:	-S9 mix: 12.7, 21.9, 41.2, 80.9, 158.9 µmol/plate +S9 mix: Same as -S9 mix
Metabolic activation:	With **[ ]**; Without **[ ]**; With and Without **[X]**; No data **[ ]**
Results:	
Cytotoxicity conc:	With metabolic activation: Without metabolic activation:
Precipitation conc:	
Genotoxic effects:	+ ? - With metabolic activation: **[ ] [ ] [X]** Without metabolic activation: **[ ] [ ] [X]**
Method:	Other
GLP:	Yes **[ ]** No **[X]** ? **[ ]**
Test substance:	purity: 98 %
Remarks:	
Reference:	Barber *et al.*: 1981

(b)

Type:	Bacterial mutation assay
System of testing:	*Saccharomyces cerevisiae* D7
Concentration:	No data
Metabolic activation:	With **[ ]**; Without **[ ]**; With and Without **[X]**; No data **[ ]**
Results:	
Cytotoxicity conc:	With metabolic activation: Without metabolic activation:
Precipitation conc:	
Genotoxic effects:	Positive but no other detail + ? - With metabolic activation: **[X] [ ] [ ]** Without metabolic activation: **[X] [ ] [ ]**
Method:	Other
GLP:	Yes **[ ]** No **[ ]** ? **[X]**
Test substance:	purity: Unknown
Remarks:	
Reference:	Bronzetti *et al.*: 1981

(c)

Type:	Test for the induction of mitotic segregation
System of testing:	*Aspergillus nidulans* diploid strain P1
Concentration:	0, 0.025, 0.05, 0.075, 0.1 % v/v
Metabolic activation:	With **[ ]**; Without **[X]**; With and Without **[ ]**; No data **[ ]**
Results:	
Cytotoxicity conc:	With metabolic activation: Without metabolic activation: 0.1% v/v
Precipitation conc:	
Genotoxic effects:	+ ? - With metabolic activation: **[ ] [ ] [ ]** Without metabolic activation: **[X] [ ] [ ]**
Method:	Other
GLP:	Yes **[ ]** No **[X]** ? **[ ]**
Test substance:	purity: >99.5 %

Remarks: Increase in frequency of morphologically abnormal colonies which produced euploid whole-chromosome segregants (haploids and non-disjunctional diploids).
Reference: Crebelli *et al.*: 1988

B. NON-BACTERIAL IN VITRO TEST

(a)
Type: Micronucleus test
System of testing: Human lymphocyte
Concentration: 0, 0.10, 0.60, 1.25, 2.50, 5.00 mM
Metabolic activation: With **[ ]**; Without **[ ]**; With and Without **[X]**; No data **[ ]**
Results: 1,1,2-Trichloroethane induced a statistically significant increase in micronucleus cells both with and without metabolic activation.
Cytotoxicity conc: With metabolic activation: 5 mM
Without metabolic activation: 2.5 mM
Precipitation conc:
Genotoxic effects:

	+	?	-
With metabolic activation:	**[X]**	**[ ]**	**[ ]**
Without metabolic activation:	**[X]**	**[ ]**	**[ ]**

Method: Other
GLP: Yes **[ ]** No **[X]** ? **[ ]**
Test substance: purity: 98 %
Remarks: Cyclophosphamide (0.1 mM) and mitomycin C (4.4×10^{-4} mM) were used as positive control.
Reference: Tafazoli & Krisch-Volders: 1996

(b)
Type: Alkaline single cell gel electrophoresis test (comet assay)
System of testing: Human lymphocyte
Concentration: 0, 2.50 mM
Metabolic activation: With **[ ]**; Without **[ ]**; With and Without **[X]**; No data **[ ]**
Results: Statistically significant increases of comet tail and tail moment with a significant correlation between % ID and tail length were found.
Cytotoxicity conc: With metabolic activation:
Without metabolic activation:
Precipitation conc:
Genotoxic effects:

	+	?	-
With metabolic activation:	**[X]**	**[ ]**	**[ ]**
Without metabolic activation:	**[X]**	**[ ]**	**[ ]**

Method: Other
GLP: Yes **[ ]** No **[X]** ? **[ ]**
Test substance: purity: 98 %
Remarks: Cyclophosphamide (0.1 mM) and ethylmethanesulfonate (2 mM) were used as positive control.
Reference: Tafazoli & Krisch-Volders: 1996

(c)
Type: Transformation assay
System of testing: BALB/c-3T3 cell
Concentration: 0, 5.0, 10.0, 25.0, 50.0, 100, 250 µg/ml
Metabolic activation: With **[ ]**; Without **[X]**; With and Without **[ ]**; No data **[ ]**
Results:
Cytotoxicity conc: With metabolic activation:
Without metabolic activation: Not observed

Precipitation conc:
Genotoxic effects: + ? -
With metabolic activation: **[ ] [ ] [ ]**
Without metabolic activation: **[X] [ ] [ ]**
Method: Other
GLP: Yes **[ ]** No **[X]** ? **[ ]**
Test substance: purity: greater than 99.7 %
Remarks: Statistically significant transformation response was observed at 10 μg/ml but not at the higher concentration in the first experiment. However, a low but statistically significant transformation response was observed at 25 and 50 μg/ml in the second study (0~50.0 μg/ml).
Reference: Tu *et al.*: 1985

(d)
Type: DNA binding assay
System of testing: Calf thymus DNA
Concentration: 1 mM
Metabolic activation: With **[X]**; Without **[ ]**; With and Without **[ ]**; No data **[ ]**
Results: 1,1,2-Trichloroethane bound to DNA at 0.35 ± 0.07 nmol/mg DNA/h.
Cytotoxicity conc: With metabolic activation:
Without metabolic activation:
Precipitation conc:
Genotoxic effects: + ? -
With metabolic activation: **[X] [ ] [ ]**
Without metabolic activation: **[ ] [ ] [ ]**
Method: Other
GLP: Yes **[ ]** No **[X]** ? **[ ]**
Test substance: purity: greater than 99 % pure
Remarks:
Reference: DiRenzo *et al.*: 1982

* 5.6 GENETIC TOXICITY IN VIVO

(a)
Type: Unscheduled DNA assay
Species/strain: Mice/B6C3F1
Sex: Female **[ ]**; Male **[ ]**; Male/Female **[X]**; No data **[ ]**
Route of Administration: Oral (by gavage as a single bolus)
Exposure period:
Doses: 0, 50, 200, 1000 mg/kg
Results: 1,1,2-Trichloroethane failed to induce unscheduled DNA synthesis.
Method: Other
GLP: Yes **[ ]** No **[X]** ? **[ ]**
Test substance: purity: unknown
Remarks:
Reference: Mirsalis,J.C. *et al., Environ.Mol.Mut.*, 14, 155-164 (1989)

(b)
Type: S-phase synthesis assay
Species/strain: Mice/B6C3F1
Sex: Female **[ ]**; Male **[ ]**; Male/Female **[X]**; No data **[ ]**
Route of Administration: Oral (by gavage as a single bolus)
Exposure period:
Doses: mail; 0, 200, 500 mg/kg
femail; 0, 200 mg/kg

Results: 1,1,2-Trichloroethane induced S-phase synthesis.
Method: Other
GLP: Yes **[ ]** No **[X]** ? **[ ]**
Test substance: purity: unknown
Remarks:
Reference: Mirsalis *et al.,*: 1989

(c)
Type: DNA binding study
Species/strain: Rats/Wistar
Sex: Female **[ ]**; Male **[X]**; Male/Female **[ ]**; No data **[ ]**
Route of Administration: i.p.
Exposure period: 22 hours
Doses: 127 µCi (6.35 µmol)/kg b.w. (in dimethylsulfoxide-sterile 0.9 % NaCl solution)
Results: Bound to DNA of the liver, kidney, lung and stomach.
Method: Other
GLP: Yes **[ ]** No **[X]** ? **[ ]**
Test substance: purity: >98 %
Remarks: 1,1,2-Trichloroethane was also bound to RNA and proteins of the liver, kidney, lung and stomach. The extent of interaction with DNA in rats was about two fifth of the value in mice.
Reference: Mazzullo *et al.*: 1986

(d)
Type: DNA binding study
Species/strain: Mice/BALB/c
Sex: Female **[ ]**; Male **[X]**; Male/Female **[ ]**; No data **[ ]**
Route of Administration: i.p.
Exposure period: 22 hours
Doses: 127 µCi (6.35 µmol)/kg b.w. (in dimethylsulfoxide-sterile 0.9 % NaCl solution)
Results: Bound to DNA of the liver, kidney, lung and stomach.
Method: Other
GLP: Yes **[ ]** No **[X]** ? **[ ]**
Test substance: purity: >98 %
Remarks: 1,1,2-Trichloroethane was also bound to RNA and proteins of the liver, kidney, lung and stomach. The extent of interaction with DNA in mice was about 2.5 times higher than in rats.
Reference: Mazzullo *et al.*: 1986

5.7 CARCINOGENICITY

(a)
Species/strain: Mice/B6C3F_1
Sex: Female **[ ]**; Male **[ ]**; Male/Female **[X]**; No data **[ ]**
Route of Administration: Oral (in corn oil by gavage)
Exposure period: 78 weeks
Frequency of treatment: Five consecutive days per week
Postexposure observation period: After 12-13 weeks without treatment
Doses: Low-dose and high-dose animals received 150 and 300 mg/kg b.w./day, respectively for eight weeks and then 200 and 400mg/kg b.w./day for 70 weeks. The time-weighted average doses were 139 and 278 mg/kg b.w./day, respectively [calculated over seven days per week].
Control group: Yes **[X]**; No **[ ]**; No data **[ ]**;

Concurrent no treatment **[X]**; Concurrent vehicle **[X]**; Historical **[ ]**

Results: At least 50 % of the male mice in each group were alive at week 86. 50 % of the female mice were still alive after 90, 89, 58 and 81 weeks in the untreated control, vehicle control, low-dose and high-dose groups, respectively. The incidence of hepatocellular neoplasms [reported as carcinomas] was increased significantly ($p < 0.01$) in all treated groups: males--2/17 (untreated controls), 2/20 (vehicle controls), 18/49 (low-dose animals) and 37/49 (high-dose animals); in females--2/20 (untreated controls), 0/21 (vehicle controls), 16/48 (low-dose animals) and 40/45 (high-dose animals). Adrenal pheochromocytomas were present in 8/48 high-dose males and in 12/43 high-dose females, but not in the other groups.

Method: Other

GLP: Yes **[ ]** No **[X]** ? **[ ]**

Test substance: purity: 99 %

Remarks: Significant incidence of hepatocellular carcinomas and adrenal pheochromocytomas

Reference: NCI-CG-TR-74 (1978)

(b)

Species/strain: Rats/Osborne-Mendel

Sex: Female **[ ]**; Male **[ ]**; Male/Female **[X]**; No data **[ ]**

Route of Administration: Oral (in corn oil by gavage)

Exposure period: 78 weeks

Frequency of treatment: Five consecutive days per week

Postexposure observation period: After 34-35 weeks without treatment

Doses: Low-dose and high-dose groups received respectively, 35 and 70 mg/kg b.w./day for 20 weeks, then 50 and 100 mg/kg b.w./day for 58 weeks. The time-weighted average doses were 33 and 66 mg/kg b.w./day, respectively [calculated over seven days per week].

Control group: Yes **[X]**; No **[ ]**; No data **[ ]**;
Concurrent no treatment **[X]**; Concurrent vehicle **[X]**; Historical **[ ]**

Results: At least 50 % of the male rats in untreated control, low-dose and high-dose groups survived more than 96 weeks; 50 % of the females in the untreated control, low-dose and high-dose groups survived more than 105 weeks. Vehicle control groups had unexpectedly poor survival, with only 5 % (1/20) of males and 20 % (4/20) of females still alive at the end of the study; the authors did not, therefore, include them in statistical comparisons. No statistically significant increase in tumour incidence was found, either in males or in females.

Method: Other

GLP: Yes **[ ]** No **[X]** ? **[ ]**

Test substance: purity: 99 %

Remarks: No increase in the incidence of neoplasms

Reference: NCI-CG-TR-74 (1978)

(c)

Species/strain: Rats/Crj:CD (SD)

Sex: Female **[ ]**; Male **[ ]**; Male/Female **[X]**; No data **[ ]**

Route of Administration: Subcutaneous injection

Exposure period: Two years

Frequency of treatment: Once a week

Postexposure observation period:

Doses: 15.37 or 46.77 μmol [2.05 or 6.24 mg] in 0.25 ml dimethylsulfoxide.

Control group: Yes **[X]**; No **[ ]**; No data **[ ]**;
Concurrent no treatment **[X]**; Concurrent vehicle **[X]**; Historical **[ ]**

Results: The median survival time was: males--untreated control, 100 weeks; vehicle control, 87 weeks; low-dose, 90 weeks; high-dose, 85 weeks; females--untreated control, 91 weeks; vehicle control, 95 weeks; low-dose, 86 weeks; high-dose, 83 weeks. Sarcomas occurred at various sites in none of the untreated controls, in 2/35 and 3/50 of vehicle control, in 4/50and 3/50 of low-dose and in 8/50 and 5/50 of high-dose rats. The proportion of low- or high-dose rats with sarcomas was not significantly larger than that of vehicle controls.
Method: Other
GLP: Yes **[ ]** No **[X]** ? **[ ]**
Test substance: purity: > 99 %
Remarks: No increased neoplasms, compared to vehicle control.
Reference: Norpoth *et al.*: 1988

(d)
Species/strain: Rats/Osborne-Mendel
Sex: Female **[ ]**; Male **[X]**; Male/Female **[ ]**; No data **[ ]**
Route of Administration: Oral (in corn oil by gavage)
Exposure period: Single exposure (Screening initiation study)
Frequency of treatment:
Postexposure observation period: 9 weeks
Doses: 0.52 mmol/kg b.w. (69.4 mg/kg b.w.)
Control group: Yes **[X]**; No **[ ]**; No data **[ ]**; 2.0 ml/kg b.w. corn oil
Concurrent no treatment **[ ]**; Concurrent vehicle **[X]**; Historical **[ ]**
Results: The number of foci/cm^2 liver in rats given 1,1,2-trichloroethane was not greater than that in the vehicle controls. [numbers of foci not reported.]
Method: Other
GLP: Yes **[ ]** No **[X]** ? **[ ]**
Test substance: purity: 98 %
Remarks: In a screening assay based on the production of γ-glutamyl- transpeptidase-positive foci in rat liver, 10 rats were given 1,1,2-trichloroethane 24 h following a two-thirds partial hepatectomy. Six days after partial hepatectomy, the rats were given 0.05 %(w/w) phenobarbital in the diet for seven weeks: They were then transferred to their regular diet for seven more days, at which time they were sacrificed.
Reference: Story *et al.*: 1986

(e)
Species/strain: Rats/Osborne-Mendel
Sex: Female **[ ]**; Male **[X]**; Male/Female **[ ]**; No data **[ ]**
Route of Administration: Oral (in corn oil by gavage)
Exposure period: 7 weeks (Screening promotion study)
Frequency of treatment: 5 days in a week
Postexposure observation period: 1 day
Doses: 0.52 mmol/kg b.w. (69.4 mg/kg b.w.)
Control group: Yes **[X]**; No **[ ]**; No data **[ ]**;
Concurrent no treatment **[ ]**; Concurrent vehicle **[X]**; Historical **[ ]**
Results: In rats initiated with N-nitrosodiethylamine, 1,1,2-trichloroethane significantly increased the incidence of γ-glutamyltranspeptidase-positive foci/cm^2 liver: control (N-nitrosodiethylamine plus corn oil), 16 $\pm$ 0.3 (SD); treated, 6.3 $\pm$ 2.2. In rats not initiated with N-nitrosodiethylamine, 1,1,2-trichloroethane also produced a significant increase in the number of foci/cm^2 liver: control (water plus corn oil), 0.4 $\pm$ 0.2; treated, 4.4 $\pm$ 1.3.
Method: Other
GLP: Yes **[ ]** No **[X]** ? **[ ]**

Test substance: purity: 98 %
Remarks: In a screening assay based on the production of γ-glutamyl-transpeptidase-positive foci in rat liver, 10 rats were given a dose of 30 mg/kg b.w. N-nitrosodiethylamine in 5 ml water or water alone by intraperitoneal injection 24 h after a two-thirds partial hepatectomy. Six days later, the rats were given 1,1,2-trichloroethane in corn oil or corn oil alone by gavage on five days per week for seven weeks.
Reference: Story *et al.*: 1986

***5.8 TOXICITY TO REPRODUCTION**

No data are available

***5.9 DEVELOPMENTAL TOXICITY/ TERATOGENICITY**

Species/strain: Mice/ICR/SIM
Sex: Female **[X]**; Male **[ ]**; Male/Female **[ ]**; No data **[ ]**
Route of Administration: Oral intubation (in corn oil)
Duration of the test: On days 8 through 12 of gestation
Exposure period: 5 days
Frequency of treatment: Daily
Doses: 350 mg/kg/day (expected to result in significant material weight reduction, up to 10 % mortality or other clinical signs of overt toxicity)
Control group: Yes **[X]**; No **[ ]**; No data **[ ]**;
Concurrent no treatment **[ ]**; Concurrent vehicle **[X]**; Historical **[ ]**
NOEL Maternal Toxicity:
NOEL teratogenicity: 350 mg/kg/day
Results: No developmental toxicity
Maternal general toxicity: 3/30 died
Pregnancy/litter data: No effect
Foetal data: No effect
Method: Other
GLP: Yes **[ ]** No **[X]** ? **[ ]**
Test substance: purity: unknown
Remarks: Single dose study (One of studies for 55 chemicals)
Reference: Seidenberg *et al.*: 1986

5.10 OTHER RELEVANT INFORMATION

A. Specific toxicities

Type: Immunotoxicity
Results: Oral administration of 1,1,2-trichloroethane dosed at 3.8 and 38 mg/kg/day to male CD-1 mice for 14 days revealed no alterations in immune system. Following oral administration at 0.2 and 2.0 g/l in drinking water for 90 days, humoral immune status was depressed in both sexes. Cell-mediated macrophage function was depressed only in males as indicated by the ability of thioglycolate-recruited peritoneal exudate cells (PEC) to phagocytize sheep erythrocytes (sRBC) at the high dose.
Remarks:
Reference: Sanders *et al.*: 1985

B. Toxicodynamics, toxicokinetics

(a)
Type: Toxicokinetics

Results: Studies in guinea pig indicate that 1,1,2-trichloroethane is easily absorbed through the skin. Oral administration in mice or rats was 81 % metabolized, indicating that at least this amount was absorbed. This suggests that 1,1,2-trichloroethane is well absorbed from the gastrointestinal tract.

Inhalation exposure of mice to 1,1,2-trichloroethane at 5445 mg/m^3 for 1hr induced the highest concentration in fat, followed by liver and kidney.

By the intraperitoneal injection to mice, 73-87 % was eliminated in urine, 0.1-2 % in feces and 16-22 %, largely as carbon dioxide, in expired air within 3 days. The major urinary metabolites were chloroacetic acid, free S-carboxymethylcysteine and thiodiacetic acid. In the case of rats, the major urinary metabolite was thioglycolic acid such as 20 % of the dose. Following oral administration of radiolabeled 1,1,2-trichloroethane to rats and mice after the unlabeled repeated administration for four weeks, 72 % were eliminated in urine, 15 % in expired air in rats and 76 % in urine, 10 % in the expired air in mice. S-Carboxymethylcysteine, thiodiacetic acid and chloroacetic acid were the major urinary metabolites in both mice and rats.

References: IARC: 1991

(b)

Type: Toxicokinetics

Results: Chlorinated hydrocarbons found in a bioassay to be carcinogenic to both B6C3F1 mice and Osborne-Mendel rats (1,2-dichloroethane), carcinogenic only to mice (1,1,2-trichloroethane, 1,1,2,2-tetrachloroethane, hexachloroethane, trichloroethylene, and tetrachloroethylene), and noncarcinogenic to either species (1,1-dichloroethane and 1,1,1-trichloroethane) were used to investigate the biochemical bases for tumorigenesis. Studies were conducted after chronic oral dosing of adult mice and rats with the MTD and 1/4 MTD of each compound. The extent to which the compounds were metabolized in 48 hr, hepatic protein binding, and urinary metabolite patterns were examined. Metabolism of the compounds (mmoles per kg body weight) was 1.7 to 10 times greater in mice than in rats. Hepatic protein binding (nanomole equivalents bound to 1 mg of liver protein) was 1.2 to 8.3 times higher in mice than in rats except for 1,2-dichloroethane and 1,1,1-trichloroethane. The noncarcinogens 1,1-dichloroethane and 1,1,1-trichloroethane exhibited 2 to 18 times more binding in mice than did the carcinogens 1,2-dichloroethane and 1,1,2-trichloroethane. Urinary metabolite patterns of the compounds were similar in both species. The biochemical parameters measured provided no clue to differentiate the carcinogens from the noncarcinogens.

References: Mitoma *et al.*: 1985

* 5.11 EXPERIENCE WITH HUMAN EXPOSURE

(a)

Results: Source: 1,1,2-Trichloroethane production plant (tank filling)
Number of Workers Exposed: 1
Frequency and duration: 330 days/year, 0.5 hours/day
Emission Measured: 2.7 mg/m^3

(b)

Results: Source: 1,1,2-Trichloroethane production plant (sampling)
Number of Workers Exposed: 1
Frequency and duration: 12 times/, 2 min/time
Emission Measured: 9.8 mg/m^3

(c)	
Results:	Source: 1,1,2-Trichloroethane production plant (analysis) Number of Workers Exposed: 1 Frequency and duration: 12 times/day, 10 min/time Emission Measured: 4.4 mg/m^3
(d)	
Results:	Source: 1,1,2-Trichloroethane production plant (maintenance) Number of Workers Exposed: 4 Frequency and duration: once/month, 15 min/time Emission Measured: 9.3 mg/m^3
Remarks:	Measured by charcoal tube sampling and GC determination
Reference:	Japan Industrial Safety and Health Association 1997

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Appendix 1

1,1,2-Trichloroethane

scenario 1

	emission rate	conc.	amount	percent	transformation rate [kg/h]	
	[kg/h]	[g/m^3]	[kg]	[%]	reaction	advection
air	1,000	9.8.E-06	9.8.E+04	98.7	1.6E+01	9.8.E+02
water	0	5.2.E-05	1.0.E+03	1.0	1.7E-01	1.0.E+00
soil	0	1.6.E-04	2.6.E+02	0.3	4.1E-02	
sediment		9.2.E-05	9.2.E+00	0.0	1.5E-03	1.8.E-04
		total amount	1.0.E+05			

scenario 2

	emission rate	conc.	amount	percent	transformation rate [kg/h]	
	[kg/h]	[g/m^3]	[kg]	[%]	reaction	advection
air	0	7.9.E-06	7.9.E+04	31.3	1.3.E+01	7.9.E+02
water	1000	8.6.E-03	1.7.E+05	68.1	2.8.E+01	1.7.E+02
soil	0	1.3.E-04	2.1.E+02	0.1	3.3.E-02	
sediment		1.5.E-02	1.5.E+03	0.6	2.5.E-01	3.1.E-02
		total amount	2.5.E+05			

scenario 3

	emission rate	conc.	amount	percent	transformation rate [kg/h]	
	[kg/h]	[g/m^3]	[kg]	[%]	reaction	advection
air	0	9.5.E-06	9.5.E+04	37.0	1.5.E+01	9.5.E+02
water	0	1.8.E-04	3.7.E+03	1.4	5.9.E-01	3.7.E+00
soil	1000	9.9.E-02	1.6.E+05	61.5	2.5.E+01	
sediment		3.3.E-04	3.3.E+01	0.0	5.3.E-03	6.6.E-04
		total amount	2.6.E+05			

scenario 4

	emission rate	conc.	amount	percent	transformation rate [kg/h]	
	[kg/h]	[g/m^3]	[kg]	[%]	reaction	advection
air	600	9.2.E-06	9.2.E+04	57.2	1.5.E+01	9.2.E+02
water	300	2.6.E-03	5.2.E+04	32.5	8.4.E+00	5.2.E+01
soil	100	1.0.E-02	1.6.E+04	10.0	2.6.E+00	
sediment		4.7.E-03	4.7.E+02	0.3	7.5.E-02	9.4.E-03
		total amount	1.6.E+05			

Physico-chemical parameter

molecular weight		133.4	Measured
melting point ［℃］		-35.5	Measured
vapor pressure [Pa]		1.00E+04	Measured
water solubility [g/m^3]		3500	Measured
log Kow		2.05	Measured
half life [h]	in air	4320	Estimated
	in water	4320	Estimated
	in soil	4320	Estimated
	in sediment	4320	Estimated

Temp. [℃]	25

Environmental parameter

		volume [m^3]	depth [m]	area [m^2]	organic carbon [－]	lipid content [－]	density [kg/m^3]	residence time [h]
bulk air	air	1.0E+13					1.2	100
	particles	2.0E+03						
	total	1.0E+13	1000	1E+10				
bulk water	water	2.0E+10					1000	1000
	particles	1.0E+06			0.04		1500	
	fish	2.0E+05				0.05	1000	
	total	2.0E+10	10	2E+09				
bulk soil	air	3.2E+08					1.2	
	water	4.8E+08					1000	
	solid	8.0E+08			0.04		2400	
	total	1.6E+09	0.2	8E+09				
bulk sediment	water	8.0E+07					1000	
	solid	2.0E+07			0.06		2400	50000
	total	1.0E+08	0.05	2E+09				

Intermedia Transport Parameters ［m/h］

air side air-water MTC	5	soil air boundary layer MTC	5
water side air water MTC	0.05	sediment-water MTC	1E-04
rain rate	1E-04	sediment deposition	5E-07
aerosol deposition	6E-10	sediment resuspension	2E-07
soil air phase diffusion MTC	0.02	soil water runoff	5E-05
soil water phase diffusion MTC	1E-05	soil solid runoff	1E-08

EXTRACT FROM IRPTC LEGAL FILES

```
file: 17.01 LEGAL   rn : 100102
systematic name:Ethane, 1,1,2-trichloro-
common name    :1,1,2-Trichloroethane
reported name  :1,1,2-Trichloroethane
cas no         :79-00-5            rtecs no       :KJ3150000
area          : ARG                type          : REG
 --------------------------------
|subject|specification|descriptor|
|-------+-------------+----------|
| AIR   |    OCC      |   MPC    |
 --------------------------------
8H-TWA: 45MG/M3 (10PPM). SKIN ABSORPTION, POTENTIAL CARCINOGEN.
entry date: OCT 1991                          effective date: 29MAY1991

title: LIMIT VALUES FOR CHEMICAL SUBSTANCES IN THE WORKING
ENVIRONMENT-RESOLUTION NO. 444/1991 OF THE MINISTRY OF WORK AND SOCIAL
SECURITY (AMENDING REGULATION DECREE NO. 351/1979 UNDER LAW NO.
19587/1972: HYGIENE AND SAFETY AT WORK)
original : ARGOB*, BOLETIN OFICIAL DE LA REPUBLICA ARGENTINA(ARGENTIAN
           OFFICIAL BULLETIN), 24170 , I , 1 , 1979
amendment: ARGOB*, BOLETIN OFICIAL DE LA REPUBLICA ARGENTINA(ARGENTIAN
           OFFICIAL BULLETIN), 27145 , I , 4 , 1991


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file: 17.01 LEGAL   rn : 204159
systematic name:Ethane, 1,1,2-trichloro-
common name    :1,1,2-Trichloroethane
reported name  :1,1,2-Trichloroethane
cas no         :79-00-5            rtecs no       :KJ3150000
area          : BRA                type          : REG
 --------------------------------
|subject|specification|descriptor|
|-------+-------------+----------|
| AIR   |    OCC      |   AL     |
 --------------------------------
35 MG/M3 (8 PPM) (FOR 48H/WK) (HAZARDOUS DEGREE : MEDIUM)
entry date: AUG 1982

title: SEGURANCA E MEDICINA DO TRABALHO (SECURITY AND OCCUPATIONAL
HYGIENE)
original : SMTBR*, SEGURANCA E MEDICINA DO TRABALHO(SECURITY AND
           OCCUPATIONAL HYGIENE), 3 , , , 1980


                                *******


file: 17.01 LEGAL   rn : 300362
systematic name:Ethane, 1,1,2-trichloro-
common name    :1,1,2-Trichloroethane
reported name  :1,1,2-Trichloroethane
cas no         :79-00-5            rtecs no       :KJ3150000
area          : CAN                type          : REG
 --------------------------------
|subject|specification|descriptor|
|-------+-------------+----------|
| AIR   |    OCC      |   TLV    |
 --------------------------------
TWA: 10 ppm, 45 mg/m3; skin absorption. Prescribed by the Canada
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Occupational Safety and Health Regulations, under the Canada Labour Code (administered by the Department of Employment and Immigration). The regulations state that no employee shall be exposed to a concentration of an airborne chemical agent in excess of the value for that chemical agent adopted by ACGIH (American Conference of Governmental Industrial Hygienists) in its publication entitled: "Threshold Limit Value and Biological Exposure Indices for 1985-86". The regulations also state that the employer shall, where a person is about to enter a confined space, appoint a qualified person to verify by means of tests that the concentration of any chemical agent or combination of chemical agents will not result in the exposure of the person to a concentration in excess of the value indicated above. These regulations prescribe standards whose enforcement will provide a safe and healthy workplace.
entry date: OCT 1994 effective date: 24MCH1994

amendment: CAGAAK, CANADA GAZETTE PART II, 128 , 7 , 1513 , 1994

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file: 17.01 LEGAL rn : 302288
systematic name:Ethane, 1,1,2-trichloro-
common name :1,1,2-Trichloroethane
reported name :1,1,2-Trichloroethane
cas no :79-00-5 rtecs no :KJ3150000
area : CAN type : REG

subject	specification	descriptor
SALE	CONSM	PRO
IMPRT		RQR
GOODS		
LABEL		

It is prohibited to sell, advertise, or import into Canada polishes, cleaning agents, liquid coating material or paint and varnish removers containing 1,1,2-trichloroethane, where such products or substances are packaged as consumer products, unless detailed labelling requirements are met. This prohibition is prescribed by Schedule I of the Hazardous Products Act (HPA), administered by the Department of Consumer and Corporate Affairs. It authorizes the prohibition and regulation of the sale, advertisement and importation of products that are or are likely to be a danger to the health or safety of the public. Products that fall under the purview of the Pest Control Products Act, the Food and Drugs Act, the Explosives Act or the Atomic Energy Control Act are, for the most part, exempt from the HPA.
entry date: MAY 1991 effective date: 01NOV1988

amendment: CAGAAK, CANADA GAZETTE PART II, 122 , 24 , 4625 , 1988

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file: 17.01 LEGAL rn : 303888
systematic name:Ethane, 1,1,2-trichloro-
common name :1,1,2-Trichloroethane
reported name :1,1,2-Trichloroethane
cas no :79-00-5 rtecs no :KJ3150000
area : CAN type : REG

subject	specification	descriptor
USE STORE LABEL	OCC	RQR

Ingredient Disclosure List - Concentration: 1% weight/weight. The Workplace Hazardous Materials Information System (WHMIS) is a national system providing information on hazardous materials used in the workplace. WHMIS is implemented by the Hazardous Products Act and the Controlled Products Regulations (administered by the Department of Consumer and Corporate Affairs). The regulations impose standards on employers for the use, storage and handling of controlled products. The regulations also address labelling and identification, employee instruction and training, as well as the upkeep of a Materials Safety Data Sheet (MSDS). The presence in a controlled product of an ingredient in a concentration equal to or greater than specified in the Ingredient Disclosure List must be disclosed in the Safety Data Sheet.
entry date: APR 1991 effective date: 31DEC1987

amendment: CAGAAK, CANADA GAZETTE PART II, 122 , 2 , 551 , 1988

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file: 17.01 LEGAL rn : 400400
systematic name:Ethane, 1,1,2-trichloro-
common name :1,1,2-Trichloroethane
reported name :1,1,2-Trichloroethane
cas no :79-00-5 rtecs no :KJ3150000
area : CSK type : REG

subject	specification	descriptor
WASTE	INDST	CLASS RQR

THE SUBSTANCE IS CLASSIFIED AS HAZARDOUS WASTE COMPONENT. IT IS OR CAN BE DANGEROUS TO HUMAN HEALTH OR ENVIRONMENT. QUANTITY, SPECIFICATION, USE OR DISPOSAL OF THE WASTE MUST BE REPORTED TO AUTHORITIES. TRANSPORT AND DISPOSAL OF THE WASTE MUST BE PERFORMED IN ACCORDANCE WITH SPECIAL DIRECTIVE
entry date: JAN 1992 effective date: 1AUG1991

title: PROVISION OF FEDERAL COMMITTEE FOR ENVIRONMENT WHICH DECLARES WASTE CLASSIFICATION AND CATALOGUE
original : SZCFR*, , , 69 , 1650 , 1991

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file: 17.01 LEGAL rn : 504201
!!! WARNING - not original IRPTC record - WARNING !!!
systematic name:Ethane, 1,1,2-trichloro-
common name :1,1,2-Trichloroethane
reported name :1,1,2-Trichloroethane
cas no :79-00-5 rtecs no :KJ3150000
area : DEU type : REG

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|subject|specification|descriptor|
|-------+-------------+----------|
| USE   |             |   RSTR   |
| USE   |    CONSM    |   RSTR   |
 -------------------------------
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1,1,2-Trichloroethane and substances or formulations containing 1,1,2-Trichloroethane at a mass content of 0.1 % or more may only be used in closed systems. This does not apply to the use for research, analytical or scientific purposes.
entry date: JUL 2001 effective date: 01JAN2001

title: Ordinance on Hazardous Substances (Gefahrstoffverordnung)
original : BGZBAD, Bundesgesetzblatt, , I , 2233 , 1999
amendment: BGZBAD, Bundesgesetzblatt, , I , 1045 , 2000

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file: 17.01 LEGAL rn : 523884
!!! WARNING - not original IRPTC record - WARNING !!!
systematic name:Ethane, 1,1,2-trichloro-
common name :1,1,2-Trichloroethane
reported name :1,1,2-Trichloroethane
cas no :79-00-5 rtecs no :KJ3150000
area : DEU type : REG

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|subject|specification|descriptor|
|-------+-------------+----------|
| AQ    |             |   CLASS  |
| USE   |    INDST    |   RQR    |
 -------------------------------
```

This substance is classified as severely hazardous to water (Water Hazard Class: WHC 3). (There are 3 water hazard classes: WHC 3 = severely hazardous; WHC 2 = hazardous; WHC 1 = moderately hazardous; and the classification as "not hazardous to water"). The purpose of the classification is to identify the technical requirements of industrial plants which handle substances hazardous to water.
entry date: SEP 2001 effective date: 01JUN1999

title: Administrative Order relating to Substances Hazardous to Water (Verwaltungsvorschrift wassergefaehrdende Stoffe)
original : BUANZ*, Bundesanzeiger, 51 , 98a , 1 , 1999

****

file: 17.01 LEGAL rn : 532521
!!! WARNING - not original IRPTC record - WARNING !!!
systematic name:Ethane, 1,1,2-trichloro-
common name :1,1,2-Trichloroethane
reported name :1,1,2-Trichloroethane
cas no :79-00-5 rtecs no :KJ3150000
area : DEU type : REG

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|subject|specification|descriptor|
|-------+-------------+----------|
| AIR   |    EMI      |   MPC    |
 -------------------------------
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THIS SUBSTANCE BELONGS TO CLASS I. THE AIR EMISSIONS OF ORGANIC

COMPOUNDS MUST NOT EXCEED (AS THE SUM OF ALL COMPOUNDS IN ONE CLASS) THE FOLLOWING MASS CONCENTRATIONS: CLASS I - 20 MG/M3 AT A MASS FLOW OF >= 0.1 KG/H; CLASS II - 100 MG/M3 AT A MASS FLOW OF >= 2 KG/H; CLASS III - 150 MG/M3 AT A MASS FLOW OF >= 3 KG/H. IF COMPOUNDS FROM DIFFERENT CLASSES ARE PRESENT, THE MASS CONCENTRATION MUST NOT EXCEED 150 MG/M3 AT A TOTAL MASS FLOW OF >= 3 KG/H.
entry date: JAN 1995 effective date: 01MCH1986

title: Technical Instructions on Air Quality Control (Technische Anleitung zur Reinhaltung der Luft)
original : GMSMA6, Gemeinsames Ministerialblatt, , 7 , 93 , 1986

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file: 17.01 LEGAL rn : 532861
!!! WARNING - not original IRPTC record - WARNING !!!
systematic name:Ethane, 1,1,2-trichloro-
common name :1,1,2-Trichloroethane
reported name :1,1,2-Trichloroethane
cas no :79-00-5 rtecs no :KJ3150000
area : DEU type : REG

subject	specification	descriptor
SALE		PRO

It is prohibited to market: 1) the substance; 2) substances and formulations containing the substance at a mass content of 0.1% or higher. The prohibition does not apply to the marketing of substances or formulations to be used in closed systems of industrial processes.
entry date: JUL 2001 effective date: 30JUN2000

title: Ordinance on the Prohibition of Chemicals (Chemikalien-Verbotsverordnung)
original : BGZBAD, Bundesgesetzblatt, , I , 1151 , 1996
amendment: BGZBAD, Bundesgesetzblatt, , I , 932 , 2000

****

file: 17.01 LEGAL rn : 540819
!!! WARNING - not original IRPTC record - WARNING !!!
systematic name:Ethane, 1,1,2-trichloro-
common name :1,1,2-Trichloroethane
reported name :1,1,2-Trichloroethane
cas no :79-00-5 rtecs no :KJ3150000
area : DEU type : REC

subject	specification	descriptor
AIR	OCC	MAK

MAK value (8-hour time-weighted average): 10 ml/m3 (ppm) or 55 mg/m3 (20 C, 1013 hPa). Peak limitation category II,2: Substance with systemic effects, onset of effect within 2 h, half-life 2 h to shift-length; excursion factor = 5 (peak level is 5 x MAK); maximum duration of peaks is 30 minutes, average value; maximum frequency is 2x/shift. - Danger of cutaneous absorption. - Carcinogen category 3B: Substance for which in vitro or animal studies have yielded evidence of carcinogenic effects

that is not sufficient for classification of the substance in one of the other categories. Further studies are required before a final decision can be made. A MAK value can be established provided no genotoxic effects have been detected. - Vapour pressure: 25 hPa at 20 C.
entry date: MAY 2001

title: List of MAK and BAT Values 2000. Maximum Concentrations and Biological Tolerance Values at the Workplace. (MAK- und BAT-Werte-Liste 2000. Maximale Arbeitsplatzkonzentrationen und Biologische Arbeitsstofftoleranzwerte.)
original : MPGFDF, Mitteilung der Senatskommission zur Pruefung gesundheitsschaedlicher Arbeitsstoffe, 36 , , , 2000

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file: 17.01 LEGAL rn : 600714
systematic name:Ethane, 1,1,2-trichloro-
common name :1,1,2-Trichloroethane
reported name :1,1,2-Trichloroethane
cas no :79-00-5 rtecs no :KJ3150000
area : GBR type : REC

subject	specification	descriptor
AQ MONIT	METHD DRINK	RQR

Describes methods for the determination of this substance in raw and potable waters by pentane extraction and electron capture gas chromatography.
entry date: MCH 1995 effective date: 1985

title: Determination of Very Low Concentrations of Hydrocarbons and Halogenated Hydrocarbons in Water.
original : SCAA**, , , , , 1984

****

file: 17.01 LEGAL rn : 606605
systematic name:Ethane, 1,1,2-trichloro-
common name :1,1,2-Trichloroethane
reported name :1,1,2-Trichloroethane
cas no :79-00-5 rtecs no :KJ3150000
area : GBR type : REG

subject	specification	descriptor
TRNSP	MARIN	RQR
AQ	MARIN	RSTR
AQ	EMI	RSTR

CATEGORY B SUBSTANCE: DISCHARGE INTO THE SEA IS PROHIBITED; DISCHARGE OF TANK WASHINGS AND RESIDUAL MIXTURES IS SUBJECT TO RESTRICTIONS.
entry date: 1992 effective date: 06APR1987

title: THE MERCHANT SHIPPING (CONTROL OF POLLUTION BY NOXIOUS LIQUID SUBSTANCES IN BULK) REGULATIONS 1987, SCHEDULE 1
original : GBRSI*, STATUTORY INSTRUMENTS, 551 , , 15 , 1987

amendment: GBRSI*, STATUTORY INSTRUMENTS, 2604 , , 2 , 1990

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file: 17.01 LEGAL rn : 700855
systematic name:Ethane, 1,1,2-trichloro-
common name :1,1,2-Trichloroethane
reported name :1,1,2-Trichloroethane
cas no :79-00-5 rtecs no :KJ3150000
area : IND type : REG

subject	specification	descriptor
MANUF		RQR
SAFTY		RQR
STORE		RQR
IMPRT		RQR

These rules define the responsabilities of occupiers of any industrial activity in which this toxic and hazardous substance may be involved. These responsabilities encompass: (a) assessment of major hazards (causes, occurrence, frequency); (b) measures to prevent accidents and limit eventual impairment to human health and pollution of the environment; (c) provision of relevant factual knowledge and skills to workers in order to ensure health and environmental safety when handling equipments and the foregoing chemical; (d) notification of the competent authorities in case of major accidents; (e) notification of sites to the competent authorities 3 months before commencing; (f)preparation of an on-site emergency plan as to how major accidents should be coped with; (g) provision of competent authorities with information and means to respond quickly and efficiently to any off-site emergency; (h) provision of information to persons outside the site, liable to be affected by a major accident; (i) labelling of containers as to clearly identify contents, manufacturers, physical, chemical and toxicological data; (j) preparation of a safety data sheet including any significant information regarding hazard of this substance and submission of safety reports to the competent authorities; (k) for the import of a hazardous chemical to India, importers must supply the competent authorities with specified information regarding the shipment. (applies to trichloroethane)
entry date: SEP 1992 effective date: 27NOV1989

title: THE MANUFACTURE, STORAGE AND IMPORT OF HAZARDOUS CHEMICALS RULES. 1989
original : GAZIN*, THE GAZETTE OF INDIA, 787 , , , 1989

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file: 17.01 LEGAL rn : 801007
systematic name:Ethane, 1,1,2-trichloro-
common name :1,1,2-Trichloroethane
reported name :1,1,2-Trichloroethane
cas no :79-00-5 rtecs no :KJ3150000
area : JPN type : REG

subject	specification	descriptor
AQ	AMBI	MXL

STANDARD VALUE (YEARLY AVERAGE VALUE): 0.006MG/L OR LESS
entry date: MAY 1994

title: ENVIRONMENTAL QUALITY STANDARD FOR WATER
original : QEJPN*, QUALITY OF THE ENVIRONMENT IN JAPAN, , , ,

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file: 17.01 LEGAL rn : 801047
systematic name:Ethane, 1,1,2-trichloro-
common name :1,1,2-Trichloroethane
reported name :1,1,2-Trichloroethane
cas no :79-00-5 rtecs no :KJ3150000
area : JPN type : REG

subject	specification	descriptor
SOIL		MXL

TARGET LEVELS OF SOIL QUALITY THROUGH LEACHING TEST AND CONTENT TEST :
0.006 MG/L OR LESS IN TEST LIQUID.
entry date: SEP 1994

title: ENVIRONMENTAL QUALITY STANDARDS FOR SOIL POLLUTION
original : QEJPN*, QUALITY OF THE ENVIRONMENT IN JAPAN, , , ,

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file: 17.01 LEGAL rn : 802005
systematic name:Ethane, 1,1,2-trichloro-
common name :1,1,2-Trichloroethane
reported name :1,1,2-Trichloroethane
cas no :79-00-5 rtecs no :KJ3150000
area : JPN type : REG

subject	specification	descriptor
AQ	DRINK	MPC

THE CONCENTRATION OF 1,1,2-TRICHLOROETHANE IN DRINKING WATER SUPPLIED BY
THE WATER WORKS SHOULD NOT EXCEED 0.006 MG/L
entry date: JUL 1994 effective date: 01DEC1993

title: THE WATERWORKS LAW
original : JPNWW*, WATERWORKS LAW OF JAPAN, , , , 1957
amendment: JPNWW*, WATERWORKS LAW OF JAPAN, , , , 1992

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file: 17.01 LEGAL rn : 1010406
systematic name:Ethane, 1,1,2-trichloro-
common name :1,1,2-Trichloroethane
reported name :1,1,2-Trichloroethane
cas no :79-00-5 rtecs no :KJ3150000
area : MEX type : REG

subject	specification	descriptor
AIR	OCC	MXL

AT ANY WORKPLACE WHERE THIS SUBSTANCE IS PRODUCED, STORED OR HANDLED A MAXIMUM PERMISSIBLE LEVEL OF 45MG/M3 (10PPM) MUST BE OBSERVED FOR A PERIOD OF 8 HOURS OR 90MG/M3 (20PPM) FOR 15 MINUTES FOUR TIMES A DAY WITH INTERVALS OF AT LEAST 1 HOUR.
entry date: DEC 1991 effective date: 28MAY1984

title: INSTRUCTION NO.10 RELATED TO SECURITY AND HYGIENIC CONDITIONS AT WORKPLACES. (INSTRUCTIVO NO. 10, RELATIVO A LAS CONDICIONES DE SEGURIDAD E HIGIENE DE LOS CENTROS DE TRABAJO).
original : DOMEX*, DIARIO OFICIAL, , , , 1984

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file: 17.01 LEGAL rn : 1301033
systematic name:Ethane, 1,1,2-trichloro-
common name :1,1,2-Trichloroethane
reported name :1,1,2-Trichloroethane
cas no :79-00-5 rtecs no :KJ3150000
area : USA type : REG

subject	specification	descriptor
MANUF	REQ	PRMT
USE	OCC	PRMT
SAFTY	OCC	MXL

; Summary - THE FOLLOWING CHEMICAL IS INCLUDED ON A LIST OF CHEMICALS AND MIXTURES FOR WHICH REPORTING IS CURRENTLY REQUIRED UNDER THE TOXIC SUBSTANCES CONTROL ACT SECTION 2607A. THIS TOXIC SUBSTANCE IS SUBJECT TO PRELIMINARY ASSESSMENT INFORMATION RULES ON PRODUCT ION QUANTITIES, USES, EXPOSURES, AND ADVERSE EFFECTS. MANUFACTURERS INCLUDING IMPORTERS MUST SUBMIT A REPORT FOR THIS LISTED CHEMICAL MANUFACTURED AT EACH SITE.
entry date: OCT 1991 effective date: 1982

title: PRELIMINARY ASSESSMENT INFORMATION RULES
original : FEREAC, FEDERAL REGISTER, 47 , , 26998 , 1982
amendment: CFRUS*, CODE OF FEDERAL REGULATIONS, 40 , 712 , 30 , 1990

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file: 17.01 LEGAL rn : 1302831
systematic name:Ethane, 1,1,2-trichloro-
common name :1,1,2-Trichloroethane
reported name :1,1,2-Trichloroethane
cas no :79-00-5 rtecs no :KJ3150000
area : USA type : REG

subject	specification	descriptor
FOOD	ADDIT	RSTR
TRANS		RSTR
STORE		RSTR
PACK		RSTR

; Summary - THIS SUBSTANCE IS INCLUDED ON A LIST OF SUBSTANCES USED TO PREPARE ADHESIVES WHICH MAY BE SAFELY USED AS COMPONENTS OF ARTICLES INTENDED FOR USE IN PACKAGING, TRANSPORTATION, OR HOLDING FOOD IN ACCORDANCE WITH THE FOLLOWING PRESCRIBED CONDITIONS: SUBSTA NCE MUST BE SEPARATED FROM THE FOOD BY A FUNCTIONAL BARRIER, MUST NOT EXCEED LIMITS OF GOOD MANUFACTURING PRACTICE USED WITH DRY FOODS, OR NOT EXCEED TRACE AMOUNTS AT SEAMS AND EDGE EXPOSURES WHEN USED WITH FATTY AND AQUEOUS FOODS. ALSO REGULATED BY SEA M INTEGRITY, LABELING STANDARDS, AND ANY PROVISION UNDER 21 CFR 175
entry date: NOV 1991 effective date: 1977

title: SUBSTANCES FOR USE ONLY AS COMPONENTS OF ADHESIVES
original : FEREAC, FEDERAL REGISTER, 42 , , 14534 , 1977
amendment: CFRUS*, CODE OF FEDERAL REGULATIONS, 21 , 175 , 105 , 1988

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file: 17.01 LEGAL rn : 1307068
systematic name:Ethane, 1,1,2-trichloro-
common name :1,1,2-Trichloroethane
reported name :1,1,2-Trichloroethane
cas no :79-00-5 rtecs no :KJ3150000
area : USA type : REG

subject	specification	descriptor
AIR	EMI	RQR

; Summary - FROM A LIST OF POLLUTANTS JUDGED TO BE HAZARDOUS FOR WHICH EMISSION STANDARDS WILL BE DEVELOPED
entry date: SEP 1991 effective date: 1985

title: CLEAN AIR ACT, 112--NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS
original : FEREAC, FEDERAL REGISTER, 50 , , 46290 , 1985
amendment: CFRUS*, CODE OF FEDERAL REGULATIONS, 40 , 61 , 1 , 1990

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file: 17.01 LEGAL rn : 1309633
systematic name:Ethane, 1,1,2-trichloro-
common name :1,1,2-Trichloroethane
reported name :1,1,2-Trichloroethane
cas no :79-00-5 rtecs no :KJ3150000
area : USA type : REG

subject	specification	descriptor
CLASS	INDST	RQR
AIR	EMI	RQR
AQ	EMI	RQR

100 (45.4); Summary - RELEASES OF THIS HAZARDOUS SUBSTANCE, IN QUANTITIES EQUAL TO OR GREATER THAN ITS REPORTABLE QUANTITY (RQ), REPORTED AS ›LBS (KG)|, ARE SUBJECT TO REPORTING TO THE NATIONAL RESPONSE CENTER UNDER THE COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT. (#)- RQ IS SUBJECT TO CHANGE
entry date: SEP 1991 effective date: 1990

title: CERCLA: LIST OF HAZARDOUS SUBSTANCES AND REPORTABLE QUANTITIES
original : CFRUS*, CODE OF FEDERAL REGULATIONS, 40 , 302 , 4 , 1990
amendment: CFRUS*, CODE OF FEDERAL REGULATIONS, 40 , 302 , 4 , 1990

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file: 17.01 LEGAL rn : 1311014
systematic name:Ethane, 1,1,2-trichloro-
common name :1,1,2-Trichloroethane
reported name :1,1,2-Trichloroethane
cas no :79-00-5 rtecs no :KJ3150000
area : USA type : REG

subject	specification	descriptor
AQ		RQR

; Summary - THIS SUBSTANCE IS INCLUDED ON A LIST REQUIRED OF THE EPA BY THE CWA SECTION 304 OF CONVENTIONAL POLLUTANTS REQUIRING MAXIMUM DAILY EFFLUENT LIMITATIONS.
entry date: NOV 1991 effective date: 1981

title: CLEAN WATER ACT (WATER QUALITY ACT OF 1987 INFORMATION AND GUIDELINES)
original : XCODE*, UNITED STATES CODE, 33 , , 1314 , 1990
amendment: XCODE*, UNITED STATES CODE, 33 , , 1314 , 1990

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file: 17.01 LEGAL rn : 1324210
systematic name:Ethane, 1,1,2-trichloro-
common name :1,1,2-Trichloroethane
reported name :1,1,2-Trichloroethane
cas no :79-00-5 rtecs no :KJ3150000
area : USA type : REG

subject	specification	descriptor
AQ	GRND	MONIT
AQ	GRND	MXL

; Summary - THIS LIST IS REQUIRED ONLY FOR GROUND-WATER MONITORING AT RCRA LAND BASED HAZARDOUS WASTE DISPOSAL UNITS. THIS FINAL RULE WILL REQUIRE THAT AN ANALYSIS OF ALL THE CONSTITUENTS OF THIS LIST BE PERFORMED ON THE GROUND WATER TAKEN FROM WELLS SURROUNDING TH OSE UNITS. THIS ANALYSIS TAKES PLACE WHEN GROUND-WATER CONTAMINATION IS FIRST DETECTED, AND THEN AGAIN ONCE PER YEAR 40 CFR 264. WHEN A LISTED CONSTITUENT IS FOUND TO BE PRESENT A BACKGROUND VALUE MUST BE SET IN COMPLIANCE WITH 40 CFR 264.98(H)(2) UNLE SS OTHERWISE STATED.
entry date: SEP 1991 effective date: 1987

title: LIST (PHASE 1) OF HAZARDOUS CONSTITUENTS FOR GROUND-WATER MONITORING FINAL RULE: INCLUDING MAXIMUM CONCENTRATION OF CONSTITUENT: FOR GROUNDWATER PROTECTION.
original : FEREAC, FEDERAL REGISTER, 52 , , 25947 , 1987
amendment: CFRUS*, CODE OF FEDERAL REGULATIONS, 40 , 264 , , 1990

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file: 17.01 LEGAL rn : 1325325
systematic name:Ethane, 1,1,2-trichloro-
common name :1,1,2-Trichloroethane
reported name :1,1,2-Trichloroethane
cas no :79-00-5 rtecs no :KJ3150000
area : USA type : REC

subject	specification	descriptor
SAFTY USE	OCC	MXL
	OCC	MXL

500 PPM
entry date: OCT 1991 effective date: JUN1990

title: POCKET GUIDE TO CHEMICAL HAZARDS
original : XPHPAW, US PUBLIC HEALTH SERVICE PUBLICATION, 90 , 117 , 216 , 1990
amendment: XPHPAW, US PUBLIC HEALTH SERVICE PUBLICATION, 90 , 117 , 216 , 1990

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file: 17.01 LEGAL rn : 1332388
systematic name:Ethane, 1,1,2-trichloro-
common name :1,1,2-Trichloroethane
reported name :Ethane,1,1,2-trichloro-
cas no :79-00-5 rtecs no :KJ3150000
area : USA type : REG

subject	specification	descriptor
WASTE STORE TRNSP	INDST	CLASS
		RQR
	REMOV	RQR

; Summary - THIS CHEMICAL, IF DISCARDED, MUST BE TREATED AS AN ACUTE HAZARDOUS WASTE. ACUTE HAZARDOUS WASTES REGULATIONS ARE MORE RESTRICTIVE FOR EXCLUSION. ANY RESIDUE OF THIS CHEMICAL LABELED AS ACUTELY HAZARDOUS AND REMAINING IN A CONTAINER, OR AN INNER LINER R EMOVED FROM A CONTAINER, IS CONSIDERED A HAZARDOUS WASTE IF DISCARDED UNLESS TRIPLE RINSING OR OTHER CLEANING MEASURES ARE TAKEN (40 CFR 261.33E).
entry date: JAN 1992 effective date: 1980

title: RCRA-RESOURCE AND CONSERVATION RECOVERY ACT: DISCARDED COMMERCIAL CHEMICAL PRODUCTS, OFF-SPECIFICATION SPECIES, CONTAINER RESIDUES, AND SPILL RESIDUES THEREOF.
original : FEREAC, FEDERAL REGISTER, 45 , , 78541 , 1980
amendment: CFRUS*, CODE OF FEDERAL REGULATIONS, 40 , 261 , 33 , 1990

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file: 17.01 LEGAL rn : 1332617
systematic name:Ethane, 1,1,2-trichloro-

common name :1,1,2-Trichloroethane
reported name :1,1,2-Trichloroethane
cas no :79-00-5 rtecs no :KJ3150000
area : USA type : REG

subject	specification	descriptor
WASTE	INDST	CLASS
STORE		RQR
TRNSP	REMOV	RQR

; Summary - THIS CHEMICAL, IF DISCARDED, MUST BE TREATED AS AN ACUTE HAZARDOUS WASTE. ACUTE HAZARDOUS WASTES REGULATIONS ARE MORE RESTRICTIVE FOR EXCLUSION. ANY RESIDUE OF THIS CHEMICAL LABELED AS ACUTELY HAZARDOUS AND REMAINING IN A CONTAINER, OR AN INNER LINER R EMOVED FROM A CONTAINER, IS CONSIDERED A HAZARDOUS WASTE IF DISCARDED UNLESS TRIPLE RINSING OR OTHER CLEANING MEASURES ARE TAKEN (40 CFR 261.33E).
entry date: JAN 1992 effective date: 1980

title: RCRA-RESOURCE AND CONSERVATION RECOVERY ACT: DISCARDED COMMERCIAL CHEMICAL PRODUCTS, OFF-SPECIFICATION SPECIES, CONTAINER RESIDUES, AND SPILL RESIDUES THEREOF.
original : FEREAC, FEDERAL REGISTER, 45 , , 78541 , 1980
amendment: CFRUS*, CODE OF FEDERAL REGULATIONS, 40 , 261 , 33 , 1990

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file: 17.01 LEGAL rn : 1336076
systematic name:Ethane, 1,1,2-trichloro-
common name :1,1,2-Trichloroethane
reported name :1,1,2-Trichloroethane
cas no :79-00-5 rtecs no :KJ3150000
area : USA type : REG

subject	specification	descriptor
AIR	EMI	RQR
SOIL	EMI	RQR
AQ	EMI	RQR
MANUF	EMI	RQR

; Summary - FACILITIES THAT EXCEEDED A MANUFACTURING, IMPORTATION, OR PROCESSING THRESHOLD OF 25,000 LBS OR THE USE OF 10,000 LBS FOR THIS CHEMICAL MUST REPORT TO EPA ANY RELEASES OF THE CHEMICAL (OR CATEGORY CHEMICAL) TO AIR, LAND, WATER, POTW, UNDERGROUND INJECTIO N, OR OFF SITE TRANSFER. THIS REGULATION COVERS STANDARD INDUSTRIAL CLASSIFICATION (SIC) CODES 20-39 ONLY).
entry date: OCT 1991 effective date: 1987

title: SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT, TITLE III. EPCRA SECTION 313 LIST OF TOXIC SUBSTANCES
original : CFRUS*, CODE OF FEDERAL REGULATIONS, 40 , 372 , 65 , 1988
amendment: CFRUS*, CODE OF FEDERAL REGULATIONS, 40 , 372 , 65 , 1988

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file: 17.01 LEGAL rn : 1337016
systematic name:Ethane, 1,1,2-trichloro-

common name :1,1,2-Trichloroethane
reported name :1,1,2-Trichloroethane
cas no :79-00-5 rtecs no :KJ3150000
area : USA type : REG

subject	specification	descriptor
AQ	DRINK	CLASS

; Summary - FROM COMPOUNDS, WHICH MAY CAUSE HUMAN HEALTH HAZARDS, LISTED FOR REGULATION UNDER THE SAFE DRINKING WATER ACT.
entry date: OCT 1991 effective date: MAY221989

title: SAFE DRINKING WATER ACT (SDWA) 1401-CONTAMINANTS TO BE REGULATED:
original : FEREAC, FEDERAL REGISTER, 54 , 97 , 22140 , 1989
amendment: FEREAC, FEDERAL REGISTER, 54 , 97 , 22104 , 1989

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file: 17.01 LEGAL rn : 1340843
systematic name:Ethane, 1,1,2-trichloro-
common name :1,1,2-Trichloroethane
reported name :1,1,2-Trichloroethane
cas no :79-00-5 rtecs no :KJ3150000
area : USA type : REC

subject	specification	descriptor
AIR	OCC	TLV

Time-Weighted Avg (TWA) 10 ppm, 55 MG/M3, skin; Summary - THIS THRESHOLD LIMIT VALUE IS INTENDED FOR USE IN THE PRACTICE OF INDUSTRIAL HYGIENE AS A GUIDELINE OR RECOMMENDATION IN THE CONTROL OF POTENTIAL HEALTH HAZARDS.
entry date: DEC 1991 effective date: 1989

title: THRESHOLD LIMIT VALUES
original : ACGIH*, AMERICAN CONFERENCE OF GOVERNMENT INDUSTRIAL HYGIENISTS, , , 11 , 1989
amendment: ACGIH*, AMERICAN CONFERENCE OF GOVERNMENT INDUSTRIAL HYGIENISTS, , , 11 , 1991

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file: 17.01 LEGAL rn : 1345039
systematic name:Ethane, 1,1,2-trichloro-
common name :1,1,2-Trichloroethane
reported name :1,1,2-Trichloroethane
cas no :79-00-5 rtecs no :KJ3150000
area : USA type : REG

subject	specification	descriptor
MONIT		RQR

; Summary - THIS IS A CHEMICAL OR MIXTURE FOR WHICH REPORTING IS CURRENTLY REQUIRED UNDER THE TOXIC SUBSTANCE CONTROL ACT HEALTH AND SAFETY STUDIES SECTION 2607D. PERSONS WHO CURRENTLY MANUFACTURE OR

PROCESS CHEMICAL SUBSTANCES OR MIXTURES FOR COMMERCIAL PURPOSES, THOSE WHO PROPOSE TO DO SO, AND THOSE WHO ARE NOT CURRENTLY INVOLVED WITH A LISTED CHEMICAL BUT WHO MANUFACTURED OR PROCESSED IT OR PROPOSED TO DO SO ANY TIME DURING THE TEN YEAR PERIOD PRIOR TO THE TIME IT BECAME LISTED MUST SUBMIT TO THE ADMINISTRATOR OF THE U.S. EPA STUDIES OR LISTS OF HEALTH AND SAFETY STUDIES CONDUCTED ON THIS SUBSTANCE FOR EVALUATION.
entry date: OCT 1991 effective date: 1986

title: HEALTH AND SAFETY DATA REPORTING RULES SECTION 8(D)
original : FEREAC, FEDERAL REGISTER, 51 , , 32726 , 1986
amendment: CFRUS*, CODE OF FEDERAL REGULATIONS, 40 , 716 , 120 , 1990

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file: 17.01 LEGAL rn : 1470118
!!! WARNING - not original IRPTC record - WARNING !!!
systematic name:Ethane, 1,1,2-trichloro-
common name :1,1,2-Trichloroethane
reported name :1,1,2-Trichloroethane
cas no :79-00-5 rtecs no :KJ3150000
area : EEC type : REG

subject	specification	descriptor
MANUF	INDST	CLASS
IMPRT	INDST	CLASS

The substance is included in a list of existing substances produced or imported within the Community in quantities exceeding 1000 tonnes per year. - A system of data reporting by any manufacturer who has produced or any importer who has imported the substance, as such or in a preparation, in quanities exceeding 10 tonnes per year is established.
entry date: AUG 1999 effective date: 04JUN1993

title: Council Regulation (EEC) No 793/93 of 23 March 1993 on the evaluation and control of the risks of existing substances
original : OJECFC, Official Journal of the European Communities, L84 , , 1 , 1993

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file: 17.01 LEGAL rn : 1476505
!!! WARNING - not original IRPTC record - WARNING !!!
systematic name:Ethane, 1,1,2-trichloro-
common name :1,1,2-Trichloroethane
reported name :1,1,2-Trichloroethane
cas no :79-00-5 rtecs no :KJ3150000
area : EEC type : REG

subject	specification	descriptor
USE	CONSM	RSTR
SALE	CONSM	RSTR
USE		RSTR
LABEL		RQR

May not be used in concentrations equal to or greater than 0.1 % by weight in substances and preparations placed on the market for sale to

the general public and/or in diffuse applications such as in surface cleaning and cleaning of fabrics. The packaging of such substances and preparations containing the substance in concentrations equal to or greater than 0.1 % shall be legible and indelibly marked as follows: "For use in industrial installations only." By way of derogation this provision shall not apply to medical or veterinary products and cosmetic products.
entry date: DEC 2001 effective date: 19NOV2001

title: Council Directive of 27 July 1976 on the approximation of the laws, regulations and administrative provisions of the Member States relating to restrictions on the marketing and use of certain dangerous substances and preparations (76/769/EEC)
original : OJECFC, Official Journal of the European Communities, L262 , , 201 , 1976
amendment: OJECFC, Official Journal of the European Communities, L286 , , 27 , 2001

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file: 17.01 LEGAL rn : 1660412
!!! WARNING - not original IRPTC record - WARNING !!!
systematic name:Ethane, 1,1,2-trichloro-
common name :1,1,2-Trichloroethane
reported name :1,1,2-Trichloroethane
cas no :79-00-5 rtecs no :KJ3150000
area : IMO type : REG

subject	specification	descriptor
AQ	EMI	RSTR
TRNSP	MARIN	RQR

Category C substance: Noxious liquid substances which if discharged into the sea from tank cleaning or deballasting operations would present a minor hazard to either marine resources or human health and therefore require special operational conditions. - Category C substances are slightly toxic to aquatic life (TLm of 10 ppm or more, but less than 100 ppm), or are categorized because of other special characteristics. - The discharge into sea of substances in Category C or ballast water, tank washings, or other residues or mixtures containing such substances shall be prohibited, except when the discharge is made under specified conditions. - Technical requirements for pumping, piping and unloading arrangements on ships and for reception facilities and cargo unloading terminal arrangements in the ports are given. Requirements on the design, equipment and operation of ships for minimizing accidental pollution are given.
entry date: JUN 1999 effective date: 03MCH1996

title: Regulations for the Control of Pollution by Noxious Liquid Substances in Bulk (Annex II of MARPOL 73/78)
original : MARPO*, International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto (MARPOL 73/78), Consolidated Edition, , , , 1997