

## Summary of Initial Risk Assessment Report

### Tetrachloromethane CAS No : 56-23-5

PRTR No of Japan: 112

This substance is assessed based on Guideline for Initial Risk Assessment Version 1.0

#### 1. General Information

##### 1.1 Physico-chemical properties

Appearance	Colorless liquid
Melting point	-23 degC
Boiling point	76.7 degC
Water solubility	800 mg/L (20 degC), 1,160 mg/L (25 degC)
Henry's constant	$2.80 \times 10^3 \text{ Pa} \cdot \text{m}^3/\text{mol}$ ( $2.76 \times 10^{-2} \text{ atm} \cdot \text{m}^3/\text{mol}$ ) (25degC, measured)
Octanol/water partition coefficient (log Kow)	2.83 (measured), 2.44 (estimated)
Soil adsorption coefficient	Koc = 49 (estimated)

##### 1.2 Environmental fate

Bioaccumulation	Exhibits little to no bioaccumulation Bioconcentration factor (BCF) : 3.2-7.4 (10 microg/L), 3.8-11 (1 microg/L) (carp), 17 and 52 (trout), 30 ( <i>Oncorhynchus mykiss</i> ), 26 ( <i>Lepomis macrochirus</i> ), measured
Biodegradation	Tetrachloromethane is generally considered to be non-biodegradable, however, it is expected to be biodegradable under specific conditions involving acclimatized microorganisms.
Stability in the environment	(In air) Reaction with OH radical: Reaction rate constant is $1.2 \times 10^{-16} \text{ cm}^3/\text{molecule} \cdot \text{sec}$ . (25 degC, measured) The half-life is 200 years or longer, given OH radical concentration of $5 \times 10^5 - 1 \times 10^6 \text{ molecule}/\text{cm}^3$ . Reaction with ozone: Tetrachloromethane does not react with ozone. When tetrachloromethane diffuses from the tropospheric air to the stratospheric air, it is degraded by ultraviolet rays and produces chlorine atoms. A chlorine atom reacts with tens of thousands of ozone molecules through chain reaction. As a result, ozone layer is destroyed. Reaction with nitrate radical: No data (In water) Tetrachloromethane is not expected to be hydrolyzed in water.
Environmental fate	If released into water, tetrachloromethane is expected to be removed mainly by volatilization, though it may be biodegradable under specific conditions involving acclimatized microorganisms.

## 2. Sources of release to the environment

### 2.1 Annual production, import, export and domestic supply in 2001 (ton/year)

Production	Import	Export	Domestic supply	Remarks
3,391	304	0.4	3,695	

### 2.2 Uses

Raw materials for chemical products (98.8%), reagents (1.2%)

### 2.3 Release from the industries within the scope of PRTR system (in 2001)

Release sources		Air (ton)	Waters (ton)	Soil (ton)	Remarks
Listed industries	Reported release	72	1	0	Release to rivers: 0.532 tons
	Release outside notification	0	0	0	
Release outside notification from non listed industry		--	--	--	
Households		--	--	--	
Mobile sources		--	--	--	
Total		72	1	0	

### 2.4 Releases from other sources

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### 2.5 Main release route

Tetrachloromethane is expected to be released into air mainly during its use.

### 3. Exposure Assessment

#### 3.1 Measured environmental concentration

Media	No. of points detected / No. of points measured	No. of samples detected / No. of samples measured	Detection range	95th percentile	Detection limit	Year of investigation, Institution
Air (microg/m <sup>3</sup> )	30/30	115/115	0.13 - 2.3	1.4	0.01	2001 Ministry of the Environment
River water (microg/L)	10/2,084	15/5,323	nd-1 <sup>1)</sup>	--	0.1-0.2	2001 National Institute for Environmental Studies
Drinking water (microg/L)	5,519 <sup>2)</sup>	--	nd-1.6 <sup>1)</sup>	--	--	2000 Japan Water Works Association
Food (microg/g)	--	0/24	nd	--	0.0002	1999 Ministry of the Environment

nd: Not detected

For calculation of the 95th percentile, data less than the detection limit are replaced with a value equal to 1/2 of the detection limit.

1) annual average

2) number of water purification plants

#### 3.2 Estimated environmental concentration

Media	Estimated concentration	Description
Air (microg/m <sup>3</sup> )	0.84	Calculated by mathematical model / Atmospheric Dispersion Model for Exposure and Risk Assessment ver.1.0 (AIST-ADMER)
River water (microg/L)	0.32	Calculated by mathematical model / Integrated River Model to predict the distribution of chemical concentration ( IRM1 )

#### 3.3 Estimated environmental concentration in water (EEC)

EEC(microg/L)	1
	Maximum (1 microg/L) of annual average concentration measured by the National Institute for Environmental Studies was used for the risk assessment <sup>1)</sup> .

### 3.4 Estimated human intake

Intake route		Concentration used for estimation of intake	Estimated intake (microg/ person/ day)	Estimated intake (microg/ kg-Bodyweight (BW)/ day)
Inhalation	Air	1.4 (microg/m <sup>3</sup> )	28	0.56
	The ninety-fifth percentile of tetrachloromethane concentrations in outdoor and indoor air surveyed by the Ministry of the Environment ,1.4 microg/m <sup>3</sup> , was used for the risk assessment.			
Oral	Drinking water	1.6 (microg/L)	3.2	0.064
		Maximum (1.6 microg/L) of annual average in 2000 measured by the Japan Water Works Association was used for the risk assessment.		
	Food	0.0001 (microg/g)	0.2	0.004
		The value (0.0001 microg/g-wet) equal to 1/2 of the detection limit was used as concentration in food, since tetrachloromethane was not detected (detection limit: 0.0002 microg/g-wet) in any sample surveyed by the Ministry of the Environment in 1999.		
Subtotal	--	3.4	0.068	
Total route		--	31	0.63

1) This substance is assessed based on the Guideline for Initial Risk Assessment Version1.0. If adequate measured concentrations are available, they are given priority and used as values for risk assessment. If they are not available, an estimated value calculated using a mathematical model is used.

## 4. Hazard assessment

### 4.1 Effects on organisms in the environment

	Acute or Chronic	Species	Endpoint	Concentration
Algae	Chronic	<i>Selenastrum capricornutum</i>	72 hours NOEC Growth inhibition (biomass)	0.38 (mg/L)
Crustacea	Chronic	<i>Daphnia magna</i>	21 days NOEC Reproduction inhibition	0.375 (mg/L)
Fish	Chronic	<i>Oncorhynchus mykiss</i>	27 days LC <sub>50</sub> (4th day of hatching)	1.97 (mg/L)
Key study		Data of crustacea ( <i>Daphnia magna</i> ) was chosen for the key study because effects were observed at the lowest concentration in the hazard assessment.		

## 4.2 Human health toxicity

Toxicity	Exposure route	Species	Duration / Dose method	Toxic effects (Key study is underlined)	NOAEL or LOAEL
Repeated dose toxicity	Inhalation	Rat (F344)	2 years Inhalation (whole body exposure)	<u>Changes in nitrate and protein levels in urine, increased splenic haemosiderin deposits, eosinophilic change of nasal mucosal epithelium,</u> changes in hematology, blood biochemistry and urinalysis, toxic changes in liver (fatty liver, ceroid deposits, fibrosis, and cirrhosis), progressive glomerulonephrosis, ceroid deposits in lymph nodes	LOAEL: 5 ppm (32.05 mg/m <sup>3</sup> ) (equivalent to 4.2 mg/kg/day)
	Oral	Rat (SD)	12 weeks Gavage	<u>Hepatic centrilobular vacuolization, increased serum enzyme levels (SDH, OCT),</u> hepatic cirrhosis, fibrosis, lobular distortion, parenchymal regeneration, hyperplastic nodules and single-cell necrosis	NOAEL: 1 mg/kg/day
	Dermal	--	--	--	--
Reproductive and developmental toxicity	--	Increased embryo resorption incidence was observed at doses which has toxic effects on dams without teratogenicity. No report on teratogenicity is available.			
Carcinogenicity	Inhalation	Rat	104 weeks Inhalation (whole body exposure)	Hepatocellular adenoma, Hepatocellular carcinoma	NOAEL: 5 ppm (32 mg/m <sup>3</sup> ) (equivalent to 4.2 mg/kg/day)
	Oral	Mouse	120 days Gavage	Hepatoma carcinoma	NOAEL: 1,196 mg/kg (equivalent to 10 mg/kg/day)
	Evaluation by IARC : Group 2B (possibly carcinogenic to humans)				
Genotoxicity	Not considered to be genotoxic				

## 5. Risk Assessment

### 5.1 Environmental organisms

Risk characterization	EEC (microg/L)	NOEC * (mg/L)	MOE (NOEC * /EEC)	Product of uncertainty factors	Conclusion
	1	NOEC: 0.375	380	10	No immediate concern
	Product of uncertainty factors (UF): Extrapolation from laboratory test (10) * Toxicity data on three nutritional stages (1) = 10				
Recommendation : The substance is considered to be of no immediate concern for the moment, and a low priority for further work.					

\* NOEC means NOEC, LOEC, EC<sub>50</sub>, etc.

### 5.2 Human health

#### 5.2.1 Repeated dose toxicity

Exposure route	Intake (microg/kgBW/day)	NOAEL (mg/kgBW/day)	Risk characterization		
			MOE	Product of uncertainty factors	Conclusion
Inhalation	0.56	LOAEL: 4.2	7,500	1,000	No immediate concern
Oral	0.068	1	15,000	500	No immediate concern
Total	0.63	1(Oral )	1,600	500	No immediate concern
Product of uncertainty factors (UF): Inhalation: Interspecies (10) * Using of LOAEL (10) * Intraspecies (10) = 1,000 Oral/Total: Interspecies (10) * Intraspecies (10) * Duration of test (5) = 500					

#### 5.2.2 Reproductive and developmental toxicity

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#### 5.2.3 Carcinogenicity

Exposure route	Intake (microg/kgBW/day)	NOAEL (mg/kgBW/day)	Risk characterization		
			MOE	Product of uncertainty factors	Conclusion
Inhalation	0.56	4.2	7,500	1,000	No immediate concern
Oral	0.068	10	150,000	5,000	No immediate concern
Total	0.63	4.2 (inhalation)	6,700	1,000	No immediate concern
Product of uncertainty factors (UF):					

Inhalation/Total: Interspecies (10) \* Intraspecies (10) \* Carcinogenicity (10) = 1,000

Oral: Interspecies (10) \* Intraspecies (10) \* Duration of test (5) \* Carcinogenicity (10) = 5,000

#### 5.2.4. Recommendation for Human Health

The substance is considered to be of no immediate concern for the moment, and a low priority for further work.

#### 6. Supplement

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