Summary of Initial Risk Assessment Report

Tribromomethane; bromoform CAS No : 75-25-2

PRTR No of Japan: 222

This substance is assessed based on Guideline for Initial Risk Assessment Version 2.0

1. General Information

1.1 Physico-chemical properties

Appearance	Colorless to pale yellow liquid
Melting point	7.5 (degC)
Boiling point	149-150 (degC)
Water solubility	3.1 g/L (25 degC)
Henry's constant	54.2 Pa*m^3/mol ($5.35*10^{-4}$ atm*m^3/mol) (25degC, estimated)
Octanol/water partition coefficient (log Kow)	1.19 (measured), 1.18 (estimated)
Soil adsorption coefficient	Koc = 35 (estimated)

1.2 Environmental fate

Bioaccumulation	Exhibits little to no bioaccumulation Bioconcentration factor (BCF) : 7.1-21 (0.1 mg/L), 7.7-19 (0.01 mg/L) (carp), measured
Biodegradation	Non-biodegradable Alhough tribromomethane is non-biodegradable in aerobic conditions, it is expected to be biodegraded in specific conditions associated with long-term acclimatization when its concentration is low.
Stability in the environment	(In air) Reaction with OH radical: Reaction rate constant is $4.3*10^{-14}$ cm^3/molecule-sec. (25 degC, estimated) The half-life is 0.5-1 year, given OH radical concentration of $5*10^5$-$1*10^6$ molecule/cm^3. Reaction with ozone: No data Reaction with nitrate radical: Reaction rate constant is $1.3*10^{-17}$ cm^3/molecule-sec. (25 degC, measured) The half-life is 0.7-7 years, given nitrate radical concentration of $2.4*10^8$-$2.4*10^9$ molecule/cm^3 (10-100 ppt). (In water) Tribromomethane is not hydrolyzed.
Environmental fate	When released to the aquatic environments, tribromomethane is expected to be mainly removed from water by volatilization to air. Removal by biodegradation is not considered to be important.

2. Sources of release to the environment

2.1 Annual production, import, export and domestic supply in 2004 (ton/year)

Production	Import	Export	Domestic supply	Remarks
18	--	--	--	

2.2 Uses

Tribromomethane is mainly used for geological analysis and dense-medium separation process.

2.3 Release from the industries within the scope of PRTR system (in 2003)

Release sources		Air (ton)	Waters (ton)	Soil (ton)	Remarks
Listed industries	Reported release	0.88	0	0	Release to river: 7.5 tons (All aquatic releases were to rivers.)
	Release outside notification	0.11	0.36	0	
Release outside notification from non listed industry		0.53	1.6	0	
Households		1.8	5.5	0	
Mobile sources		--	--	--	
Total		3.3	7.5	0	

2.4 Releases from other sources

No information about the substance is available.

2.5 Main release route

Tribromomethane is expected to be released to the aquatic environments and the air mainly through unintentional production of tribromomethane as a result of chlorine disinfection at water purification plants.

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^3)	0/12	0/63	nd	--	0.042- 3.2	1980 Ministry of the Environment
River water (microg/L)	0/12	0/60	nd	--	0.2-26	1976 Ministry of the Environment
Drinking water (microg/L)	1,442/5,468	--/19,765	nd-50	6.0	1-18	2003 Japan Water Works Association
Food (microg/g) (fish)	0/4	0/20	nd	--	0.005- 0.0065	1976 Ministry of the Environment

nd: Not detected

For calculation of the 95th percentile, data less than the detection limit are replaced with a value of one half of the detection limit.

3.2 Estimated environmental concentration

Media	Estimated concentration	Description
Air (microg/m^3)	0.020	Calculated by mathematical model / Atmospheric Dispersion Model for Exposure and Risk Assessment ver.1.5 (AIST-ADMER)
River water (microg/L)	0.013	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)	0.013
	Estimated concentration was used for the risk assessment, since no adequate measured concentration was available[1)].

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	0.020 (microg/m^3)	0.40	$8.0*10^{-3}$
		Estimated concentration was used for the risk assessment, since measured concentrations are outdated.		
Oral	Drinking water	6.0 (microg/L)	12	0.24
		The ninety-fifth percentile of measured concentrations in purified water surveyed in 2003 were used for the risk assessment.		
	Food	0.000027 (microg/g)	$3.2*10^{-3}$	0.000064
		Concentration in fish was used because data of intake via food were not available. Since measured concentration in seawater was not available, 1/10 of that in river water was used as concentrations in seawater. Concentration in fish is estimated as a product of the concentration in seawater and a BCF. 0.013(microg/L) * 1/10 * 21 (L/kg) = 0.027 (microg/kg)		
	Subtotal	--	12	0.24
Total route		--	12.4	0.25

1) This substance is assessed based on the Guideline for Initial Risk Assessment Version2.0. Under Version 2.0, a measured concentration and an estimated concentration (calculated by mathematical model) are compared and the larger of two concentrations is used for risk assessment.

4. Hazard assessment

4.1 Effects on organisms in the environment

	Acute or Chronic	Species	Endpoint	Concentration
Algae	No data	--	--	--
Crustacea	Acute	*Penaeus aztecus*	96 hours LC_{50}	26.0 (mg/L)
Fish	Chronic	*Cyprinodon variegatus*	> 28 days NOEC Mortality after hatching	4.8 (mg/L)
Key study		Data of fish (*cyprinodon variegatus*) 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	--	--	--	--
	Oral	Rat	1 month (feeding)	Reduced body weight gain, hepatic cell vacuolization, decreased serum Glu, ChE, Crn, ALP, TG, BUN, and LDH	LOAEL: 680 ppm (equivalent to 56.4 mg/kg/day)
	Dermal	--	--	--	--
Reproductive and developmental toxicity	--	--	--	--	--
Carcinogenicity	Evaluation by IARC : Group 3 (not classifiable as to its carcinogenicity to humans)				
Genotoxicity	Considered to be genotoxic				

5. Risk Assessment

5.1 Environmental organisms

	EEC (microg/L)	NOEC * (mg/L)	MOE (NOEC * /EEC)	Product of uncertainty factors	Conclusion
Risk characterization	0.013	NOEC: 4.8	370,000	100	No immediate concern
	Product of uncertainty factors (UF): Extrapolation from laboratory test (10) * Toxicity data on one nutritional stage (10) = 100				
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_{50}, 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	$8.0*10^{-3}$	No adequate data for the risk assessment is available.	Not calculated	Not calculated	--
Oral	0.24	LOAEL: 56.4	240,000	10,000	No immediate concern

Total	0.25	56.4 (oral)	230,000	10,000	No immediate concern
Product of uncertainty factors (UF): Interspecies (10) * Intraspecies (10) * Using of LOAEL (10) * Duration of test (10) = 10,000					

5.2.2 Reproductive and developmental toxicity

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5.2.3 Carcinogenicity

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5.2.4. Recommendation for Human Health

Although there was no adequate toxicity data available to evaluate exposure via the inhalation route, the MOE calculated using total intake from both routes (inhalation and oral) is larger than the product of uncertainty factors. Thus, 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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