Summary of Initial Risk Assessment Report

o-Toluidine CAS No : 95-53-4

PRTR No of Japan: 225

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

1. General Information

1.1 Physico-chemical properties

Appearance	Pale yellow liquid
Melting point	-16.3 degC
Boiling point	200-202 degC
Water solubility	16.6 g/L (25 degC)
Henry's constant	0.201 Pa*m^3/mol ($1.98*10^{-6}$ atm*m^3/mol) (25degC, measured)
Octanol/water partition coefficient (log Kow)	1.34 (measured), 1.62 (estimated)
Soil adsorption coefficient	Koc = 74 (estimated)

1.2 Environmental fate

Bioaccumulation	Exhibits little to no bioaccumulation Bioconcentration factor (BCF): 2.1 (calculated using logKow of 1.34)
Biodegradation	*o*-Toluidine is generally considered non-biodegradable; however, it is expected to be biodegradable in specific conditions involving acclimatized microorganisms.
Stability in the environment	(In air) Reaction with OH radical: Reaction rate constant is $1.32*10^{-10}$ cm^3/molecule-sec (25 degC, estimated). The half-life is 1-3 hours, given OH radical concentration of $5*10^5$-$1*10^6$ molecule/cm^3. Reaction with ozone: No data Reaction with nitrate radical: No data *o*-Toluidine is suggested to be possibly directly degraded by photolysis, since it absorbs light with wavelength of 290 nm or higher in the atmospheric environment. (In water) *o*-Toluidine is not expected to be hydrolyzed in water.
Environmental fate	If released to water, o-Toluidine is expected to be removed by gradual volatilization to air and by biodegradation under specific conditions associated with acclimatization. *o*-Toluidine partly adsorbed to soil particles is expected to settle out to sediments where it will undergo little biodegradation under anaerobic conditions.

2. Sources of release to the environment

2.1 Annual production, import, export and domestic supply in 2003 (ton/year)

Production	Import	Export	Domestic supply	Remarks
1,002		--	--	

2.2 Uses

Chemical intermediate for dyestuffs/pigments(90%) and raw material for epoxy resin curing agents

2.3 Release from the industries within the scope of PRTR system (in 2002)

Release sources		Air (ton)	Waters (ton)	Soil (ton)	Remarks
Listed industries	Reported release	5	< 0.5	0	Release to rivers: 1 kg
	Release outside notification	--	--	--	
Release outside notification from non listed industry		--	--	--	
Households		--	--	--	
Mobile sources		--	--	--	
Total		5	< 0.5	0	

2.4 Releases from other sources

Another release source is cigarette smoke. *o*-Toluidine is contained in main-stream and sidestream cigarette smoke at a rate of 0.16microg/cigarette and 3microg/cigarette, respectively. Assuming that all *o*-toluidine in sidestream smoke is released to air, the amount of release from cigarette smoke is estimated to be 1 ton/year in Japan based on the total sales of cigarettes in 2002 (312 billion cigarettes).

2.5 Main release route

o-Toluidine is expected to be released to air mainly during its production. It is also released to air through cigarette smoke that contains *o*-toluidine.

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	0/18	nd	--	$5*10^{-5}$ - 0.15	1985 Ministry of the Environment
River water (microg/L)	2/19	2/19	nd- 0.011	0.0056	0.003	2003 Ministry of the Environment
Drinking water (microg/L)(as ground water)	0/10	0/10	nd	--	0.003	2003 Ministry of the Environment
Food (microg/g)	0/9	0/45	nd	--	0.01	1999 Japan Food Research Laboratories

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)	0.056	-Calculated by mathematical model / Atmospheric Dispersion Model for Exposure and Risk Assessment ver.1.01 (AIST-ADMER) -Maximum of annual average concentration.
River water (microg/L)	--	Concentration in river water was not estimated, since annual release of *o*-toluidine to rivers was merely 1 kg according to 2002 PRTR data .

3.3 Estimated environmental concentration in water (EEC)

EEC(microg/L)	0.0056
	The ninety-fifth percentile of measured concentrations was used for the risk assessment, since concentration in river water was not estimated by model.

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	0.056 (microg/m^3)	1.1	0.022
		Estimated air concentration was used for the risk assessment, since measured concentrations were outdated.		
Oral	Drinking water	0.0015 (microg/L)	0.0030	$6.0*10^{-5}$
		Concentration in ground water was used, since measured concentrations in drinking water were not available. The value (0.0015 microg/L) equal to 1/2 of the detection limit was used, since *o*-Toluidine was not detected in any samples in the 2003 survey.		
	Food	0.005 (microg/g)	10	0.20
		Duplicate diet study on meals of generic households was performed to measure concentration in food. The value (0.005 microg/L) equal to 1/2 of the detection limit was used, since *o*-Toluidine was not detected in any samples in this survey.		
	Subtotal	--	10	0.20
Total route		--	11	0.22

4. Hazard assessment

4.1 Effects on organisms in the environment

	Acute or Chronic	Species	Endpoint	Concentration
Algae	Chronic	*Selenastrum capricornutum*	72 hours NOEC Growth inhibition (biomass)	2.91 (mg/L)
Crustacea	Chronic	*Daphinia magna*	21 days NOEC Reproduction inhibition	0.0126 (mg/L)
Fish	Acute (prolonged toxicity)	*Oryzias latipes*	21 days NOEC Mortality	50 (mg/L)
Key study		The data of crustacea (*daphnia magna*) 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	Oral administration in feed of hydrochloride of *o*-Toluidine for 7 weeks	Reduced body weight gains, pigmentation of kidneys and spleen	LOAEL: 1,000 ppm (equivalent to 74.6 mg/kg/day of *o*-Toluidine)
	Dermal	--	--	--	--
Reproductive and developmental toxicity	--	--	--	--	--
Carcinogenicity	Evaluation by IARC : Group 2A (Probably carcinogenic to humans)				
Genotoxicity	DNA damage was observed *in vitro* and *in vivo* and clastogenicity was observed *in vitro*. Gene mutation and clastogenicity *in vivo* was negative. It is also reported that *N*-oxidization metabolites induce gene mutation under metabolic activation conditions. No conclusion drawn regarding genotoxicity, because of DNA damage in vitro and negative in vivo				

5. Risk Assessment

5.1 Environmental organisms

	EEC (microg/L)	NOEC * (mg/L)	MOE (NOEC * /EEC)	Product of uncertainty factors	Conclusion
Risk characterization	0.0056	NOEC: 0.0126	2,300	50	No immediate concern
	Product of uncertainty factors (UF): Extrapolation from laboratory test (10) * Toxicity data on two nutritional stages (5) = 50				
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	0.022	No adequate data	Not calculated	Not calculated	Could not be assessed
Oral	0.2	LOAEL: 74.6	370,000	10,000	No immediate concern
Total	0.22	74.6 (oral)	340,000	10,000	No immediate concern
Product of uncertainty factors (UF): Oral/Total: 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

Risk characterization of carcinogenicity of the substance was not carried out in this assessment.

5.2.4. Recommendation for Human Health

In terms of oral exposure, the substance is considered to be of no immediate concern for the moment, and a low priority for further work. As for inhalation exposure, the risk assessment was not conducted due to the lack of adequate toxicity data.

6. Supplement

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