11	CAS No.: 120-82-1	Substance: 1,2,4-Trichlorobenzene

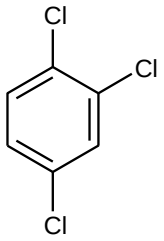
Chemical Substances Control Law Reference No.: 3-74 (trichlorobenzene)

PRTR Law Cabinet Order No.*: 1-290

Molecular Formula: $C_6H_3Cl_3$

Molecular Weight: 181.45

Structural formula:



*Note: No. in Revised Cabinet Order enacted on October 1, 2009

1. General information

The aqueous solubility of this substance is 40 mg/1000 g (25°C), the partition coefficient (1-octanol/water) (log K_{ow}) is 3.98, and the vapor pressure is 0.43 mmHg (=57 Pa) (25°C). The biodegradability (aerobic degradation) of trichlorobenzene is not considered to be good, and bioaccumulation is thought to be at a medium level. Furthermore, its half-life for hydrolysis is 3.4 years (25°C, pH=7).

This substance is designated as a Type III Monitoring Chemical Substance under the Law Concerning the Examination and Regulation of Manufacture, etc. of Chemical Substances. Trichlorobenzene is designated as a Class 1 Designated Chemical Substance under the Law Concerning Reporting, etc. of Releases to the Environment of Specific Chemical Substances and Promoting Improvements in Their Management (PRTR Law). The main uses of trichlorobenzene are as a dyestuff and pigment intermediate, in transformer oils, and in lubricants. The production (shipments) and import quantity as trichlorobenzene in fiscal 2007 was 100 to <1,000 t/y.

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2. Exposure assessment

Because this substance is not a Class 1 Designated Chemical Substance under the PRTR Law, release and transfer quantities could not be obtained. Predictions of distribution by medium using a Mackay-type level III fugacity model indicated that if equal quantities were released to the atmosphere, water bodies, and soil, the proportion distributed to soil would be greater.

The predicted maximum exposure to humans via inhalation, based on general environmental atmospheric data, was around 0.28 μg/m^3. The predicted maximum oral exposure was estimated to be less than around 0.0004 μg/kg/day based on calculations from data for groundwater. The risk of exposure to this substance by intake from an environmental medium via food is considered slight based on estimates of oral exposure using estimated concentrations in fish species.

The predicted environmental concentration (PEC), which indicates exposure to aquatic organisms, was less than around 0.01 μg/L for both public freshwater bodies and seawater.

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3. Initial assessment of health risk

This substance is irritating to eyes and respiratory tracts. When inhaled, it will cause coughing, pharyngodynia and burning sensation. When orally taken, it will cause stomachache, pharyngodynia and vomiting. When taken into eyes, they will turn red and suffer from pain. When attached to skin, skin will be red, dry, and rough.

Sufficient information could not be obtained on its carcinogenicity, and its initial assessment was conducted on the basis of data on its non-carcinogenic effects.

As for its oral exposure, NOAEL of 5.5 mg/kg/day (for calcification of renal papillae, hepatic fatty degeneration) was

obtained from mid-term and long-term toxicity tests for rats, and this was identified as its 'non-toxic level*'.

As for its inhalation exposure, NOAEL of 3 ppm (for increased elimination of uroporphyrin) was obtained from its mid-term and long-term toxicity tests for rats. It was then adjusted against exposure conditions to provide 0.54 ppm (4.0 mg/m^3). This was divided by 10, due to their short test periods, to provide 0.4 mg/m^3 as its 'non-toxic level*'.

As for its oral exposure, its maximum exposure was estimated to be around less than 0.0004 μg/kg/day, when intakes of freshwater from public water supply were assumed. Its margin of exposure (MOE) would be more than 1,400,000, when calculated from its 'non-toxic level*' of 5.5 mg/kg/day and its estimated maximum exposure, and then divided by 10 due to the fact that the 'non-toxic level*' was obtained from animal experiments. Its intakes through drinking water up to around 0.002 μg/kg/day have been reported for some location, and MOE for these will be more than 280,000. Since its exposure through intakes of food from the environmental media would be limited, MOE will not change significantly even if this exposure is combined. No further action will be required at the moment to assess health risk from oral exposure to this substance.

As for its inhalation exposure, its maximum exposure concentration was estimated to be around 0.28 μg/m^3, when its concentrations in the ambient air were considered. Its MOE would be 140, when calculated from its 'non-toxic level*' of 0.4 mg/m^3 and its estimated maximum exposure concentration, and then divided by 10 due to the fact that 'non-toxic level*' was obtained from animal experiments. No further action will be required at the moment to assess health risk from inhalation exposure to this substance in the ambient air.

Information of toxicity				Exposure assessment			Result of risk assessment			Judgment
Exposure Path	Criteria for risk assessment	Animal	Criteria for diagnoses (endpoint)	Exposure medium	Predicted maximum exposure quantity and concentration					
Oral	'Non-toxic level*' 5.5 mg/kg/day	Rats	calcification of renal papillae, hepatic fatty degeneration	Drinking water	—	μg/kg/day	MOE	—	×	○
				Groundwater	<0.0004	μg/kg/day	MOE	>,1,400,000	○	
Inhalation	'Non-toxic level*' 0.4 mg/m^3	Rats	increased elimination of uroporphyrin	Ambient air	0.28	μg/m^3	MOE	140	○	○
				Indoor air	—	μg/m^3	MOE	—	×	×

Non-toxic level *

- When a LOAEL is available, it is divided by 10 to obtain a level equivalent to NOAEL.
- When an adverse effect level for the short-term exposure is available, it is divided by 10 to obtain a level equivalent to an adverse effect level for the long-term exposure.

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4. Initial assessment of ecological risk

With regard to acute toxicity, the following reliable data were obtained: a 96-h median effective concentration (EC_{50}) of 1,400 μg/L growth inhibition in the green algae *Pseudokirchneriella subcapitata*; a 96-h median lethal concentration (LC_{50}) of 540 μg/L for the crustacean *Palaemonetes pugio*; a 96-h LC_{50} of 1,217 μg/L for the Cyprinodontidae fish species *Jordanella floridae*; and a 48-h LC_{50} of 930 μg/L for the midge *Tanytarsus dissimilis*. Accordingly, based on these acute toxicity values and an assessment factor of 100, a predicted no effect concentration (PNEC) of 5.4 μg/L was obtained.

With regard to chronic toxicity, the following reliable data were obtained: a 72-h no observed effect concentration (NOEC) of 2,180 μg/L for growth inhibition in the green algae *P. subcapitata*; a 21-d NOEC of 100 μg/L for reproductive inhibition in the crustacean *Daphnia magna*; and an 85-d NOEC of 99.8 μg/L for growth inhibition in the fish species *Oncorhynchus mykiss*. (rainbow trout). Accordingly, based on these chronic toxicity values and an assessment factor of 10, a predicted no effect concentration (PNEC) of 10 μg/L was obtained. The value of 5.4 μg/L obtained from the acute toxicity to the crustacean was used as the PNEC for this substance.

The PEC/PNEC ratio was less than 0.002 for both freshwater bodies and seawater. Accordingly, further work is thought to be unnecessary at this time.

Hazard assessment (basis for PNEC)			Assessment factor	Predicted no effect concentration PNEC (μg/L)	Exposure assessment		PEC/PNEC ratio	Assessment result
Species	Acute/ chronic	Endpoint			Water body	Predicted environmental concentration PEC (μg/L)		
Crustacean *Palaemonetes pugio*	Acute	LC_{50} Mortality	100	5.4	Freshwater	<0.01	<0.002	○
					Seawater	<0.01	<0.002	

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5. Conclusions

	Conclusions		Judgment
Health risk	Oral exposure	No further action required.	○
	Inhalation exposure	No further action required.	○
Ecological risk	No need of further work at present.		○

［Risk judgments］ ○: No need for further work ▲: Requiring information collection

■: Candidates for further work ×: Impossibility of risk characterization

（○）: Though a risk characterization cannot be determined, there would be little necessity of collecting information.

（▲）: Further information collection would be required for risk characterization.