3	CAS No.: 110-83-8	Substance: Cyclohexene

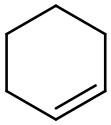
Chemical Substances Control Law Reference No.:3-2234

PRTR Law Cabinet Order No.:

Molecular Formula: C_6H_{10}

Molecular Weight: 82.14

Structural formula:



1. General information

The water solubility of this substance is 160 mg/1,000g (25°C), the partition coefficient (1-octanol/water) (log K_{ow}) is 2.86, and the vapor pressure is 88.5–89.0 mmHg (=1.18×10^4–1.19×10^4 Pa) (25°C). This substance is judged not to be readily biodegradable (aerobic degradation), and not to be bioaccumulative. Furthermore, it is stable to hydrolysis for 5 days (pH=4, 7, 9, 50°C).

The main uses of the substance are as an intermediate raw material for cyclohexanol and L-lysine, as a specialty solvent, and as a raw material for cyclohexene oxide and various other organic synthesis processes. The production and import quantity in FY 2009 was 874 t.

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2. Exposure assessment

Because this substance is not classified 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), 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.

Data for setting the predicted maximum exposure to humans via inhalation could not be obtained. The predicted maximum oral exposure was estimated to be generally 0.00052 μg/kg/day based on calculations from data for public freshwater bodies. 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.

The predicted environmental concentration (PEC), which indicates exposure to aquatic organisms, was around 0.013 μg/L for public freshwater bodies and around 0.00034 μg/L for seawater.

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3. Initial assessment of health risk

This substance is irritating to eyes, skin, and respiratory tract. An intake of its solution may cause chemical pneumonitis by pulmonary aspiration. The substance may affect the central nervous system. When inhaled, it causes coughing and drowsiness. When orally taken, it causes drowsiness, breathlessness and nausea. Contact of skin to the substance makes it red and dry. When taken into an eye, it will be red.

As sufficient information was not available on carcinogenicity of the substance, an initial assessment was conducted on the basis of the information on its non-carcinogenic effects.

As for oral exposure to the substance, a NOAEL of 50 mg/kg/day (for salivation and lacrimation) obtained from mid- and long-term toxicity tests on rats was divided by 10 due to their rather short test periods. Its outcome of 5 mg/kg/day was deemed to be the lowest reliable dose without any effect, and this was identified as its ‘non-toxic level*’. As for inhalation exposure to the substance, a LOAEL of 600 ppm (for effects such as suppressed body weight increase and pulmonary congestion) and a NOAEL, or the highest concentration without any effect, of 300 ppm were obtained from mid- and long-term toxicity tests on mice. These are adjusted to 54 ppm (181 mg/m^3) against exposure conditions, and

this was identified as its 'non-toxic level*'.

As for its oral exposure, its mean exposure would be 0.000056 μg/kg/day and its predicted maximum exposure would be 0.00052 μg/kg/day, respectively, if its intakes through freshwater from public water bodies were assumed. The MOE would be 960,000, when calculated from the 'non-toxic level*' of 5 mg/kg/day and the predicted maximum exposure, and divided by 10 for conversion of the 'non-toxic level*' from animal experiments to an equivalent dose for humans. Since exposure to this substance in environmental media through intakes of food is considered to be limited, significant changes in the MOE is not likely, even when this exposure is combined. Therefore, further actions would not be required to assess health risk from oral exposure to this substance at present.

As for inhalation exposure, its exposure concentration was not identified, and its health risk could not be assessed. For some location, it was reported that the maximum concentration of the substance in the ambient air was no more than 400 ppt (1.3 μg/m^3). For reference, the MOE will be 14,000, if this is combined with the 'non-toxic level*' of 181 mg/m^3, and divided by 10 for conversion of the 'non-toxic level*' from animal experiments to an equivalent dose for humans. Therefore, collection of information would not be required to assess health risk from inhalation exposure to this substance in the ambient air.

Toxicity					Exposure assessment			Result of risk assessment			Judgment
Exposure Path	Criteria for risk assessment		Animal	Criteria for diagnoses (endpoint)	Exposure medium	Predicted maximum exposure dose and concentration					
Oral	Non-toxic level *	5 mg/kg/day	Rats	Salivation, lacrimation	Drinking water	–	μg/kg/day	MOE	–	×	○
					Freshwater	0.00052	μg/kg/day	MOE	960,000	○	
Inhalation	Non-toxic level *	181 mg/m^3	Mice	No effect observed even at the highest dose	Ambient air	–	μg/m^3	MOE	–	×	(○)
					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.

4.Initial assessment of ecological risk

With regard to acute toxicity, the following reliable data were obtained: a 72-h EC_{50} exceeding 3,570 μg/L for growth inhibition in the green algae *Pseudokirchneriella subcapitata*; a 48-h EC_{50} of 2,100 μg/L for immobilization in the crustacean *Daphnia magna*; and a 96-h LC_{50} of 5,800 μg/L for the fish *Oryzias latipes* (medaka). Also obtained was a 48-h EC_{50} of 560,000 μg/L for developmental anomaly and mortality in the Pacific oyster *Crassostrea gigas*. Accordingly, based on these acute toxicity values and an assessment factor of 100, a predicted no effect concentration (PNEC) of 21 μg/L was obtained.

With regard to chronic toxicity, the following reliable data were obtained: a 72-h NOEC of 3,570 μg/L for growth inhibition in the green algae *P. subcapitata*; and a 21-d NOEC of 740 μg/L for reproductive inhibition in the crustacean *D. magna*. Accordingly, based on these chronic toxicity values and an assessment factor of 100, a predicted no effect concentration (PNEC) of 7.4 μg/L was obtained. This 7.4 μg/L obtained from the crustacean chronic toxicity was used as the PNEC for this substance.

The PEC/PNEC ratio was 0.002 for freshwater bodies and 0.00005 for 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	Judgment based on PEC/PNEC ratio	Assessment result
Species	Acute/ chronic	Endpoint			Water body	Predicted environmental concentration PEC (μg/L)			
Crustacean *Daphnia magna*	Chronic	NOEC reproductive inhibition	100	7.4	Freshwater	0.013	0.002	○	○
					Seawater	0.00034	0.00005		

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5. Conclusions

	Conclusions		Judgment
Health risk	Oral exposure	No need for further work.	○
	Inhalation exposure	Though a risk characterization cannot be determined, there would be little necessity of collecting information.	(○)
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.