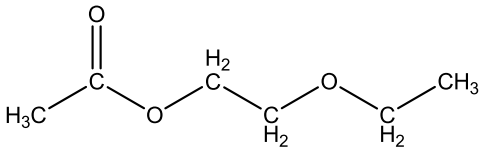
10	CAS No.: 111-15-9	Substance: 2-Ethoxyethanol acetate

Chemical Substances Control Law Reference No.: 2-740 (Acetate ester of ethylene glycol monoalkyl (C1-4) ether)

PRTR Law Cabinet Order No.: 1-133

Molecular Formula: $C_6H_{12}O_3$ Structural Formula:

Molecular Weight: 132.16



1. General information

The aqueous solubility of this substance is 2.29×10^5 mg/L (20°C), the partition coefficient (1-octanol/water) (log K_{ow}) is 0.24, and the vapor pressure is 1.8 mmHg (=240 Pa) (25°C). Biodegradability (aerobic degradation) is judged to be good. Its half-life for hydrolysis is 30–300 days (pH = 7–8, calculated value).

This substance 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 this substance are for paints for metal products and furniture, printing ink solvents, and electronic component ink solvents. The production and import quantity in fiscal 2009 was 344 t. The production and import category under the PRTR Law is more than 100 t.

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2. Exposure assessment

Total release to the environment in fiscal 2010 under the PRTR Law was 310 t, of which approximately 190 t or 61% of overall releases were reported. The major destination of reported releases was the atmosphere. In addition, approximately 64 t was transferred to waste materials, and 0.005 t transferred to sewage. Industry types with large reported releases were the transportation equipment and machinery manufacturing industry, metal products manufacturing industry, electrical machinery manufacturing industry, the plastic products manufacturing industry, and the ceramics, soil, and stone industry for the atmosphere, and the chemical industry for public water bodies. The largest release among releases to the environment including those unreported was to the atmosphere. A multi-media model used to predict the proportions distributed to individual media in the environment indicated that in regions where the largest quantities were estimated to have been released to the environment overall or to the atmosphere in particular, the predicted proportion distributed to the atmosphere was 39.4%, and the proportions distributed to the water bodies and soil were both 30.2%. In regions where the largest estimated releases were to public water bodies, the predicted proportions distributed to the atmosphere, water bodies, and soil were 38.7%, 30.5%, and 30.6%, respectively.

The maximum expected concentration of exposure to humans via inhalation, based on annual average general environmental atmospheric data, was around 0.14 μg/m^3, whereas the maximum expected exposure from indoor air was around 16 μg/m^3. The mean annual value for atmospheric concentration in fiscal 2010 was calculated by using a plume-puff model on the basis of reported releases to the atmosphere according to the PRTR Law; this model predicted a maximum level of 18 μg/m^3.

The maximum expected oral exposure could not be obtained. However, the value was around 0.002 μg/kg/day when calculated from groundwater data. When reported releases to public freshwater bodies in fiscal 2010 according to the PRTR Law were divided by the ordinary water discharge of the national river channel structure database, estimating the concentration in rivers taking dilution alone into consideration gave a maximum value of 0.012 μg/L. Using this estimated concentration for rivers to calculate oral exposure gave 0.00048 μg/kg/day. The risk of exposure to this substance by intake from an environmental medium via food is considered slight,

based on estimates of oral exposure obtained by using estimated concentrations in fish species.

The predicted environmental concentration (PEC) could not be obtained. However, past data yielded values of around less than 0.05 μg/L for public freshwater bodies and around 0.05 μg/kg/day for seawater. The maximum river concentration was estimated to be 0.012 μg/L from reported releases to public freshwater bodies under the PRTR Law.

3.Initial assessment of health risk

This substance may cause slight irritation to eyes. It may affect blood, resulting in blood cell disorders and anemia, and kidney disorders if exposed to it in high concentrations. In addition, this substance may affect the central nervous system, possibly leading to loss of consciousness. Contact of the substance with eyes may case redness, while contact of the substance with skin may make it dry. Its inhalation may cause dizziness, lethargy, headache and loss of consciousness, while its oral exposure may cause, in addition to these symptoms, nausea and vomiting. Similar symptoms may occur by its absorption through skin.

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

With regard to oral exposure to the substance, a NOAEL of 500 mg/kg/day (for decreased testis and seminal vesicle weights, lower sperm counts, etc.) obtained from its reproductive and developmental toxicity tests on mice was identified to be the reliable lowest dose of the substance as its 'non-toxic level*'. With regard to inhalation exposure to the substance, a NOAEL of 25 ppm (for lower body weights of fetuses and delayed ossification, etc.) obtained from its reproductive and developmental toxicity tests on rabbits was adjusted for their durations to provide 6.3 ppm (34 mg/m^3) for its intermittent to continuous exposure. This value was identified to be the reliable lowest dose of the substance as its 'non-toxic level*'.

As oral exposure levels to the substance were not known, its health risk could not be assessed.

In addition, the maximum exposure to the substance was predicted to be below 0.002 μg/kg/day for its oral exposure from historical data on its exposure through groundwater reported in 2000. The MOE would be above 25,000,000 when calculated from the its predicted maximum exposure and 'non-toxic level*' of 500 mg/kg/day from animal experiments as reference data, and divided by a factor of 10 to convert animal data to human. The maximum exposure was calculated to be 0.00048 μg/kg/day from concentrations in river water with effluents from operators discharging high concentrations of the substance, reported in FY 2010 under the PRTR Law. The MOE would be 100,000,000 when calculated from this value as its reference. As exposure to the substance in the environment through food intakes would be limited, the MOE would not change significantly even when this exposure was included. Therefore, collection of further information would not be required to assess health risk from its oral exposure.

As for inhalation exposure to the substance, its maximum exposure concentration in the ambient air was predicted to be approximately 0.14 $\mu g/m^3$. The MOE would be 24,000 when calculated from its 'non-toxic level*' of 34 mg/m^3 and the maximum exposure concentration predicted from animal experiments, and divided by a factor of 10 to convert animal data to human. The maximum (annual mean) concentration in the ambient air near operators with its emissions in high concentrations was calculated to be 18 $\mu g/m^3$ from its emissions reported in FY 2010 under the PRTR Law. The MOE would be 190 when calculated from this value as its reference. The MOE would be 210 when calculated from the maximum exposure concentration of approximately 16 $\mu g/m^3$ predicted for the indoor air. Therefore, no further action would be required at this moment to assess health risk from its inhalation exposure both in the ambient air and in the indoor 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*' 500 mg/kg/day	Mouse	Decreased testis and seminal vesicle weights, lower sperm counts, etc.	Drinking water	— μg/kg/day	MOE	—	×	(○)
				Freshwater	— μg/kg/day	MOE	—	×	
Inhalation	'Non-toxic level*' 34 mg/m^3	Rabbit	Lower body weights of fetuses and delayed ossification, etc.	Ambient air	0.14 μg/m^3	MOE	24,000	○	○
				Indoor air	16 μg/m^3	MOE	210	○	○

Non-toxic level *

- When a LOAEL is available, it is divided by 10 to obtain a NOAEL-equivalent level.
- 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 72-h EC_{50} in excess of 1,000,000 μg/L for growth inhibition in the green alga *Pseudokirchneriella subcapitata*, 48-h EC_{50} of 197,000 μg/L for swimming inhibition in the crustacean *Daphnia magna*, a 96-h LC_{50} of 41,000 μg/L for the fish species *Lepomis macrochirus* (bluegill), and a 96-h LC_{50} of 65,200 μg/L for the freshwater snail *Aplexa hypnorum*. Accordingly, based on these acute toxicity values and an assessment factor of 100, a predicted no effect concentration (PNEC) of 410 μg/L was obtained.

With regard to chronic toxicity, the following reliable data were obtained: a 72-h NOEC of 1,000,000 μg/L for growth inhibition in the green alga *P. subcapitata*, and a 21-d NOEC of 44,400 μg/L for reproductive inhibition in the crustacean *D. magna*. Accordingly, based on these chronic toxicity values and an assessment factor of 100, a PNEC of 440 μg/L was obtained.

The value of 410 μg/L obtained from the acute toxicity to the fish species was used as the PNEC for this substance.

The risk of this substance could not be judged because the predicted environmental concentration (PEC) could not be obtained. However, albeit past data, values of less than around 0.05 μg/L for public freshwater bodies and around 0.05 μg/L for seawater have been obtained. The ratio of these values to the PNEC is less than 0.1. Furthermore, the maximum river concentration was estimated to be 0.012 μg/L from reported releases under the PRTR Law, and the ratio of this value to the PNEC is less than 0.1. Accordingly, the need to gather further data regarding this substance is considered to be minimal.

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)			
Fish (bluegill)	Acute	LC_{50} mortality	100	410	Freshwater	—	—	×	○
					Seawater	—	—		

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5. Conclusions

	Conclusions		Judgment
Health risk	Oral exposure	Although risk to human health could not be identified, collection of further information would not be required.	(○)
	Inhalation exposure	No need for further work.	○
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.