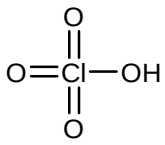
4	CAS No.: 7601-90-3	Substance: Perchloric acid

Chemical Substances Control Law Reference No.: 1-221

PRTR Law Cabinet Order No.:

Molecular Formula: $ClHO_4$ Structural formula:

Molecular Weight: 100.46



1. General information

Perchloric acid salts are thought to exist in the atmosphere either as solid particles or adsorbed onto airborne particulate matter. They are thought to dissolve rapidly and break down in water.

The main uses of perchloric acid are as an analytical chemistry reagent; for dissolution of metals, alloys and minerals; catalysts for organic synthesis; and production raw materials for perchloric acid salts and their derivatives. The main uses for perchloric acid salts are as a propellant for rockets and missiles, airbags, explosives, fireworks, matches and signal flares. The sodium perchlorate production quantity in 2009 was 1,400 t (estimated value). The production (shipments) and import quantities of sodium perchlorate and potassium perchlorate in 2007 were 10 to <100 t/y and 100 to <1,000 t/y, respectively.

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2. Exposure assessment

Because this substance is not 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. A reliable vapor pressure could not be obtained for this substance, and on this account predictions of distribution by medium were not attempted.

Data for setting the predicted maximum exposure to humans via inhalation could not be obtained.

The predicted maximum oral exposure was estimated to be around 1.9 μg/kg/day based on calculations from data for potable water and food, and around 1.7 μg/kg/day based on calculations from data for groundwater and food.

The predicted environmental concentration (PEC), which indicates exposure to aquatic organisms, was about 17 μg/L for public freshwater bodies and generally 1 μg/L for seawater.

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3. Initial assessment of health risk

This substance is corrosive and its vapour is highly corrosive to the eyes, skin and respiratory tract. Inhalation of vapour or mist may cause lung oedema. Symptoms of poisoning via the inhalation route include sore throat, burning sensation, cough and laboured breathing, while those via the oral route include sore throat, abdominal pain, burning sensation, diarrhoea, shock or collapse and vomiting. Contact with the substance may cause redness and pain in the skin and serious skin burns, redness, pain and severe deep burns in the eyes and permanent loss of vision. Ammonium salt, potassium salt and sodium salt of the substance are irritable to the eyes, skin and respiratory tract.

As sufficient information was not available on the carcinogenicity of this 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 0.007 mg/kg/day (for decreased RAIU) obtained from effects observed in humans was deemed as a plausible value for the lowest dose of the substance and was identified as its ‘non-toxic level*’. Continued administration at approximately 0.007 mg/kg/day did not lead to decreased iodine uptake, and adverse effects on human bodies caused by iodine deficiency attributable to such decreased iodine uptake

was not anticipated. Therefore, division by 10 was for short test periods was perceived unnecessary. This perception could be vindicated by statements given by U.S.EPA (2005) and ATSDR (2008). As for inhalation exposure, a NOAEL, or concentration with no effect, of 0.86 mg/m^3 obtained from effects on human was deemed as a plausible value for the lowest dose of the substance. 0.86 mg/m^3 derived was adjusted to 0.17 mg/m^3 according to exposure conditions was identified as its 'non-toxic level*'. As for inhalation exposure, its non-toxic level could not be identified.

With regard to oral exposure to the substance, the predicted maximum exposure was approximately 1.9 µg/kg/day, when intakes of drinking water and food were assumed. The MOE derived was 3.7 when calculated from the 'non-toxic level*' of 0.007 mg/kg/day and the predicted maximum exposure. When intakes through groundwater and food were assumed, the predicted maximum exposure was approximately 1.7 µg/kg/day, and the MOE derived was 4.1. Furthermore, intakes through freshwater from public water bodies and through food were assumed, the predicted maximum exposure would be approximately 2.4 µg/kg/day, and the MOE derived would be 2.9. Detailed assessment would be required for health risk from oral exposure to this substance.

As for inhalation exposure to the substance, the absence of information available on exposure concentrations did not allow for a health risk assessment. This substance was presumed to be present in the form of solid dust in the atmosphere or to be adsorbed onto suspended particulate matter. There was too little information available on changes and degradations in the atmosphere, to calculate concentrations in the ambient air. Therefore, collection of further information would be required to assess health risk from inhalation exposure to this substance in the ambient air.

Information of toxicity				Exposure assessment		Result of risk Exposure 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 * ' 0.007 mg/kg/day	Human	Inhibition of RAIU	Drinking water/Food	1.9 µg/kg/day	MOE	3.7	■	■
				Groundwater / Food	1.7 µg/kg/day	MOE	4.1	■	
Inhalation	'Non-toxic level * ' 0.17 mg/m^3	Human	No effect 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.

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4. Initial assessment of ecological risk

With regard to acute toxicity, the following reliable data were obtained: a 48-h LC_{50} of 490,000 µg ClO_4^-/L for the crustacean *Daphnia magna*, a 96-h LC_{50} of 1,120,000 µg ClO_4^-/L for the fish species *Danio rerio* (zebrafish), and a 120-h LC_{50} of 2,280,000 µg ClO_4^-/L for the African clawed frog *Xenopus laevis*. Accordingly, based on these acute toxicity values and an assessment coefficient of 1000, a predicted no effect concentration (PNEC) of 490 µg ClO_4^-/L was obtained.

With regard to chronic toxicity, the following reliable data were obtained: a 6-d NOEC of 9,645 µg ClO_4^-/L for reproductive inhibition in the crustacean *Ceriodaphnia dubia*, a 35-d NOEC of more than 490,000 µg ClO_4^-/L for growth inhibition or mortality in the fish species *Pimephales promelas* (fathead minnow), and a 42-d NOEC of 58,500 µg ClO_4^-/L for mortality or emergence inhibition in the midge *Chironomus tentans*. Accordingly, based on these chronic toxicity values and an assessment coefficient of 100, a predicted no effect concentration (PNEC) of 96 µg ClO_4^-/L was obtained. The value of 96 µg ClO_4^-/L obtained from the chronic toxicity to the crustacean was used as the PNEC for this substance.

The PEC/PNEC ratio was 0.2 for freshwater bodies and 0.01 for seawater, and data collection is considered necessary. Efforts are required to augment toxicity data towards algae for this substance.

Hazard assessment (basis for PNEC)			Assessment coefficient	Predicted no effect concentration PNEC (μg/L)	Exposure assessment		PEC/ PNEC ratio	Judgment based on PEC/PNEC ratio	Assessment result
Species	Acute/ chronic	End point			Water body	Predicted environmental concentration PEC (μg/L)			
Crustacean *Ceriodaphnia dubia*	Chronic	NOEC reproductive inhibition	100	96	Freshwater	17	0.2	▲	▲
					Seawater	1	0.01		

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5. Conclusions

	Conclusions		Judgment
Health risk	Oral exposure	Candidates for further work	■
	Inhalation exposure	Further information collection would be required for risk characterization.	（▲）
Ecological risk	Requiring information collection.		▲

［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.