

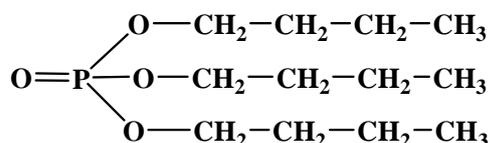
20	CAS No.: 126-73-8	Substance: Tri-n-butyl phosphate
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Chemical Substances Control Law Reference No.: 2-2021

PRTR Law Cabinet Order No.: 1-354 Structural Formula:

Molecular Formula: C₁₂H₂₇O₄P

Molecular Weight: 266.31



1. General information

The aqueous solubility of this substance is 280 mg/L (25°C), and the partition coefficient (1-octanol / water) (log Kow) is 4.00. The vapor pressure is 1.13 x 10⁻³ mmHg (= 0.151 Pa) (25°C). Degradability is 0% by BOD degradation rate, and the accumulation factor is judged to be zero or very low. Hydrolysis is thought to progress only to a degree that cannot be detected (pH = 2 - 12, 24 hours, measured value).

This substance is a Type 2 Monitoring Chemical Substance under the Law Concerning the Examination and Regulation of Manufacture, etc. of Chemical Substances and 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). Its primary uses and release sources are as a catalyst, stabilizer (resin and fiber), plasticizer, and others (lubricant additive and defoamer for leather). Production and import quantities under the PRTR law are 100 tons.

2. Exposure assessment

Total release to the environment in FY2003 under the PRTR Law came to approximately 2.3 tons, of which 1.1 tons was reported. Release to public water bodies accounted for a large part of the reported release. In addition, 65 tons was transferred as waste. Chemical Industry accounted for high levels of release to the atmosphere. Textile mill products and Pulp, paper and paper products accounted for high levels of release to public water bodies.

When estimated releases outside notification are included, release to water bodies accounted for the greatest quantity of release to the environment. The distribution into the different media in the environment predicted by means of a multimedia model was 53.9% for water bodies and 45.5% for bottom sediment.

The predicted maximum exposure concentration for inhalation exposure to human beings was approximately 0.0038 µg/m³. In addition, a value of approximately 0.396 µg/m³ has been reported based on data for indoor air. The predicted maximum oral exposure was estimated to be more than 0.0004 µg/kg/day but less than 0.03 µg/kg/day.

The predicted environmental concentration (PEC) that indicates exposure to aquatic organisms was estimated to be approximately 0.24 µg/L for freshwater and approximately 0.03 µg/L for seawater public water bodies.

3. Initial assessment of health risk

Even brief exposure to this substance may result in severe irritation of the eyes, skin and respiratory tract. If inhaled, it may cause coughing, headache, nausea, sore throat and unconsciousness. Contact with the skin may result in redness and a burning sensation. Contact with the eyes may result in redness and pain.

There is insufficient information regarding the carcinogenicity of the substance, and it is not possible to make a judgment as to whether it causes cancer in humans. For this reason, an initial assessment of the substance was conducted based on information of non-carcinogenic effects.

As the 'Non-toxic level' was observed, used to estimate the margin of exposure (MOE), a no observed effect level (NOEL) of 8.9 mg/kg/day (urinary bladder transitional epithelium hyperplasia), obtained from rat medium- and long-term toxicity testings, was established for oral exposure. It was not possible to establish a 'Non-toxic level' for inhalation exposure.

With regard to oral exposure, when intake of groundwater and food was postulated, the maximum predicted exposure was estimated to be more than 0.0004 $\mu\text{g}/\text{kg}/\text{day}$ but less than 0.03 $\mu\text{g}/\text{kg}/\text{day}$. As the ‘Non-toxic level’ of 8.9 $\text{mg}/\text{kg}/\text{day}$ and the maximum predicted exposure were established by means of animal testing, the value was divided by 10 to derive an MOE of more than 30,000 but no more than 2,200,000. Accordingly, assessment of the health risk from oral exposure to this substance is thought to be unnecessary at this time.

It was not possible to determine the health risk for inhalation exposure. However, more than 99% of the predicted quantity released to the environment is released to water bodies, and subsequently as well almost none of the substance is predicted to be distributed in the atmosphere. Moreover, as a reference, if the rate of absorption is postulated to be 100% and the ‘Non-toxic level’ for oral exposure is converted to the ‘Non-toxic level’ for inhalation exposure, a value of 30 mg/m^3 is obtained. The MOE assessed from this value and the predicted maximum exposure concentration is 790,000 for ambient air and 7,500 for indoor air in local areas. Accordingly, there is thought to be comparatively little need to gather information, etc. on inhalation exposure in order to evaluate the health risk posed by the substance.

Knowledge of toxicity				Exposure assessment		Result of risk assessment			Judgment
Exposure path	Guidelines for risk assessment	Animal	Impact assessment guideline (endpoint)	Exposure medium	Predicted maximum exposure quantity and concentration	MOE			
Oral	No observed adverse effect level 8.9 $\text{mg}/\text{kg}/\text{day}$	Rat	Urinary bladder transitional epithelium hyperplasia	Drinking water / food	— $\mu\text{g}/\text{kg}/\text{day}$	MOE	—	×	○
				Groundwater / food	0.0004 ~ 0.03 $\mu\text{g}/\text{kg}/\text{day}$	MOE	30,000 ~ 2,200,000	○	
Inhalation	No observed adverse effect level — mg/m^3	—	—	Ambient air	0.0038 $\mu\text{g}/\text{m}^3$	MOE	—	×	×
				Indoor air	— $\mu\text{g}/\text{m}^3$	MOE	—	×	×

4. Initial assessment of ecological risk

With regard to acute toxicity, reliable information of a 96-hour EC_{50} growth inhibition value of 2,800 $\mu\text{g}/\text{L}$ was found for the algae *Scenedesmus subspicatus*, a 72-hour LC_{50} value of 2,100 $\mu\text{g}/\text{L}$ was found for the crustacea *Daphnia magna* (water flea), a 96-hour LC_{50} value of 14,100 $\mu\text{g}/\text{L}$ was found for the fish *Oryzias latipes* (medaka), and a 24-hour EC_{50} growth inhibition value of 20,000 $\mu\text{g}/\text{L}$ was found for the tetrahymena *Tetrahymena pyriformis*. Accordingly, an assessment factor of 100 was used, and a predicted no effect concentration (PNEC) of 21 $\mu\text{g}/\text{L}$ was obtained based on the acute toxicity values. With regard to chronic toxicity, reliable information of a 72-hour no observed effect concentration (NOEC) growth inhibition value of 3,400 $\mu\text{g}/\text{L}$ was found for the algae *Pseudokirchneriella subcapitata*, a 21-day NOEC reproduction value of 1,030 $\mu\text{g}/\text{L}$ was found for the crustacea *D. magna*, and a 48-day post-hatching lethal threshold concentration (LETC) of 8,300 $\mu\text{g}/\text{L}$ was found for the fish *Oncorhynchus mykiss* (rainbow trout). Accordingly, an assessment factor of 10 was used, and a PNEC value of 100 $\mu\text{g}/\text{L}$ was obtained based on the chronic toxicity values. As the PNEC for the substance, a value of 21 $\mu\text{g}/\text{L}$ obtained from the acute toxicity for the crustacea was used.

The PEC/PNEC ratio was 0.01 for freshwater bodies and 0.001 for seawater bodies. Accordingly, further work is thought to be unnecessary at this time.

Hazard assessment (basis for PNEC)			Assessment factor	Predicted no effect concentration PNEC ($\mu\text{g}/\text{L}$)	Exposure assessment		PEC/PNEC ratio	Result of assessment
Species	Acute / chronic	Endpoint			Water body	Predicted environmental concentration PEC ($\mu\text{g}/\text{L}$)		
Crustacea	Acute	LC_{50} Mortality	100	21	Freshwater	0.24	0.01	○
					Seawater	0.03	0.001	

5. Conclusions

	Conclusions		Judgment
Health risk	Oral exposure	Assessment is thought to be unnecessary at this time.	○
	Inhalation exposure	Risk cannot be determined. However, there is thought to be comparatively little need to collect information, etc.	×
Ecological risk	No need of further work.		○

[Risk judgments] ○: No need of further work ▲: Requiring information collection
■: Candidates for further work ×: Impossible of risk characterization