6	CAS No.: 91-59-8	Substance: 2-Naphthylamine

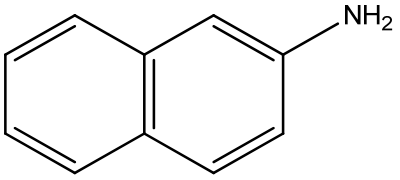
Chemical Substances Control Law Reference No.:

PRTR Law Cabinet Order No.:

Molecular Formula: $C_{10}H_9N$

Molecular Weight: 143.19

Structural Formula:



1.General information

The aqueous solubility of this substance is 189 mg/1,000 g (20°C), the partition coefficient (1-octanol/water) (log K_{ow}) is 2.28, and the vapor pressure is 2.56×10^{-4} mmHg (=0.0341 Pa) (25°C). Biodegradability data could not be obtained for this substance. The biodegradability (aerobic degradation) of 1-naphthylamine is characterized by a BOD degradation rate of 0%. In addition, this substance does not possess any hydrolyzable groups.

This substance is used as an intermediate for azo dyes. Further, the sale and distribution of household products containing azo dyes that are readily produced this substance, was banned from April 2016 under the provisions of the Act on Control of Household Products Containing Harmful Substances due to the adverse human health effects of substances contained in them. Such household products include textile products such as diapers, diaper covers, underwear, pyjamas, gloves, socks, inner garments and outer garments as well as leather products such as underwear, gloves, innerwear, and outerwear.

The manufacture, import and use of products containing more than 1% by weight of this substance and its salts is in principle prohibited under the Industrial Safety and Health Act. This substance is contained in cigarette smoke and is formed via the combustion of chemical substances found in tobacco.

2.Exposure assessment

Because this substance is not classified as a Class 1 Designated Chemical Substance under the PRTR Law, release and transfer quantities could not be obtained.

Predictions of proportions distributed to individual media by use of a Mackay-type level III fugacity model indicate that if equal quantities were released to the atmosphere, water bodies, and soil, the proportion distributed to soil would be largest.

The maximum expected concentration of exposure to humans via inhalation, based on ambient atmospheric data, was around less than 0.00085 μg/m^3.

Data for potable water, ground water, public freshwater bodies, food, and soil to assess oral exposure could not be obtained. Further, albeit based on data for a limited area, calculations for potable water gave a daily exposure reference value of around less than 0.004 μg/kg/day. In addition, albeit based on data for a limited area, calculations for ground water and public water bodies gave a daily exposure reference value of around less than 0.004 μg/kg/day. Data for setting the predicted environmental concentration (PEC), which indicates exposure to aquatic organisms, could not be obtained. However, a value of around less than 0.1 μg/L for public freshwater and for seawater was obtained from calculations based on past data.

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3. Initial assessment of health risk

This substance may irritate the respiratory tract and the skin. The substance may cause effects on the blood, resulting in the formation of methemoglobin, and may cause effects on the bladder, resulting in inflammation and hematuria. Both inhalation and ingestion of this substance will cause cyanosis to the lips, fingernails, and skin, as well as sudden

confusion, dizziness, convulsions, headache, nausea, and unconsciousness. The substance can be absorbed into the body via skin, and may cause the same symptoms as inhalation and ingestion.

This substance is classified as carcinogenic to humans because there are sufficient evidence for carcinogenicity in experimental animals and occupationally exposed humans. Considering the above, the initial assessment was conducted for both non-carcinogenic and carcinogenic effects.

The 'non-toxic level' for oral exposure could not be identified. The cancer slope factor for oral exposure of 1.8 $(mg/kg/day)^{-1}$ (based on bladder tumors), determined from carcinogenicity tests in monkeys, was adopted assuming no threshold. Neither 'non-toxic level' nor unit risk could be identified for inhalation exposure.

Regarding the oral exposure, due to the lack of identified exposure levels, the health risk could not be assessed. However, the maximum exposure level was estimated to be less than 0.004 $\mu g/m^3$, approximately, based on data in a certain area on drinking water and past data on public freshwater bodies and groundwater reported in 2006. The excess cancer incidence rate for reference would be less than 7.2×10^{-6}, when calculated from the estimated maximum exposure level and the cancer slope factor. This could be below or above the judgment criteria. Since exposure to the substance in environmental media via food is presumed to be limited despite the lack of exposure level via food , including it in the calculation would not change the excess cancer incidence rate significantly. Therefore, as a comprehensive judgment, collection of information would be required to assess the health risk of this substance via oral exposure. The first step would be to examine needs for measurements with lower detection limits.

Regarding the inhalation exposure, due to the lack of identified 'non-toxic level' and unit risk, the health risk could not be assessed. However, the tentative unit risk would be 5.4×10^{-4} $(\mu g/m^3)^{-1}$ derived from the conversion of the slope factor for oral exposure, assuming that 100% of the inhaled substance is absorbed. The excess cancer incidence rate for reference corresponding to the predicted maximum exposure level of less than 0.00085 $\mu g/m^3$, approximately, would be less than 4.6×10^{-7}, when calculated from the tentative unit risk. Therefore, as a comprehensive judgment, collection of further information would not be required to assess the health risk of this substance via inhalation in ambient air.

Toxicity						Exposure assessment		MOE & Excess incidence rate		Comprehensive judgment
Exposure Path	Criteria for risk assessment			Animal	Criteria for diagnoses (endpoint)	Exposure medium	Predicted maximum exposure dose and concentration			
Oral	'Non-toxic level'	-	mg/kg/day	-	-	Drinking water	- µg/kg/day	MOE	-	▲
								Excess incidence rate	-	
	Slope factor	1.8	$(mg/kg/day)^{-1}$	Monkeys	Bladder tumors	Ground water	- µg/kg/day	MOE	-	
								Excess incidence rate	-	
Inhalation	'Non-toxic level'	-	mg/m^3	-	-	Ambient air	<0.00085 $\mu g/m^3$	MOE	-	○
								Excess incidence rate	-	
	Unit risk	-	$(\mu g/m^3)^{-1}$	-	-	Indoor air	- $\mu g/m^3$	MOE	-	×
								Excess incidence rate	-	

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.

4.Initial assessment of ecological risk

With regard to acute toxicity, the following reliable data were obtained: a 72-h EC_{50} of 500 μg/L for growth inhibition in the alga *Raphidocelis subcapitata*, a 48-h EC_{50} of 835 μg/L for swimming inhibition in the crustacean *Daphnia magna*, and a 96-h LC_{50} of 3,890 μg/L for the fish species *Oryzias latipes* (medaka). Accordingly, based on these acute toxicity values and an assessment factor of 100, a predicted no effect concentration (PNEC) of 5 μg/L was obtained.

With regard to chronic toxicity, the following reliable data were obtained: a 72-h NOEC of 157 μg/L for growth inhibition in the alga *R. subcapitata* and a 21-d NOEC of 14 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 0.14 μg/L was obtained.

The value of 0.14 μg/L obtained from the chronic toxicity to the crustacean was used as the PNEC for this substance.

Data for setting the predicted environmental concentration (PEC) could not be obtained for this substance. Accordingly, an assessment of ecological risk could not be made. However, albeit past data, a report of less than around 0.1 μg/L exists for this substance in both public freshwater bodies and seawater. The ratio of this value to the PNEC is less than 0.7. Accordingly, based on a comprehensive review of the above findings, efforts to collect data are needed.

Environmental concentration data need to be augmented for this substance, through efforts to elucidate emission quantities into the environment, lowering the detection limit where necessary. Further, efforts to collect data regarding chronic toxicity towards fish species are needed.

Hazard assessment (basis for PNEC)			Assessment coefficient	Predicted no effect concentration PNEC (μg/L)	Exposure assessment		PEC/ PNEC ratio	Comprehensive judgment
Species	Acute/ chronic	Endpoint			Water body	Predicted environmental concentration PEC (μg/L)		
Crustacean *Daphnia magna*	Chronic	NOEC Reproductive inhibition	100	0.14	Freshwater	—	—	▲
					Seawater	—	—	

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5. Conclusions

	Conclusions		Judgment
Health risk	Oral exposure	Requiring information collection.	▲
	Inhalation exposure	No need for further work.	○
Ecological risk	Requiring information collection.		▲

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