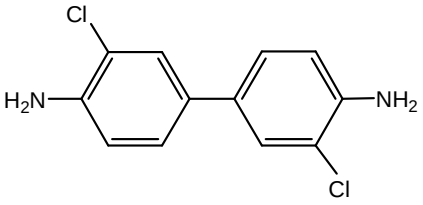
7	CAS No.: 91-94-1	Substance: 3,3'-dichlorobenzidine

Chemical Substances Control Law Reference No.: 4-800

PRTR Law Cabinet Order No.:1-138

Structural Formula:



Molecular Formula: $C_{12}H_{10}Cl_2N_2$

Molecular Weight: 253.13

1. General information

The aqueous solubility of this substance is 3.11 mg/L (25°C) and the partition coefficient (1-octanol/water) (log Kow) is 3.51 (pH = 8.7, 23°C). The vapor pressure is 7 x 10^{-6} mmHg (= 1 x 10^{-3} Pa) (22°C). Degradability (aerobic degradation) in terms of BOD-based degradation percentage is estimated to be 1%. This substance is determinated to be non or not highly bioaccumulative. In addition, this substance does not have hydrolyzable groups.

This substance is a Type 2 and Type 3 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). The substance is a principal intermediate for organic yellow pigments and considerably used for printing ink. The total production and imports in FY 2006 was 6,594 tons, which was categorized as falling within the 100-ton class of production and imports under the PRTR Laws.

---

2. Exposure assessment

The total releases to the environment in FY 2005 based on the PRTR Law were zero tons and the transfers to sewage and waste were 0.0001 and 7.2 tons, respectively. The ratio of distribution to each environmental medium was estimated using a multimedia model to be 66.5% for water bodies and 27.0% for sediment in an area having the largest transfers to sewage.

It was not possible to obtain data to enable a predicted maximum exposure concentration to be established for inhalation exposure to human beings. The highest oral predicted exposure was calculated to be approximately less than 0.0004 μg/kg/day based on data regarding freshwater bodies. The risk of exposure to this substance through food in environmental media is considered to be low.

The predicted environmental concentration (PEC), which indicates exposure to aquatic organisms, was estimated to be less than 0.010 μg/L for both freshwater and seawater public water bodies.

---

3. Initial assessment of health risk

The substance irritates the respiratory tract. By inhalation, it may cause cough and sore throat.

There was information on general toxicity of this substance. With regard to carcinogenicity, initial assessment of the effects of both of this substance and benzidine was conducted. This is because: benzidine, whose structural formula is similar to the substance, is classified as a human carcinogen; this substance may contribute to the bladder cancer incidence attributed to benzidine considering the fact that the same industrial plants produce both substances; most of the results of genotoxicity tests were positive; and the recent epidemiological studies suggested increased tumor formation.

A lowest observed adverse effect level (LOAEL) of 10.4 mg/kg/day (increased GPT) was obtained for oral exposure from the medium- and long-term toxicity testing for dogs. The value was divided by 10, because it was LOAEL, and a value of 1 mg/kg/day was derived as the 'Non-toxic level*'. With regard to the carcinogenicity, the slope factor assuming no threshold was determined to be 1.2$(mg/kg/day)^{-1}$ (mammary tumors), which was derived from the testing for rats. For

inhalation exposure, neither the 'Non-toxic level*' for non-carcinogenic effects nor the unit risk assuming no threshold for carcinogenicity could be estimated.

With regard to oral exposure, in case of intakes of freshwater in the public water bodies, the predicted maximum exposure was approximately less than 0.0004 μg/kg/day. The margin of exposure (MOE) of exceeding 25,000 was derived from the 'Non-toxic level*' of 1 mg/kg/day divided by the predicted maximum dose, and divided by 10, because of the 'Non-toxic level*' being established by means of animal testing, and further divided by 10 considering carcinogenicity. With regard to carcinogenicity, the excess incidence rate corresponding to the predicted maximum dose was derived to be less than 4.8×10^{-7} from the slope factor. As the exposure to this substance through food intakes was estimated minor, even when the exposure through freshwater and food are combined, it would not greatly affect the MOE values. Accordingly, further action for assessment of its health risk from oral exposure to this substance would not be required at present.

Concerning inhalation exposure, because neither 'Non-toxic level*', the unit risk nor exposure concentration was determined, its health risk can not be identified. Its release into the atmosphere was reported to be zero tons; Its vapor pressure is relatively low, being 4.5×10^{-9}–7×10^{-6} mmHg at 20°C. The half-life in the atmosphere of this substance is 1.6-16hours. Released substance was estimated to distribute mostly into the water, and little into the atmosphere. Accordingly, there would be little necessity of collecting information on inhalation exposure to this substance in the ambient air for its health risk assessment.

Information of toxicity					Exposure assessment		Result of risk assessment			Judgment
Exposure Path	Criteria for risk assessment		Animal	Criteria for diagnoses (endpoint)	Exposure medium	Predicted maximum exposure quantity and concentration				
Oral Inhalation	'Non-toxic level*'	1 mg/kg/day	Dogs	increased GPT	Drinking water	— μg/kg/day	MOE	—	×	○
							Excess incidence rate	—	×	
	Slope factor	1.2 $(mg/kg/day)^{-1}$	Rats	mammary tumors	Freshwater	< 0.0004 μg/kg/day	MOE	> 25,000	○	
							Excess incidence rate	$< 4.8\times10^{-7}$	○	
Oral	'Non-toxic level*'	— mg/m^3	—	—	Ambient air	— $\mu g/m^3$	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 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, reliable information of a 72-hour median effective concentration (EC_{50}) growth inhibition value of 1,350 μg/L was found for the algae *Pseudokirchneriella subcapitata*, a 48-hour EC_{50} immobilization value of 1,900 μg/L was found for the crustacea *Daphnia magna* (water flea), and a 96-hour median lethal concentration (LC_{50}) value of 510 μg/L was found for the fish *Oryzias latipes* (medaka). Accordingly, an assessment factor of 100 was used, and a predicted no effect concentration (PNEC) of 5.1 μg/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 151 μg/L was found for the algae *P. subcapitata*, and a 21-day NOEC reproduction value of 210 μg/L was found for the crustacea *D. magna*. Accordingly, an assessment factor of 100 was used, and a PNEC value of 1.5 μg/L was obtained based on the chronic toxicity values. As the PNEC for the substance, a value of 1.5 μg/L obtained from the chronic toxicity for the algae was used.

The PEC/PNEC ratio was less than 0.007 for both freshwater bodies and 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 (μg/L)	Exposure assessment		PEC/ PNEC ratio	Result of assessment
Species	Acute / chronic	Endpoint			Water body	Predicted environmental concentration PEC (μg/L)		
Algae (green algae)	Chronic	NOEC growth inhibition	100	1.5	Freshwater	<0.010	<0.007	○
					Seawater	<0.010	<0.007	

---

5. Conclusions

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

[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.