

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

INTEROFFICE COMMUNICATION

TO: File for 1,4-butanediol (CAS# 110-63-4)
FROM: Mary Lee Hultin
DATE: May 15, 2009
SUBJECT: Screening level for 1,4-butanediol (CAS# 110-63-4)

The Initial Risk Screening Level (ITSL) for 1,4-butanediol (CAS# 110-63-4) is 79 $\mu\text{g}/\text{m}^3$ based on annual averaging.

AQD staff previously performed literature searches and approved predicated ambient impacts for this compound. An updated review was conducted for finalizing a screening level as part of a review for Permit 126-08A. The predicted ambient impact for this permit to install is 0.42 $\mu\text{g}/\text{m}^3$. Previous review by Sadoff, 2004, determined that a p.a.i. of 0.02714 was acceptable. The update included a search of the following references: EPB Chemical Criteria Database; AQD Chemical Files; IRIS database; ACGIH TLV 2008; NIOSH RELs 2008; MDEQ Library; CAS Online; NLM Online; EPBCD entries. Limited toxicity studies were found.

1,4-butanediol is a chemical used in the manufacture of other compounds. It is used orally as an illicit drug, as it is rapidly converted after oral exposure into γ -hydroxy-butyric acid (GHB) by alcohol dehydrogenase in humans and animals. Overdoses from 1,4-butanediol have resulted in severe neurotoxicity and death.

Available acute toxicity data includes LC₁₀, LD₅₀ and a 2-week inhalation study citation in RTECS; NTP summary data on a developmental toxicity test in mice and a metabolism study. These findings are summarized in the table below.

Species	Method	Duration	Dose	Results
Pregnant Swiss CD-1 mice	Gavage	Gd 6-15	0, 100, 300, 600 mg/kg/d	100 mg/kg/d NOAEL for maternal and developmental toxicity
Rat, male and female	LD50	Single dose	1.83 g/kg and 2.00 g/kg, respectively	lethal
Wistar rat	Gavage	28 d	5,50, 500 mg/kg/d	50 mg/kg/d NOAEL
Rat, male Crl:CD	Ihl	6 hr/day, 5 d/wk, 2 wk	0, 0.2, 1.1 or 5.2 mg/l mg/L	1.1 mg/L NOAEL

Irwin, 2006 concluded that due to the similarity to γ -hydroxybutyric acid, and the negative results in NTP chronic bioassay, that 1,4-butanediol is not expected to be carcinogenic.

Screening level development

The oral route of exposure yields significant neurotoxicity, whereas inhalation exposure resulted in effects on the clinical chemistry of the blood of the experimental animals. Inhalation data was chosen for derivation of the screening level.

As per Rule 232:

- No appropriate human RfC from IRIS is available. Neither are an RfD, or an OEL.
- 232 (d) guidelines used to obtain ITSL from 7-day rat inhalation study
 - $ITSL = (NOAEL/35*100) \times (\text{hours exposed per day}/24 \text{ hours})$
 - $(1.1 \times 10^6 \mu\text{g}/\text{m}^3/35*100)/(6/24) = \mathbf{78.57 \mu\text{g}/\text{m}^3 \text{ or } 79 \text{ ug}/\text{m}^3}$
 - Averaging time is annual

References

Kinney, L. A., et al., 1991, Inhalation Toxicology, v. 3(4) pl 379-88

Irwin, 2006, J. Appl. Toxicol., v. 26(1):72-80

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