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Chemical Name: 1-Bromopropane

CAS: 106-94-5

Synonyms: n-Propylbromide

Acute Health Based Value (HBV) = 50,000 $\mu\text{g}/\text{m}^3$

$$= \frac{[\text{Point of Departure (HEC)}]}{[\text{Uncertain Factors}]} \div [\text{Exposure Adjustment Factor*}]$$

$$= \frac{1534 \text{ mg}/\text{m}^3}{30} \div 1$$

$$= 51,133 \text{ rounded to } 50,000 \text{ } \mu\text{g}/\text{m}^3$$

* The Exposure Adjustment Factor is a default value applied to address concerns of potential life-stage exposure differences between infants, children, and adults.

Source of Toxicity Value: MDH 2010

Critical Study: NTP, 2003 study in CrI: CD(SD) IGS BR Sprague-Dawley rats

Point of Departure: 305 ppm (1534 mg/m^3) BMCL₀₅

Human Equivalent Concentration: 1534 mg/m^3 (no time adjustment for developmental effects)

Total Uncertainty/Adjustment: 30

UF/AF Allocation: 10 for intraspecies variability; 3 for interspecies variability (pharmacodynamics)

1 as a default exposure adjustment factor (AF) to protect infants and children (no adjustment needed as the value is based on early life exposure)

Critical Effect(s): Reduced fetal weight

Additivity Endpoint(s): Developmental/Reproductive

Subchronic Health Based Value (HBV_{subchronic}) = 4,000 $\mu\text{g}/\text{m}^3$

$$= \frac{[\text{Point of Departure (HEC)}]}{[\text{Uncertain Factors}]} \div [\text{Exposure Adjustment Factor}]$$

$$= \frac{335.3 \text{ mg}/\text{m}^3}{30} \div 3$$

$$= 3,726 \text{ rounded to } \mathbf{4,000 \mu\text{g}/\text{m}^3}$$

Source of Toxicity Value: MDH 2010
 Critical Study: Ichihara et al., 2000 study in male Wistar rats
 Point of Departure: 200 ppm (1006 mg/m³) NOAEC
 Human Equivalent Concentration: 335.3 mg/m³
 Total Uncertainty/Adjustment: 90
 UF/AF Allocation: 10 for intraspecies variability; 3 for interspecies variability (pharmacodynamics)
 3 as a default exposure adjustment factor (AF) to protect infants and children
 Critical Effect(s): Neurological (decrease in both hind limb and forelimb grip strength)
 Additivity Endpoint(s): Nervous System

$$\mathbf{\text{Chronic Health Based Value (HBV}_{\text{chronic}}) = 20 \mu\text{g}/\text{m}^3}$$

$$= \frac{[\text{Point of Departure (HEC)}]}{[\text{Uncertain Factors}]} \div [\text{Exposure Adjustment Factor}]$$

$$= \frac{20.15 \text{ mg}/\text{m}^3}{300} \div 3$$

$$= 22.4 \text{ rounded to } \mathbf{20 \mu\text{g}/\text{m}^3}$$

Source of Toxicity Value: MDH 2010
 Critical Study: NTP, 2009 study in male and female F344/N rats
 NTP, 2009 study in male and female B6C3F1 mice
 Point of Departure: 125 ppm (629 mg/m³) LOAEC in rats
 62.5 ppm (314 mg/m³) LOAEC in mice
 Human Equivalent Concentration: 29.2 mg/m³ (from rats)
 11.1 mg/m³ (from mice)
 20.15 mg/m³ ** (averaged HECs from rats and mice)
 Total Uncertainty/Adjustment: 900
 UF/AF Allocation: 10 for intraspecies variability; 3 (i.e. √10) for interspecies variability (pharmacodynamics); 10 for using a LOAEC as the point of departure;
 3 as a default exposure adjustment factor (AF) to protect infants and children

Critical Effect(s): Non-neoplastic lesions in the respiratory system (both rats and mice)
Additivity Endpoint(s): Respiratory system

** For deriving the chronic HBV, MDH chose to use the mean of Human Equivalent Concentrations (HECs) of interest for the same endpoint from two species in the same well-conducted (GLP) study. MDH has determined that the two parts of this study provide the same level of scientific merit and certainty for extrapolation to humans, and combining the data provides greater confidence in the accuracy of the result.

Cancer Health Based Value (HBV_{cancer}) = Not Applicable

Note: A recently completed NTP draft report (NTP, 2009) concludes that there is clear evidence of carcinogenicity in female rats and mice, but only some evidence of carcinogenicity in male rats and no evidence of carcinogenicity in male mice. When these data are finalized it should be possible to develop a unit risk for 1-bromopropane.

Volatile: Yes, highly volatile

Summary of Guidance Value History:

There are no HRVs promulgated for 1-bromopropane. The above HBVs represent new guidance values.

Summary of toxicity testing for health effects identified in the Health Standards Statute:

	Endocrine	Immunotoxicity	Development	Reproductive	Neurotoxicity
Tested?	No ¹	Yes	Yes	Yes	Yes
Effects?	--	Yes ²	Yes ³	Yes ³	Yes ⁴

Note: Even if testing for a specific health effect was not conducted for this chemical, information about that effect might be available from studies conducted for other purposes. Most chemicals have been subject to multiple studies in which researchers identify a concentration where no effects were observed, and the lowest concentration that caused one or more effects. A toxicity value based on the effect observed at the lowest concentration across all available studies is considered protective of all other effects that occur at higher concentrations.

Comments on extent of testing or effects:

¹ No information was found regarding endocrine effects of 1-bromopropane.

² 1-Bromopropane has been shown to be immunotoxic in rats and mice. Lee et al (2007) administered 1-bromopropane to Balb/C mice by gavage in doses of 200, 500, or 1,000 mg/kg and found suppression of antibody response to T-dependent antigen and suppression of splenic intracellular IL-2 in response to ConA.

Anderson et al (2010) reported decreased spleen cellularity and function and decreased antibody response in both F344/N rats and B6C3F1 mice

³ The National Toxicology Program (NTP, 2003) concluded that, based on experimental data in animals, there were serious concerns for exposures at the upper end of occupational exposures (18 – 381 ppm or 90

to 1900 mg/m³), but only minimal concern at lower exposures that are intermittent and well controlled (0.04 – 0.63 ppm or 0.2 – 3.17 mg/m³).

Animal data provide clear evidence of adverse effects on developmental and reproductive toxicity. Decreased fetal body weights and skeletal variations have been reported at with subchronic inhalation exposures of 500 ppm or greater. Reproductive impacts including decreased prostate weights, and decreased sperm motility and number of normal sperm in male rats and increased follicular cysts and increased estrus cycle length in female rats have been reported with subchronic inhalation exposures of 250 ppm or greater.

1-BP is listed on the Proposition 65 list as a reproductive developmental toxicant.

⁴ 1-Bromopropane is neurotoxic in experimental animals and occupationally exposed humans. No evidence was found to support impacts on the developing brain and nervous system.

References:

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