

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

INTEROFFICE COMMUNICATION

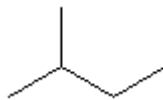
April 6, 2001

TO: File for Isopentane (CAS No. 78-78-4)
FROM: Michael Depa, Toxics Unit, Air Quality Division
SUBJECT: Development of the Screening Level

The initial threshold screening level (ITSL) for isopentane (also called 2-methylbutane) is 17,700 $\mu\text{g}/\text{m}^3$ (8-hr averaging time).

The following references or databases were searched to identify data to determine the screening level: Environmental Protection Agency's (EPA's) Integrated Risk Information System (IRIS), the Registry of Toxic Effects of Chemical Substances (RTECS), the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLV), National Institute of Occupational Safety and Health (NIOSH) Pocket Guide to Hazardous Chemicals, Environmental Protection Bureau Library, International Agency for Research on Cancer (IARC) Monographs, Chemical Abstract Service (CAS) Online (1967- September 2000), National Library of Medicine (NLM), Health Effects Assessment Summary Tables (HEAST), and National Toxicology Program (NTP) Status Report. The EPA has not established a reference concentration (RfC) or reference dose (RfD) for isopentane. The ACGIH has established an Occupational Exposure Limit (OEL) for isopentane at 1770 mg/m^3 (600 ppm). NIOSH REL does not have a Recommended Exposure Limit (REL) for isopentane. The molecular weight is 72.15 g, and the molecular formula is $\text{CH}_3\text{CH}_2\text{CH}(\text{CH}_3)_2$. The molecular structure is shown in Figure 1. The boiling point is 27.8°C. Isopentane is not water soluble and is expected to be a liquid at room temperature. The vapor pressure is 595 mmHg at 21°C. The odor threshold is around 400 ppm (ACGIH, 2000).

Figure 1. Molecular Structure of Isopentane



The toxicity of isopentane was reviewed in a report by Galvin et al. (1999).

Inhalation Toxicity Data

In an LC50 study, 4 groups of 5 male and 5 female Charles River albino rats were exposed to 841840, 1241440, 1423400 and 1841840 mg/m^3 isopentane for 4 hours and observed for 14 days (Phillips Petroleum, 1976). The LC50 was determined to be 1,281,900 mg/m^3 . Anesthesia was noted at 10 minutes after eth exposures started and persisted through exposure period or until death occurred. The animals that survived the exposure period were completely recovered within 20 minutes after the exposure ceased. Intermittent tremors were noted in several animals prior to death. At necropsy the lungs of the rats which died in the 1423400 mg/m^3 did not collapse when the thorax was opened. The authors stated that no other pathological observations were noted.

In another LC50 study, groups of 5 male and 5 female Sprague-Dawley rats were exposed to 32,540 mg/m³ isopentane for 4 hours and observed for 14 days (Phillips Petroleum, 1982). No deaths occurred during the exposure or observation period. No gross signs and symptoms of intoxication were noted. No exposure-related trends were apparent in the mean male and female body weight data. Two females had uterine horns distended with clear fluid. No other gross pathological findings were observed.

In an irritation study, a group of four CD-1 male mice were exposed to a head only concentration of 32540 mg/m³ isopentane (Phillips Petroleum, no date)

In a 28-day gavage study, groups of 10 male F344 rats were exposed to 0, 0.5 or 2.0 g/kg/day 5 days per week for 4 weeks (Halder et al., 1985). Body weight, kidney pathology and mortality were examined.

Derivation of Screening Level

The ITSL for isopentane was based on the TLV for "Pentane, all isomers" including: 78-78-4, 109-66-0, and 463-82-1. The TLV is 600 ppm. There is no NIOSH REL for isopentane, however, the REL for pentane (CAS No. 109-66-0) is 120 ppm (350 mg/m³). The Science Advisory Panel reviewed the NIOSH basis for the REL and determined that it was inappropriate to use for pentane, "[U]sing the lower NIOSH REL which is based on hexane neurotoxicity in calculation of the ITSL for pentane is considered inappropriate."

The ITSL was calculated pursuant to Rule 232(1)(c) as follows:

$$\text{ITSL} = \text{OEL}/100$$

Where the OEL is occupational exposure limit (either the TLV or REL).

$$\text{ITSL} = (1770 \text{ mg/m}^3)/100$$

$$\text{ITSL} = 17.7 \text{ mg/m}^3$$

$$\text{ITSL} = 17700 \text{ } \mu\text{g/m}^3 \text{ (8-hour averaging time).}$$

References

ACGIH. 1998 (supplement). Documentation of threshold limit values (TLVs) and biological exposure indices (BEI). American Conference of Governmental Industrial Hygienists. Cincinnati, OH, 45240-1634.

Galvin J, Marashi F. 1999. 2-methylbutane (isopentane). Journal of Toxicology and Environmental Health, Part A. Volume 58, pages 23-33.

Halder C, Holdsworth C, Cockrell B, Piccirillo V. 1985. Hydrocarbon nephropathy in male rats: identification of the nephrotoxic components of unleaded gasoline. Toxicology and Industrial Health. Volume 1 (3). Pages 67-87.

Phillips Petroleum. 1982. Isopentane Toxicity Study Summary. Bartlesville, OK. Hazelton Laboratories America, Inc. (unpublished report).

Phillips Petroleum. 1976.

Phillips Petroleum. no date. Respiratory