

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

INTEROFFICE COMMUNICATION

May 26, 2016

TO: File for 2-Methoxy-1-Propanol (CAS No. 1589-47-5)
FROM: Mike Depa, Toxics Unit, Air Quality Division
SUBJECT: Initial Threshold Screening Level

The Initial Threshold Screening Level (ITSL) for 2-methoxy-1-propanol is 660 $\mu\text{g}/\text{m}^3$, with annual averaging time.

Previously, the averaging time (AT) assigned to MTBE was 24 hours, as per the default methodology (see attached memo from Gary Butterfield dated November 8, 2001). The current file review concludes that the AT may appropriately be set at annual, based on the nature and duration of the key study and the ITSL value derivation, as allowed under Rule 229(2)(b). Therefore, the AT is set to annual.

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

INTEROFFICE COMMUNICATION

November 8, 2001

TO: 2-Methoxy-1-propanol file (CAS # 1589-47-5)
FROM: Gary Butterfield, Toxics Unit
SUBJECT: Screening Level for 2-Methoxy-1-propanol

The initial threshold screening level (ITSL) for 2-methoxy-1-propanol is being set at 660 $\mu\text{g}/\text{m}^3$ with 24-hour averaging.

2-Methoxy-1-propanol is also known as the beta isomer of propylene glycol monomethyl ether or beta-PGME. Commercial PGME is made up of a mixture containing 98% alpha-PGME (CAS #107-98-2) and 2% beta-PGME. The beta-PGME is considered to be a contaminant. 2-Methoxy-1-propanol is a water soluble, liquid material with a molecular weight of 90.1 g/mol. The following references or databases were searched to identify data to determine the screening level: U.S. Environmental Protection Agency (EPA) Integrated Risk Information System (IRIS), National Institute for Occupational Safety and Health (NIOSH) Registry for Toxic Effects of Chemical Substances (RTECS), American Conference of Governmental and Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs), Michigan Department of Environmental Quality (DEQ) library, International Agency for Research on Cancer (IARC) Monographs, Chemical Abstract Service (CAS) Online (1967 - July 2000), National Library of Medicine (NLM) - Toxline, and National Toxicology Program (NTP) Status Report.

Standard secondary toxicity references (NTP, EPA IRIS, ACGIH, IARC, NIOSH, etc.) were searched for information on this chemical that could be used to set an ITSL. A July 17, 2000 CAS and NLM on-line literature search was conducted to look for any toxicity data.

NIOSH (1991) provides a good overview of the toxic effects of 2-methoxy-1-propanol. There is not much toxicity data available for this chemical, as it is a contaminant of commercial 1-methoxy-2-propanol. 2-Methoxy-1-propanol is not produced as a pure material for commercial use.

The literature search found only a few toxicity studies that have been published for this chemical. In an acute oral study reported by Smyth et al (1941) the rat LD-50 was found to be 5.71 g/kg for beta-PGME.

In addition to the acute LD-50, a reproductive/developmental toxicity study was also located during the literature search. It is generally preferred to use a longer-term study to provide the basis of the screening level. Therefore, the reproductive study would provide a better basis for setting the screening level. Hellwig et al (1994) reported the results from a rabbit inhalation reproductive/developmental toxicity study. Himalayan rabbits were exposed to 0, 528, 823, 1310 or 1990 mg/m^3 on gestation days 6 to 18. Fetuses were examined at gestation day 29 for compound effects. Maternal toxicity was evident at the high dose level by significantly reduced body weights. All of the fetuses at the high dose level were malformed. Many fetuses at the second highest dose level also had statistically increased number of skeletal anomalies. The top 3 dose levels had increased soft tissue variations, while all of the dose levels had increased

skeletal variations. The author concluded that the low dose 143 ppm or 528 mg/m³ was close to the fetal NOAEL.

A screening level can be calculated from the reproductive/developmental LOAEL of 528 mg/m³ from Hellwig et al using EPA RfC methodology as follows. The beta-PGME vapors can be considered to be a category 3 type gas as the toxic effects observed are extra-respiratory. Due to a lack of information on blood:gas partitioning, the default value of one is used for the animal to human ratio. This results in the LOAEL (hec) being equivalent to the LOAEL (adj).

$$\text{LOAEL (adj)} = (528 \text{ mg/m}^3) \times 6/24 = 132 \text{ mg/m}^3$$

$$\text{LOAEL (hec)} = 132 \text{ mg/m}^3$$

$$\text{RfC} = (132 \text{ mg/m}^3)/(2 \times 10 \times 10) = 660 \text{ } \mu\text{g/m}^3$$

Where uncertainty factors of 10 were used for animal-to-human, and sensitive individuals. The uncertainty factor for LOAEL-to-NOAEL adjustment was reduced to 2 because the LOAEL dose level is close to the expected NOAEL dose - the incidence of variations in the low dose group is not greatly more than statistically significant.

ITSL = 660 $\mu\text{g/m}^3$ with 24-hour averaging

If there is beta-PGMEA present in addition to the beta-PGME, both materials need to be evaluated for exceedance of a hazard index of one, using this ITSL for beta-PGME and the ITSL for beta-PGMEA. Due to the fact that beta-PGMEA is metabolized to beta-PGME in the first step of metabolism. Thus, both beta-PGME and beta-PGMEA will contribute to the observed toxic effect.

In support of the screening level for beta-PGME, the ITSL (of 500 $\mu\text{g/m}^3$) developed for beta PGMEA could be compared to the ITSL for beta-PGME. The ITSL for beta-PGMEA was also based on a reproductive/developmental study. For this comparison, multiplying the ITSL of beta-PGMEA by the ratio of the molecular weight between PGME and PGMEA (i.e. $500 \times (132/90) = 730 \text{ } \mu\text{g/m}^3$). It is seen that the resulting estimated ITSL of 730 is very close to the calculated ITSL of 660 $\mu\text{g/m}^3$ determined for beta-PGME above. Thus, increasing the confidence in the above ITSL for beta-PGME as being calculated most appropriately.

References:

Hellwig et al. 1994. Prenatal toxicity of inhalation exposure to 2-methoxypropanol-1 in rabbits. Fund Appl Toxicol 23:608-613.

NIOSH. 1991. NEG and NIOSH basis for an occupational health standard: propylene glycol ethers and their acetates. US Dept of Health and Human Services.

Smyth et al. 1941. The single dose toxicity of some glycols and derivatives. J Ind Hyg Toxicol 23:259-268.

GB:DB

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