

MICHIGAN DEPARTMENT OF NATURAL RESOURCES

INTEROFFICE COMMUNICATION

August 4, 1995

TO: File for Methyl Mercaptan (74-93-1)

FROM: Marco Bianchi

SUBJECT: Final Evaluation for ITSL Listing

Methyl mercaptan was initially evaluated by AQD staff in 1993, using interim ITSL procedures to derive a value of 10 ug/m³ (1 hr. averaging) based on a NIOSH 15-min. ceiling limit. In an effort to finalize all interim chemical screening levels, this chemical was re-reviewed to set a final ITSL. The following references or databases were searched to identify data for determining an ITSL: IRIS, HEAST, NTP Management Status Report, RTECS, EPB-CCD, EPB library, CAS-online, NLM-online, IARC, NIOSH Pocket Guide, and ACGIH Guide.

Review of the literature revealed acute and subchronic animal studies in addition to occupational exposure information.

Mercaptans are known to be potent ocular and dermal irritants. Methyl mercaptan acts toxicologically like hydrogen sulfide and may depress the central nervous system producing respiratory paralysis and death. The odor of methyl mercaptan resembles that of hydrogen sulfide, but it can be detected at much lower concentrations; an odor threshold of 0.0016 ppm has been reported.

In an acute inhalation study by Tansy et al., (1981) male and female Sprague-Dawley rats were randomly selected into 47 dose groups with each group consisting of 5 males and 5 females. The rats were exposed to vapors of methyl mercaptan and other reduced sulfur compounds for 4-h periods in order to determine 24-h LD₅₀ values using calculated gas concentrations. During exposure, rats were deprived of food and water. Animals that survived the 24 hr exposure survived to the end of the 14 day observation period. The LD₅₀ for methyl mercaptan was determined to be 675 ppm.

In a second series of experiments by Tansy et al., (1981) 31 male rats/group were exposed to concentrations of 0, 2, 17, and 57 ppm of methyl mercaptan vapor through an inhalation chamber for 7h/d, 5d/wk for a period of 3 months to determine subchronic toxicological effects. An additional 10 animals/group were randomly selected for metabolic performance studies. According to the authors, histopathological findings were essentially absent except for microscopic suggestions of liver damage. The most readily apparent observation was a decrease in body weight. Average values of terminal body weights for all exposed groups were lower than that for the control group. This difference was

significant in the 57 ppm group and followed a statistically dose-related trend. Additional observations included, hyperplastic nodules found in four livers from rats exposed to 2 and 57 ppm, and a hepatic carcinoma was found in a liver from a rat exposed to 17 ppm. However, nodules were also observed in the livers of control rats and were found to be hyperplastic. The hepatic carcinoma was considered to be a singular event that wasn't believed to be associated with the study.

The ACGIH established a TLV of 0.5 ppm (0.98 mg/m^3), based on a close toxicological similarity between methyl mercaptan and hydrogen sulfide. Because methyl mercaptan has a stronger odor than hydrogen sulfide a TLV of 0.5 ppm was recommended. NIOSH established a more conservative occupational exposure limit of 0.5 ppm as a 15-min ceiling limit, maintaining that a ceiling value was more appropriate for this substance.

From the data presented above, it would appear the Tansey study could be used to develop an RfC taking precedence over an OEL based value. However, given the known acute toxicity and odor concerns of methyl mercaptan, it is difficult to justify using rodent data to develop a number using a longer averaging time than the 1-hr. value derived by using the REL. Additionally, the Tansey study does not address the irritant effects of this compound. Therefore, the NIOSH REL of 1 mg/m^3 (15-min ceiling level) is designed to be protective against acute irritated effects which appear to be the most sensitive endpoints identified by the available data. The final initial threshold screening level value will stay at 10 ug/m^3 based on a 1 hr. averaging time. But, the odor threshold for this compound should be taken into consideration when developing permit conditions since it is between $0.02\text{-}2.0 \text{ ug/m}^3$.

References:

Documentation of TLVs and BEIs, vol. II pp. 939-940 (1991).

Tansy, MF et al., (1981). Acute and subchronic toxicity studies of rats exposed to vapors of methyl mercaptan and other reduced-sulfur compounds. J. Toxicol. Environ. Health. 8:71-88.

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