

MICHIGAN DEPARTMENT OF NATURAL RESOURCES

INTEROFFICE COMMUNICATION

August 3, 1995

TO: File for Methylamine (74-89-5)

FROM: Marco Bianchi

SUBJECT: Final Evaluation for ITSL Listing

Methylamine was initially evaluated by AQD staff in 1992, using interim ITSL procedures to derive a value of 120 ug/m³ (8 hr. averaging) based on a TLV. 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.

Methylamine is a compound having strong irritant properties. A 40% aqueous solution of this compound produces immediate, severe irritation with necrosis and bleeding when placed in the eyes of rabbits. The acute oral LD₅₀ of methylamine ranges from 100-200 mg/kg body weight when administered to rats as a 40% amine base aqueous solution and 1600-3200 mg/kg when given as the hydrochloride salt. Rats exposed to methylamine for 2.5 hrs. by inhalation resulted in a LC₅₀ of 448 ppm. (RTECS, 1995). By comparison, a 2-hour mouse inhalation study, resulted in a LC₅₀ of 2400 mg/m³ (Lewis, 1993).

In an oral subchronic study, weaned male rats were given 10 mg methylamine/kg body weight by stomach intubation or basal diet at 100 mg/kg body weight/day for 21, 45, 65, and 90 days. Body weights were recorded weekly and observations were made for toxic symptoms. Liver, heart, lungs, kidneys, and adrenals were collected, weighed, and examined for gross lesions. Growth rate study of rats administered methylamine showed linear growth and no significant difference was observed in body or organ weights when each group was compared to the control (Sarkar and Sastry, 1990).

In a subchronic study by Kinney et al., (1990) 10 male Crl:CD(SD)BR rats per group were exposed to 0, 75, 250, or 750 ppm methylamine by nose-only inhalation 6 hrs/day, 5 days/wk. for 2 weeks. Rats were sacrificed either immediately following the 10th exposure or following a 14-day recovery period. Rats exposed to 750 ppm showed hyperactivity, aggression, lung noise, dry red nasal and ocular discharges, salivation, diarrhea, and facial hair loss. Death resulted in four of the ten rats exposed to 750 ppm. A red nasal discharge was observed in all groups but was most severe in rats exposed to 250 or 750 ppm methylamine. No

other response to methylamine was seen in rats exposed to 250 and 75 ppm. During the recovery period, lung noise, clear or dry red nasal discharges, ocular opacity, pallor, diarrhea, and discolored fur were observed in rats exposed to 750 ppm. An additional rat from this group died during the recovery period. No abnormal clinical signs were observed in any of the other groups during the recovery period. Severe body weight loss, clinical pathologic changes suggestive of liver damage, nasal degenerative changes, and hematopoietic changes were observed during exposure and recovery at 750 ppm. According to the authors, "75 ppm approached the NOAEL under these test conditions." They further stated that the current TLV of 10 ppm for methylamine appears to be appropriate and protective.

The ACGIH and NIOSH originally established an occupational exposure level for methylamine of 10 ppm (12.8 mg/m³). But in 1993, the ACGIH lowered this value to 5 ppm (6.4 mg/m³). The reasoning for this action was a conservative interpretation of the Kinney study mentioned above, and human data by Beard and Noe (1981). Beard and Noe, found human transient eye, nose, and throat irritation produced by brief exposure to 20-100 ppm methylamine. No evidence of irritation was produced from transient exposures less than 10 ppm. Based on this new ACGIH TLV, 5 ppm (6.4 mg/m³) will be used to derive an ITSL for methylamine.

The ITSL was derived as follows:

ACGIH TLV = 6.4 mg/m³

6.4 mg/m³ x 1000 ug/mg = 6,400 ug/m³

ITSL = 1% of the ACGIH

6,400 ug/m³ x 0.01 =

The ITSL for methylamine = 64 µg/m³ based on 8 hr. averaging.

References:

Beard, R. and J. Noe: (1981) Aliphatic and alicyclic amines. In: *Patty's Industrial Hygiene and Toxicology*, 3rd. Rev. ed., vol 2B. John Wiley and Sons, New York. pp. 3135-3173.

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

Kinney, L., Valentine, R., Chen, H., et al. 1990. Inhalation toxicology of methylamine. *Inhal. Toxicol.* 2(1) 29-39.

Sarkar, S. and M. Sastry. 1990. Chronic toxicity of methylamine on oral administration and feed contamination in rats. *Indian J. Anim. Sci.* 60(3):319-320.

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