MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

INTEROFFICE COMMUNICATION

November 15, 1995

TO: File for Chlorobromomethane (74-97-5)

FROM: Marco Bianchi

SUBJECT: Initial Threshold Screening Level

The initial threshold screening level (ITSL) for chlorobromomethane is 10,600 $\mu g/m^3$ based on an 8 hr. averaging time.

The following references or databases were searched to identify data to determine the ITSL: IRIS, HEAST, NTP Management Status Report, RTECS, EPB-CCD, EPB library, CAS-online, NLM-online, IARC, NIOSH Pocket Guide, and ACGIH Guide.

RTECS listed a number of LC_{50} and LD_{50} studies on chlorobromomethane that ACGIH documentation more fully described. Comstock and Oberst reported rats died after a 15-minute inhalation exposure at concentrations in the range of 152-170 g/m^3. Svirbely et al., found the oral LD_{50} of chlorobromomethane in mice to be 4300 mg/kg. He also reported the LC_{50} in mice for a single 7-hour exposure was approximately 3000 ppm, whereas Torkelson et al., reported that rats survived a single exposure at 5000 ppm for 7 hours. Comstock observed that chlorobromomethane exposure concentrations of 3000 ppm for 15 minutes in rats produced light narcosis; while transient pulmonary edema occurred at exposure levels below 27,000 ppm. At higher concentrations (>22,000 ppm), interstitial pneumonia resulted in delayed deaths.

There is only limited data on human exposures for chlorobromomethane. Rutstein (1963) described three cases of acute poisoning in fire fighters using this compound as a fire-extinguishing agent. The cases were characterized by severe headache, loss of consciousness after the exposure, gastric upsets, loss in weight, and slow recovery. The exposures were brief, but at very high concentrations of chlorobromomethane vapor.

In chronic studies, Svirbely and Highman et al., (1947) exposed 2 female dogs, 3 male rabbits, and 20 male rats for 7 hrs/day; 5 days/wk for a period of fourteen weeks to a concentration of 1000 ppm. None of the animals exposed to this compound died during the experiment and all appeared to be in excellent health. They gained weight in the same way as the controls and showed no toxic effects during or after exposure. The blood findings showed no significant changes and liver function tests revealed no hepatic damage. Kidney function was normal throughout the experiment, all tests being negative. Additionally, inorganic and organic bromide tests showed that urinary excretion of inorganic bromide has a similar tendency to increase during the exposure but in contrast to the behavior of the blood bromide, the urinary bromide drops

very materially during the exposure free days. However, the disappearance of the bromide is less complete after exposure for thirteen weeks. These findings show that with continued exposure to chlorobromomethane, there is a tendency of bromide to accumulate in the organism. By contrast, there was no distinct accumulation of organic bromide as observed with inorganic bromide.

Torkelson and Oyen et al., (1960) exposed three matched groups of animals consisting of 20 male and 20 female rats, 10 male and 10 female guinea pigs, 2 male and 2 female rabbits, and 10 female mice. The first group was exposed 79 to 82 times in 114 days to 500 ppm chlorobromomethane in air (average 490 ppm by analysis). The second group was similarly exposed to an average concentration of 1000 ppm (average 1010 ppm by analysis). The exposures were for 7 hrs/day; 5 days/wk. The third group was maintained as unexposed controls. Repeated exposures for four months at 1000 ppm resulted in adverse effects in all species. Male and female rats exhibited microscopic changes in the liver, which included very slight proliferation of the bile duct epithelium with very slight portal fibrosis and inflammation. There was some cloudy swelling of the parenchymal cells in the midzonal areas spreading to the central areas of the lobule. Numerous parenchymal cells in the midzonal areas and portal areas contained many small vacuoles. Male guinea pigs and rabbits both exhibited a decrease in spermatogenesis with replacement of fibrosis occurring in the tubules. Female guinea pigs were only observed to have an increase in neutrophils and female mice, a slight increase in the average liver and kidney weights as compared to those of controls. At the 500 ppm exposure level, only female rats were found to have adverse liver effects. These effects included, an increase in liver weights, and slight bile duct epithelial proliferations and very slight portal fibrosis, together with occasional large and small vacuoles in parenchymal cells of the midzonal areas. Since female rats were the only group significantly affected by exposures to 500 ppm, another group of female rats was exposed to 400 ppm (370 ppm by analysis) and observed for their response. Results showed that only an increase in liver weights was observed as compared to controls.

The ACGIH, OSHA and NIOSH have concurred in setting an occupational exposure level (OEL) for chlorobromomethane at 200 ppm or (1060 mg/m^3). They base this occupational exposure level on the belief that this value is sufficiently low to prevent CNS effects as well as effects on the liver. In addition, the AQD also employs a 100-fold safety factor when deriving an ITSL based on an OEL. Therefore, the OEL of 1060 mg/m^3 seems appropriate to derive an ITSL for this compound.
The ITSL was derived as follows:

ACGIH TLV = 1060 mg/m^3

1060 mg/m^3 ÷ 100 = 10.60 mg/m^3

$$10.60\ mg/m^3 \times \frac{1000}{1\ mg/m^3} = 10{,}600\ ug/m^3$$

The ITSL for chlorobromomethane = 10,600 $\mu g/m^3$ based on 8 hr. averaging.

References:

ACGIH. 1994. Documentation of the TLVs and BEIs.

Comstock, C., R. Fogleman, and F. Oberst. (1953). Acute narcotic effects of monochlorobromomethane vapor in rats. *Arch. Ind. Hyg. Occup. Med.* 7:526-528.

Rutstein, H.R. (1963). Acute chlorobromomethane toxicity. *Arch. Environ. Health.* 7:440-444.

Svirbely J.L. et al., (1947). The toxicity and narcotic action of mono-chloro-mono-bromomethane with special reference to inorganic and volatile bromide in blood, urine and brain. *Journal of Industrial Hygiene and Toxicology. 29:6 382-389.*

Torkelson, T.R. et al., (1960). The toxicity of bromochloromethane (methylene chlorobromide) as determined on laboratory animals. *Am. Ind. Hyg. Assoc. J. 21:275-286.*

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