

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

INTEROFFICE COMMUNICATION

To: File for Hydrogen Bromide (CAS# 10035-10-6)

From: George Eurich

Date: 1-10-2012

Subject: **Screening level for Hydrogen Bromide (CAS# 10035-10-6)**

The screening level for Hydrogen Bromide (HBr) is 70 $\mu\text{g}/\text{m}^3$ based on 1 hour averaging.

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 (MDEQ) library, International Agency for Research on Cancer (IARC) Monographs, Chemical Abstract Service (CAS) online, National Library of Medicine (NLM) - Toxline, and National Toxicology Program (NTP) Status Report.

Physical Data:

- * Colorless liquefied gas
- * MW = 80.92
- * Highly corrosive to most metals, with evolution of hydrogen gas

The AQD had previously established an Interim Initial Threshold Screening Level of 99 $\mu\text{g}/\text{m}^3$ (1-hour avg) for hydrogen bromide, which was based on a TLV ceiling limit of 3 ppm. Subsequent literature reviews, as noted above, were performed in 2004 and again in 2011. These searches determined that there are no EPA RfD or RfC values for HBr, nor are there published toxicity data sufficient to derive an RfC. The TLV ceiling limit has been lowered to 2 ppm.

AQD staff performed a comparative study of HBr and Hydrogen Chloride (HCl) in concert with the 2004 literature review. It was noted that both cause irritation to nasal and tracheal mucosa. NIOSH notes that the acute toxicities of the two compounds are similar. They compared 1 hour LC50 values from different rat studies with results identifying LC50s of 2858 ppm for HBr and 3124 ppm for HCl. Also during this study, it was noted that HCl has an EPA RfC derived ITSL of 20 $\mu\text{g}/\text{m}^3$ based on 24 hour averaging. When converted to 1 hour averaging using the method in Table 22 of R336.1227, the resulting ITSL is 91 $\mu\text{g}/\text{m}^3$, nearly equivalent to the HBr interim ITSL.

Using the current TLV (2 ppm - ceiling) as a basis for the screening level determination results in an ITSL as follows:

$$X \text{ mg}/\text{m}^3 = (y \text{ ppm}) (\text{MW})/24.45$$

$$X \text{ mg}/\text{m}^3 = (2 \text{ ppm}) (80.92)/24.45$$

TLV of 2 ppm HBr = 7 mg/ m³

ITSL = OEL divided by 100
= (7 mg/ m³)/100
= (0.07 mg/ m³) (1000 µg/mg)

ITSL = 70 µg/m³ based on 1 hr avg

References:

ACGIH. 2010. TLVs and BEIs based on the documentation of the threshold limit values for chemical substances and physical agents & biological exposure indices. ACGIH. Cincinnati, OH.

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

INTEROFFICE COMMUNICATION

October 21, 2004

TO: Cathy Simon, Toxics Unit Chief

FROM: Mary Lee Hultin, Toxicologist Specialist

SUBJECT: Comparative toxicities of HBr and HCl

The following information was found on the comparative toxicities of HBr (CAS # 10035-10-6) and HCl (CAS # 7647-01-0). Both cause irritation of the nasal and tracheal mucosa. The ITSLs of the two are comparable. The ITSL for HBr is an interim number based on a TLV ceiling and is 99 $\mu\text{g}/\text{m}^3$ based on 1 hour averaging. The ITSL for HCl is based on an EPA RfC and is 20 $\mu\text{g}/\text{m}^3$ based on 24 hour averaging. If you convert the HCl ITSL into a 1 hour averaged value using the method in Table 22 of the R 227, you get 91 $\mu\text{g}/\text{m}^3$. This is almost equivalent to the HBr ITSL. The ACGIH publishes ceiling values for both compounds as 2 ppm (which converts to about 3 $\mu\text{g}/\text{m}^3$ for HCl and about 7 for HBr). NIOSH notes that the acute toxicities of the two compounds are similar. They compared 1 hour LC50 values from different studies using rats. The Lethal Concentration values for 50% of the experimental population (i.e., LC50s) were 2858 ppm for hydrogen bromide and 3124 ppm for HCl.

A study was done to compare the acute dermal toxicity of hydrogen bromide, hydrogen iodide and hydrogen chloride. The results showed that HBr caused more severe burns to the skin than either HI or HCl. Thus, it is conceivable that HBr is more acutely toxic than HCl by this route.

MLH:LH