MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

INTEROFFICE COMMUNICATION

TO: Copper and Copper Compounds File (CAS # 7440-50-8)

FROM: Gary Butterfield

SUBJECT: Screening Level for Copper and Copper Compounds

DATE: December 2, 2009

This memo is designed to cover copper and copper compounds, rather than continue to develop individual lTSLs for each compound, especially when those past ITSLs were all based on the copper TLV for each of those compounds. The many past copper materials with individual ITSLs, include: copper sulfate (7758-98-7), cupric acetate (142-71-2), copper nitrate (3251-23-8), and cupric oxide (1317-38-0). This ITSL may well also be applied to many additional copper compounds in the future, as can be evaluated on a case by case basis.

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 (1968- Dec 2009), National Library of Medicine (NLM) - Toxline, and National Toxicology Program (NTP) Status Report.

The CAS and NLM on-line literature searches were conducted on Dec. 3, 2009. The majority of toxicity data studies that were located were by the oral route of exposure. There are numerous occupational reports with inhalation exposure, but the exact exposure levels in those studies usually aren't known.

The CaIEPA does have an acute REL of 100 $\mu g/m^3$ with 1-hour averaging for copper compounds.

The literature search found that there is no EPA RfC or RfD for copper. However, the IRIS database does have a listing in the tracking that IRIS entries are in the process of being revised for copper but are currently scheduled to be completed near the end of 2010. It should be considered that oral toxicity data is not appropriate to provide the basis for setting the ITSL, due to the likely respiratory tract response to inhaled copper compounds that is not duplicated from oral exposures. There were no long term inhalation studies of adequate quality available for an RfC type ITSL to be calculated.

The hierarchy for establishing a screening level then points to use of the OEL value for setting the ITSL for copper and copper compounds. The metal fume values are much lower than the dust/mist OELs. The

metal fume value is more appropriate to use as most air pollution sources are from heated processes. The ACGIH TLV is 0.2 mg/m^3 and the NIOSH REL is 0.1 mg/m^3. Even though both of the OEL values are based to be protective of similar effects (i.e., metal fume fever as reported by Gleason 1968), the ACGIH is the more recently developed value. They also took into consideration the reported no effect levels observed in industry occurring at 0.4 mg/m^3. Therefore, the AQD considers the TLV as the most appropriate OEL to use as the basis for the ITSL.

Therefore, the ITSL is being set at a value, which is 2 µg/m^3 with 8-hour averaging, based on the copper fume TLV of 0.2 mg/m^3, under R232(1)(c).

References:

ACGIH. 1991. Documentation of the Threshold Limit Values and Biological Exposure Index.

ACGIH. 2001. Documentation of the Threshold Limit Values and Biological Exposure Index.

ATSDR. 2004. Toxicological profile for copper — update.

California EPA. 1999. Determination of acute reference exposure level for airborne toxicants. http://oehha.ca.gov/media/downloads/crnr/acuterel.pdf

Gleason. 1968. Exposure to copper dust. Amer Indust Hyg Assoc J 29:461-2. as cited in the ACGIH documentation for copper.

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MICHIGAN DEPARTMENT OF NATURAL RESOURCES

INTEROFFICE COMMUNICATION

April 20, 1992

To : Copper File

From : Gary Butterfield

Subject : AAC for Copper (CAS # 7440-50-8)

There is a general lack of adequate quality toxicity data via the inhalation route of exposure with either animals or humans. Perhaps the best quantification of human exposures was documented by Gleason (1968). In that report, 0.1 mg/m^3 exposures caused symptoms of metal fume fever to occur in workers. After installation of controls, there was a reduction of copper exposure to 0.008 mg/m^3, and a corresponding stop in the workers complaints of those symptoms.

The ACGIH TLV documentation has a brief discussion of a few published, as well as, some unpublished reports of personal industrial experience from persons that showed no effects at concentrations of 0.4 mg/m^3 or lower. The TLV Committee used this information to support of the TLV of 0.2 mg/m^3 for copper fume.

For calculation of the AAC, it has been determined that it is inappropriate to convert EPA'S oral RfD of 1.3 mg/L. If the MD is converted, an AAC of 0.13 mg/m^3 is obtained, which is higher than the level of exposure causing effects as reported by Gleason(1968). In addition, the effects from inhalation, metal fume fever and respiratory irritation, are much different than the effects following oral over exposure — GI, hepatic and renal effects. These reasons indicate adoption of a converted oral RfD is inappropriate for establishing the AAC.

Therefore the AAC of 2 $\mu g/m^3$ with 8 hour averaging from the TLV is currently the best available data upon which to base the AAC.

References :

ACGIH. Documentation of the TLV's.

EPA 1984 Health Effects Assessment Document for Copper.

EPA 1987 Drinking Water Criteria Document for Copper. ECAO-Cin-417.

Gleason. 1968. Am Ind Hyg Assoc J 29:461—462.