

MICHIGAN DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENT

INTEROFFICE COMMUNICATION

TO: Butyl acrylate File (CAS # 141-32-2)

FROM: Gary Butterfield

SUBJECT: Screening Level for Butyl acrylate

DATE: November 4, 2010

Butyl acrylate had an ITSL of 520 ug/m³ with 8-hour averaging set in 1992 based on the TLV of 10 ppm (or 52 mg/m³). In 1996, ACGIH revised the TLV to 2 ppm. However, the ITSL was not reviewed or revised by the AQD to reflect the newer TLV at that time. The present evaluation of the most recent available data was conducted in order to update the 1992 ITSL.

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 - April 2010), National Library of Medicine (NLM) - Toxline, and National Toxicology Program (NTP) Status Report.

The CAS and NLM literature searches were conducted on April 13, 2010. The available toxicity data for butyl acrylate is fairly good. There are animal acute and medium length studies and a chronic inhalation study, as well as, some reproductive effects studies for this chemical. There is not adequate human toxicity studies or adverse effects reports other than irritation of eyes and respiratory tract following exposure. The ACGIH TLV of 2 ppm or 10 mg/m³ was set to avoid nasal and eye irritation. The animal shorter-term exposures are found to be at much higher concentrations than the rat chronic inhalation study by Reininghaus et al (1991).

Reininghaus et al (1991) reported the results of a two-year inhalation exposure of Sprague-Dawley rats to 0, 15, 45 or 135 ppm (or 0, 86, 258, or 773 mg/m³ as reported by the authors) butyl acrylate for 6 hour a day, 5 days a week. The groups had 86 animals of each sex at the start of the study divided into various sub-groups. These sub-groups were interim sacrificed at 12 and 18 months as well as at the end of the 24-month exposure (ten rats per sex per sacrifice date). There was also a larger sub-group that had a 6-month recovery (non-exposure) period to observe what

effects might change following cessation of exposure. At the end of the 6 month recovery period there were 58 control, 47 low dose, 56 mid dose, and 50 high dose animals (combined male and female) examined. The incidence of eye lesions did not follow a dose response relationship. The incidence of nasal mucosal reserve cell hyperplasia in the nasal cavity at level 2 was found to have a dose response relationship with the percentage of animals responding of 0, 1, 40 and 41% occurring for the control to high dose groups in the larger recovery groups. It should be noted that the interim sacrifice group that was evaluated at the end of the 24-month exposure did have increased incidence of this lesion even at the 15 ppm dose level. However, there was recovery occurring during the 6-month recovery period, the lesion is relatively mild, and the limited group size at 24-month sacrifice time leads to use of the recovery group for identification of the NOAEL. The NOAEL from the recovery group is considered to be 15 ppm.

From the available data several potential screening levels were calculated below.

Possible screening level from NOAEL/LOAEL method:

Reininghaus et al with NOAEL for nasal reserve cell hyperplasia at level 2

NOAEL = 15 ppm or 86 mg/m³

NOAEL(adj) = 86 mg/m³ x 6/24 x 5/7 x 24/30 = 12.3 mg/m³

RGDR = $\frac{(V/SA)_a}{(V/SA)_h} = \frac{(0.28/15)}{(13.8/200)} = 0.27$ for category 1 gas nasal effects

NOAEL(hec) = 12.3 mg/m³ x 0.27 = 3.32 mg/m³

UF = 10H x 3A = 30

Possible ITSL = 3.32 mg/m³ x 1/30 = 110 ug/m³ => 100 ug/m³ with 24 hour avg

Possible screening level from BMDS:

Modeled Reininghaus nasal lesion incidence, dropping high dose group for better model fit.

BMDL₁₀ = 115.9 mg/m³ from average of gamma and weibull model

BMDL₁₀(avg) = 115.9 mg/m³ x 6/24 x 5/7 x 24/30 = 16.6 mg/m³

BMDL₁₀(hec) = 16.6 mg/m³ x 0.27 = 4.5 mg/m³

Possible ITSL = 4.5 mg/m³ x 1/30 = 150 ug/m³ => 100 ug/m³ with 24-hour average

Possible screening level based on the OEL:

ACGIH TLV = 2 ppm or 10 mg/m³

Possible ITSL = 10 mg/m³ x 1/100 = 100 ug/m³ with 8 hour average

The above possible screening levels do support each other in setting the ITSL at 100 ug/m³. The best basis for the ITSL is the ACGIH TLV as the long time acceptable OEL. Therefore the 8-hour averaging time is being associated with this ITSL based on use of the TLV.

References:

ACGIH. 2001. Documentation of TLV and BEI.

Reininghaus et al. 1991. Chronic toxicity and oncogenicity of inhaled methyl acrylate and butyl acrylate in Sprague-Dawley rats. *Fd Chem Toxicol* 29:329-39.

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