MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

INTEROFFICE COMMUNICATION

December 30, 2002

TO: 2-Methylnaphthalene File (CAS #91-57-6)

FROM: Gary Butterfield, Air Unit, Environmental Science and Services Division

SUBJECT: Screening Level for 2-Methylnaphthalene

2-Methylnaphthalene (2-MN) is a solid crystalline material at ambient temperatures with a melting point of 34° Celsius (C), and a boiling point of 241° C. The vapor pressure has been reported to be 0.068 mmHg. Thus, 2-MN can be considered to be a semi-volatile material.

The following references or databases were searched to identify data to determine the screening level: United States Environmental Protection Agency (EPA) Integrated Risk Information System, National Institute for Occupational Safety and Health, Registry for Toxic Effects of Chemical Substances, American Conference of Governmental and Industrial Hygienists Threshold Limit Values, Michigan Department of Environmental Quality library, International Agency for Research on Cancer Monographs, Chemical Abstract Service (CAS) Online (1967 - July 2000), National Library of Medicine (NLM) Toxline, and National Toxicology Program Status Report.

On-line literature searches were conducted on March 13, 2001 of the CAS and on March 15, 2001 of the NLM.

A very limited amount of toxicity studies are available for this chemical. It does appear that the lungs are the target organ from the toxicity data available. This is consistent with adverse effects observed after naphthalene exposures as well. In an acute study reported by Griffin et al., (1981), mice given IP injections developed pulmonary necrosis within 24 hours. However, in a chronic feeding study reported by Murata et al., (1997) there was no consistent abnormal lung changes other than increased alveolar proteinosis. Proteinosis is not a known risk factor for any adverse pathological changes but it does reduce the lung ability for oxygen transport. Thus, the lung proteinosis is considered to be an adverse effect.

The chronic mouse study reported by Murata et al., (1997) is virtually the only repeated dose study available to provide data for consideration in development of the screening level. The high dose in this chronic study was at a level that caused a 20% growth retardation without any histopathology changes. The low dose of the chronic study of 52 mg/kg was selected as the lowest-observed-adverse-effect level (LOAEL) to avoid possible adverse effects from alveolar proteinosis. If a screening level was to be developed using this oral study's LOAEL, the approach would be based upon determination of an oral reference dose (RfD) using the EPA's RfD methodology.

Where an uncertainty factor of 10 was used for animal-to-human, sensitive individuals, and LOAEL-to-no-observed-adverse-effect level:

Estimated RfD = $\frac{52\ mg/kg}{10 \times 10 \times 10}$ = 0.052 mg/kg

Health based ITSL from oral exposure =
(52 ug/kg) x (70 kg/20 m3) = 180 ug/m3 with a 24-hour averaging time

There is some question about whether there is a difference between adverse effects observed following inhalation exposure versus oral exposure to 2-MN. The available data on toxic effects and pharmacokinetics of 2-MN is too limited to be able to make definite conclusions. However, this does lead to some concern about using oral exposure data for establishing an inhalation screening level. Considering these uncertainties, and that an Initial Risk Screening Level (ITSL) based on oral data would exceed the 24-hour particulate matter (PM) National Ambient Air Quality Standards (NAAQA), it is considered inappropriate to use the oral exposure study (Murata et al., (1997)) for establishing the screening level for 2-MN.

Korsak et al., (1998) studied behavior effects of a 4-hour inhalation exposure on rats. Rats were evaluated for changes in rotarod performance after the 4-hour exposure, as well as, the rat's paw sensitivity to heat (a measure of analgesia), and changes in respiration rate. This is not a standard acute LC50 determination study with a 14-day follow-up observation period. However, for the purpose of setting a screening level, the highest concentration (527 mg/m3) where no deaths were observed, could be used as a surrogate for an LC50 in the R232(1)(f) equation for an LC50 as follows:

ITSL = $\frac{527\ mg/m3}{500 \times 100}$ = 10 ug/m3 with an annual averaging time

Due to a lack of data, this ITSL is considered more appropriate than basing the ITSL on the trace value of 0.1 ug/m3.

The chemical and physical properties indicate that 2-MN is a semi-volatile solid at ambient temperatures. Therefore, the screening level should be evaluated considering the NAAQS for PM. The ITSL of 10 ug/m3 is less than the PM-10 standard of 50 ug/m3 with an annual averaging time. Therefore, the ITSL presents no inconsistencies with the particulate standard.

References:

Griffin et al., 1981. Pulmonary toxicity, hepatic and extrahepatic metabolism of 2-MN in mice. Toxicol Appl Pharmacol 61: 185-196.

Korsak et al., 1998. Toxic effects of acute inhalation exposure to 1-MN and 2-MN in experimental animals. Int J Occup Med Environ Health 11: 335-342.

Murata et al., 1997. Chronic toxicity and carcinogenicity studies of 2-MN in B6C3F1 mice. Fund Appl Toxicol 36: 90-3.

gb:dp

cc: Cathy Simon, ESSD