**MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY**

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**INTEROFFICE COMMUNICATION**

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TO: File for 1-Methylnaphthalene [CAS# 90-12-0]

FROM: Doreen Lehner, Toxics Unit, Air Quality Division

DATE: January 12, 2017

SUBJECT: 1-Methylnaphthalene [CAS# 90-12-0] ITSL change in the averaging time from 24 hours to annual

The current ITSL for 1-methylnaphthalene (250 µg/$m^3$) has a justification (attached) dated April 28, 2008. The averaging time (AT) assigned at that time was 24 hours, as per the default methodology (Rule 232(2)(b)). The current file review concludes that the AT may appropriately be set at annual, as the screening level is based on an 81 week feeding study in mice (Murata et al. 1993). Therefore, the AT is being changed from 24 hours to annual at this time.

**References:**

APCR. 2016. Air Pollution Control Rules, Promulgated pursuant to Part 55, Air Pollution Control, of the Natural Resources and Environmental Protection Act, Michigan Department of Environmental Quality. 1994. Act 451, as amended (NREPA).

Murata Y, Denda A, Maruyama H, and Konishi Y. 1993. Chronic Toxicity and Carcinogenicity Studies of 1-Methyl-naphthalene in B6C3F1 Mice. Fund Appl Toxidol 21:44-51.

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TO: 1-Methylnaphthalene file (CAS # 90-12-0)

FROM: Gary Butterfield

SUBJECT: Screening level for 1-Methylnaphthalene

DATE: April 28, 2008

1-Methylnaphthalene is also known as alpha-methylnaphthalene. 1-Methylnaphthalene is a colorless liquid. The molecular formula is $C_{11}H_{10}$. The molecular weight is 142.2 g/mol. The melting point of 1-methylnaphthalene is -22C. The boiling point is 244C. The vapor pressure is 0.054 mmHg. 1-Methylnaphalene is a polycyclic aromatic hydrocarbon (PAH) that can be distilled from coal tar and petroleum, or formed during combustion processes.

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 2008), National Library of Medicine (NLM) - Toxline, and National Toxicology Program (NTP) Status Report.

The CAS and NLM on-line literature searches were originally conducted on October 12, 2006, with an updated search on April 17, 2008. There was only a couple of toxicity articles located using oral or inhalation route of exposure found during the literature search. An 81-week chronic mouse oral dosing study reported by Murata et al (1993), and an acute inhalation study in rats and mice reported by Korsak et al (1998) looked at behavioral effects.

The chronic mouse oral study by Murata et al was used by ATSDR (2005) to develop the chronic oral MRL of 70 ug/kg. Groups of 50 male and 50 female $B_6C_3F_1$ mice were fed diets of 0, 0.07 or 0.15% for 81 weeks. Those diet levels convert to daily doses of 0, 71 or 140 mg/kg using food consumption data reported by the authors. The lowest dose was identified as the LOAEL because the dosed mice had increased pulmonary alveolar proteinosis. Both dose levels also had peripheral blood changes as well – increased hemoglobin, mean corpuscular hemoglobin, albumin/globulin ratio, as well as, significant organ weight changes for the brain, heart, and thymus. The male mice had a slight, statistically significant increased incidence of alveolar/bronchiolar adenomas and adenocarcinomas. The male mice incidence for the combined tumors was 2/49, 13/50 and 15/50, for the control to high dose.

This well conducted study meets the basic definition for calling 1-methylnaphthalene a carcinogen. It is possible to calculate the IRSL and SRSL from this study incidence of male mouse alveolar/bronchiolar adenomas and adenocarcinomas. The BMDS multistage – cancer model can be used to calculate the male mouse oral potency of $3.63x10^{-3}$ $(mg/kg)^{-1}$, which can be converted to the human oral potency of $2.33x10^{-2}$ $(mg/kg)^{-1}$ by using body weight adjustment to the ¾ power. The inhalation cancer potency can then be determined by converting the oral potency to the human inhalation potency of $6.7x10^{-6}$ $(ug/m3)^{-1}$ based on a 70 kg person breathing $20m^3$ a day. This inhalation potency will result in the IRSL being 0.14 $ug/m^3$ and the SRSL being 1.4 $ug/m^3$ with annual averaging.

It is also possible to calculate an ITSL from the non-carcinogenic effects (alveolar proteinosis, and changes in organ weights and hematology) observed at the low dose in Murata et al (1993). The occurrence of alveolar proteinosis, and changes in organ weights statistically significantly occurred at the lowest dose, of 71 mg/kg, which can be identified as the LOAEL. An attempt to use the Benchmark Dose software (BMDS) found that the goodness-of-fit statistics indicate the models are poor fits for the available data. Therefore the ITSL will be derived from the NOAEL/LOAEL methodology, which first calculates an oral RfD/MRL, which is then changed into the ITSL based on a person breathing $20m^3$ and weighing 70 kg under R232(1)(b).

$$RfD = \frac{71\ mg/kg}{10 \times 10 \times 10} = 71\ ug/kg$$

In the above RfD calculation, the standard uncertainty factors (UF) of 10 for a) sensitive individuals, b) animal-to-human, and c) LOAEL-to-NOAEL were used. It should be noted that the above calculated value is identical to the ATSDR (2005) chronic oral MRL.

The chronic ITSL can be calculated using the MRL or RfD by the methods in R232(1)(b).

ITSL = 71 ug/kg x (70kg/20m3) = 248 rounded to 250 ug/m3 with 24 hour averaging

References:

ATSDR. 2005. Toxicological Profile for Naphthalene, 1-Methylnaphthalene, and 2-Methylnaphthalene

Korsak et al.1998. Toxic effects of acute inhalation exposure to 1-methylnaphthalene and 2-methylnaphthalene in experimental animals. Int J Occup Med Environ Health 11(4):335-42.

Murata et al. 1993. Chronic Toxicity and Carcinogenicity Studies of 1-Methyl-naphthalene in B6C3F1 Mice. Fund Appl Toxicol 21: 44-51.

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