MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

INTEROFFICE COMMUNICATION

TO: File for distillates (petroleum), heavy thermal cracked (CAS #64741-81-7)

FROM: Anne Kim, Air Quality Division, Toxics Unit

SUBJECT: Screening Level Derivation

DATE: June 25, 2007

The initial threshold screening level (ITSL) for distillates (petroleum), heavy thermal cracked is 15 µg/m³ based on an annual averaging time.

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, Registry for Toxic Effects of Chemical Substances, American Conference of Governmental and Industrial Hygienists Threshold Limit Values, National Institute for Occupational Safety and Health Pocket Guide to Hazardous Chemicals, Environmental Protection Bureau Library, International Agency for Research on Cancer Monographs, Chemical Abstract Service (CAS) - Online (1967 – 2007), National Library of Medicine, Health Effects Assessment Summary Tables, and National Toxicology Program Status Report. The EPA has not established a reference concentration or reference dose for distillates (petroleum), heavy thermal cracked.

Background

The TSCA description for distillates (petroleum), heavy thermal cracked defines it as, "[a] complex combination of hydrocarbons from the distillation of the products from a thermal cracking process. It consists of unsaturated hydrocarbons having carbon numbers predominantly in the range of C15 through C36 and boiling in the range of approximately 260 degrees Celsius to 480 degrees Celsius (500 degrees Fahrenheit to 896 degrees Fahrenheit). This stream is likely to contain 5 wt. % or more of 4- to 6-membered condensed ring aromatic hydrocarbons" (EPA, 1979).

Animal Toxicity

A developmental study was conducted in Sprague-Dawley rats (Environmental and Health Science Laboratory, 1993). Groups of 12 pregnant female rats were exposed to 2000 mg/kg of water or heavy coker gas oil (HCGO), CAS #64741-81-7, on gestation day 13. Observations were made throughout the study period for changes in appearance, behavior, and mortality. Body weight measurements were recorded on gestation days 0, 6, 13, 14, and 20. On gestation day 20, all animals were necropsied. Organs were grossly examined, select organs were weighed (liver, thymus, and uterus), the number of corpora lutea per ovary was recorded, and the number and location of implantations (early/late resorptions and live/dead fetuses) were recorded. Litters were gendered, weighed, and externally examined for malformations. Each litter was then equally divided into two groups: one for visceral examination and one for skeletal examination.

Maternal effects: Red vaginal discharge, perineal staining, and soft stool were observed in females exposed to HCGO. Body weight gain and mean net body weight were significantly decreased in exposed females compared to those of control. Uterine weights and thymus weights were significantly reduced in exposed females. The decreased uterine weights were, however, attributed to the decreased fetal weights observed in the corresponding exposure group.

Fetal effects: As mentioned above, a significant decrease in fetal weights were observed in male fetuses from exposed dams. A statistically significant increase in incidence of malformations was seen in fetuses from exposed dams. Observed malformations included cleft palate, shortened hindpaw digits, micrognathia, absence of forepaw and hindpaw digits, malrotation of the right hindlimb, depressed eye bulge, microtia, and imperforate anus. The most prevalent malformation observed was incidence of cleft palate. Thus, both maternal and fetal effects resulted from exposure to a single, oral dose of 2000 mg/kg HCGO on gestation day 13.

An acute LD50 study was conducted using Sprague-Dawley rats (UBTL, 1988). Five male and five female rats were given a single dose of 5 g/kg by oral gavage and sacrificed after 14 days. All animals were observed hourly for the first four hours after exposure and twice daily for the remainder of the study. Body weights were measured before exposure and 7 and 14 days after exposure. No animals died during the study; all were terminated at the end of the study for gross necropsy examination. Pale or mottled kidneys and mottled livers were seen in few rats. Because no deaths occurred from an exposure dose of 5 g/kg, the LD50 was established to be greater than 5 g/kg. (EPA, 2004)

The developmental study will not be used to derive the ITSL because the fetal effects observed with the single exposure dose of 2000 mg/kg produced frank effects; an ITSL cannot be based on an exposure concentration that results in frank effects. Therefore, the ITSL for distillates (petroleum), heavy thermal cracked will be derived based on the LD50 of greater than 5 g/kg from the 1988 UBTL study.

Derivation of Screening Level

$$ITSL = \frac{1}{500} \times \frac{1}{40} \times \frac{1}{100} \times \frac{LD50\ (mg/kg) \times W_A}{0.167 \times I_A}$$

where W_A = Body weight of experimental animal in kilograms (kg)
I_A = Daily inhalation rate of experimental animal in m^3/day

Calculation of LD50:
LD50 = 5 g/kg from UBTL (1988)
LD50 = 5 g/kg x (1000 mg/g) = 5000 mg/kg

Calculation of W_A:
W_A = mean value of male weight of 0.314 kg and female weight of 0.245 kg

$$W_A = \frac{0.314 + 0.245}{2}$$

W_A = 0.2795 kg

Calculation of I_A:
$I_A = 0.8W_A^{0.8206}$ (EPA, 1988)
$I_A = 0.8(0.2795)^{0.8206}$
I_A = 0.281 m^3/day

$$ITSL = \frac{1}{500} \times \frac{1}{40} \times \frac{1}{100} \times \frac{5000 \times 0.2795}{0.167 \times 0.281}$$

$ITSL = 0.01489 mg/m^3$

$ITSL = 14.89\ ug/m^3 =$ **$15\ ug/m^3$**

Therefore, the ITSL for distillates (petroleum), heavy thermal cracked (64741-81-7) is 15 ug/m^3 based on an annual averaging time.

References

Environmental and Health Science Laboratory. 1993. Support: Interim Reports of Single Dose Teratogenicity Study of Ten Refinery Streams in Rats with Cover Letter Dated 090193. Environmental and Health Science Laboratory under Mobil Oil Corp. EPA/OTS; Doc #89-931000034S. NTIS/OTS0509763-16.

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EPA. 1979. Toxic Substance Control Act Chemical Substance Inventory. Initial Inventory. Volume I. United States Environmental Protection Agency, Office of Toxic Substances. Washington D.C. 20460.

EPA. 1988. Recommendation for and Documentation of Biological Values for Use in Risk Assessment. United States Environmental Protection Agency. PB 88-179874.

EPA. 2004. USEPA HPV Challenge Program Test Plan – Heavy Fuel Oils Category. The Petroleum HPV Testing Group. Consortium Registration. 201-15368B. 114p.

UBTL. 1988. Final Report – Acute Oral Toxicity Study (Limit Test) in Rats Administered Test Article F-97-01. Utah Biomedical Test Lab, Inc. UBTL Study 64707.

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