MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

INTEROFFICE COMMUNICATION

TO: File for Azobenzene (CAS # 103-33-3)

FROM: Doreen Lehner, Toxics Unit, Air Quality Division

SUBJECT: Historical Screening Level for Azobenzene (CAS # 103-33-3)

DATE: May 28, 2014

The Initial Risk Screening Level (IRSL) for azobenzene (CAS# 103-33-3) is 0.03 µg/m^3 based on an annual averaging time. The IRSL was established on 2/3/1988 based on an inhalation unit risk (IUR) of 3.1E-5 (µg/m^3)$^{-1}$, developed by the EPA on 7/1/1993 (EPA, 1993). The EPA based their IUR determination on a rat feeding study conducted by NCI (1979) where female rats developed abdominal cavity sarcomas.

Azobenzene (CAS# 103-33-3) also known as azobenzide, diazobenzene, and diphenyldiimide is the simplest example of an azo compound, which is composed of two phenyl rings linked by an N=N double bond. Azobenzene is an orange-red crystal with a molecular weight of 182.22 g/mol, has a melting point of 68°C, and is soluble in most organic solvents. Azobenzene is combustible, toxic, and when heated emits highly toxic fumes. Azobenzene occurs as a by-product during the manufacture of benzidine. Azo compounds strongly absorb light and are used: as dyes; as an intermediate in the manufacture of insecticides and in rubber products; as acaricide, fumigants, herbicides, and growth regulators.

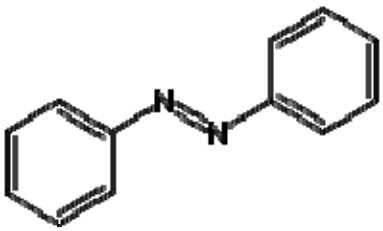

Figure 1. Structure of azobenzene

“Azobenzene was administered in the diet to F344 rats and B6C3F1 mice (50 animals/sex/ dose) for 106 weeks and 105 weeks, respectively. Control groups consisted of 50 untreated animals of each sex. The dietary concentrations were 200 and 400 ppm for rats. For male mice the dietary concentrations were 200 and 400. Because of lowered body weights after 38 weeks, the initial 400 and 800 ppm concentrations for female mice were reduced, to give time-weighted concentrations of 208 and 505 ppm. In rats sarcomas of various types, including fibrosarcomas, hemangiosarcomas and osteosarcomas, were observed in the spleen and other abdominal organs at incidences that were dose-related in each sex and that were statistically significantly higher in the high-dose group than in controls in each sex.

In mice no tumors were observed at any site at significantly higher incidence than in the controls for either sex" (EPA, 1993).

Administered Dose (ppm)	Human Equivalent Dose (mg/kg)/day	Tumor Incidence
0	0	0/20
200	1.53	5/50
400	3.06	21/50

"The unit risk should not be used if the air concentration exceeds 3E+2 µg/cu.m, since above this concentration the unit risk may not be appropriate" (EPA, 1993). Even though EPA established an inhalation unit risk, they admit that "while the study design is adequate for a feeding bioassay, these data are less than optimal for the assessment [of] risk related to exposure by inhalation in the absence of route-comparative pharmacokinetic information" (EPA, 1993).

Rule 231(1) was used to develop the IRSL, using the unit risk value derived by EPA for azobenzene. The equation is below:

$$IRSL = \frac{1 \times 10^{-6}}{Unit\ Risk}$$

Using the EPA IUR of 3.1E-5 $(\mu g/m^3)^{-1}$ for the unit risk gives:

$$IRSL = \frac{1 \times 10^{-6}}{3.1 \times 10^{-5} \mu g/_{m^3}} = 0.03226 \mu g/_{m^3}$$

The staff person that developed the Initial Risk Screening Level (IRSL) for azobenzene (CAS# 103-33-3) in 1993 rounded this value to 0.03 µg/m^3 and the SRSL was derived as 0.3 µg/m^3 based on an annual averaging time.

References

Act 451 of 1994, Natural Resources and Environmental Protection Act and Air Pollution Control Rules, Michigan Department of Environmental Quality.

EPA. 1993. Integrated Risk Information System. Azobenzene (CASRN 103-33-3). Retrieved data on 5/27/2014. Available online at: http://www.epa.gov/iris/subst/0351.htm

NCI (National Cancer Institute). 1979. Bioassay of azobenzene for possible carcinogenicity. NCI Carcinogenesis Technical Report Series. No. 154. P. 112.

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