

To: Naphthalene File (CAS # 91-20-3)
From: Gary Butterfield
Date: 10/19/04
Subject: Re-Evaluation of cancer unit risk value

The cancer unit risk value established by AQD in July 2001 has been updated due to the availability of new information. On September 10, 2004, EPA announced the release of an external peer groups report on naphthalene's carcinogenicity, which evaluated the draft June 2004 Toxicological Review of Naphthalene (document # NCEA-S-1707). California EPA has also recently (Aug 2, 2004) released a peer reviewed unit risk value for naphthalene. The unit risk values and ambient air concentrations associated with an increased cancer risk of 1×10^{-6} for each agency is presented below.

	EPA	Cal EPA	AQD (2001)
Unit Risk (ug/m3)-1	1×10^{-4}	3×10^{-5}	3×10^{-6}
Air conc. for 10-6 risk (ug/m3)	0.01	0.03	.3

The new 2004 AQD value was calculated from NTP 2000 study's male rat nasal epithelial adenoma incidence adjusting for rats that died before the first tumor appeared - incidence of 0/44, 6/42, 8/44 and 15/41 for the control, 10, 30 and 60 ppm groups.

The exposure doses were adjusted to lifetime doses of exposure by converting ppm to ug/m3 (using 5.24 mg/m3/ppm to obtain 0, 52.4, 157, or 314 mg/m3), and 6 of 24 hours exposure on 5 days per week to get the life time exposure levels of 0, 9360, 28100 or 56100 ug/m3. This is considered to be the lifetime exposure level for humans as well as rats, because for inhalation exposures the rat exposure is equivalent to the human exposure.

Running the above incidences and adjusted doses in the Linearized Multistage Model (Global 82) results in the 10-6 inhalation unit risk value of 1.17×10^{-5} (ug/m3)-1 which rounds to two significant figures as 1.2×10^{-5} (ug/m3)-1. This unit risk results in an IRSL of 0.08 ug/m3, and a SRS� of 0.8 ug/m3 with annual averaging.

The combined incidence of male rat nasal epithelial adenoma and male rat olfactory neuroblastomas incidence adjusting for rats that died before the first tumor appeared - incidence of 0/49, 6/48, 11/48 and 18/49 for the control, 10, 30 and 60 ppm groups.

The exposure doses were adjusted to lifetime doses of exposure by converting ppm to ug/m3 (using 5.24 mg/m3/ppm to obtain 0, 52.4, 157, or 314 mg/m3), and 6 of 24 hours exposure on 5 days per week to get the life time exposure levels of 0, 9360, 28100 or 56100 ug/m3. This is considered to be the lifetime exposure level for humans as well as rats, because for inhalation exposures the rat exposure is equivalent to the human exposure.

Running the above incidences and adjusted doses in the Linearized Multistage Model (Global 82) results in the 10-6 inhalation unit risk value of 1.22×10^{-5}

(ug/m3)-1 which rounds to two significant figures as 1.2×10^{-5} (ug/m3)-1. This unit risk results in an IRSL of 0.08 ug/m3, and a SRSL of 0.8 ug/m3 with annual averaging.

There is no difference between the unit risk values from the adenoma incidence or combined adenoma and neuroblastoms incidence, both have UR of 1.2×10^{-5} (ug/m3)-1.

	EPA	Cal EPA	AQD (2004)
Unit Risk (ug/m3)-1	1×10^{-4}	3×10^{-5}	1.2×10^{-5}
Air conc. for 10-6 risk (ug/m3)	0.01	0.03	0.08

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

INTEROFFICE COMMUNICATION

January 23, 2014

TO: File for Naphthalene (CAS No. 91-20-3)
FROM: Michael Depa, Air Quality Division
SUBJECT: Screening Levels for Naphthalene

A new acute initial threshold screening level (ITSL) for naphthalene is being established at 520 $\mu\text{g}/\text{m}^3$ with an 8-hr averaging time. Additionally, the chronic ITSL for naphthalene is remaining at 3 $\mu\text{g}/\text{m}^3$, but the averaging time is being changed from 24-hrs to annual.

A review of available acute benchmarks of some other agencies was conducted to determine an appropriate basis for an acute ITSL. Acute inhalation benchmarks for naphthalene are not available from U.S. Environmental Protection Agency (USEPA), California EPA, or the Agency for Toxic Substances and Disease Registry (ATSDR). Also there is no Acute Exposure Guidance Level (AEG) for naphthalene. Texas (TCEQ) has an acute benchmark of 200 $\mu\text{g}/\text{m}^3$ (1 hour averaging time), however, that is based on odor rather than toxicity.

The new short term ITSL is based on the Threshold Limit Value (TLV) of 10 ppm (52 mg/m^3) (ACGIH, 2001). The TLV was established to protect against ocular irritation observed at 15 ppm. Pursuant to Rule 232(1)(c), the ITSL was derived from the TLV (an occupational exposure limit or OEL) as follows:

$$\begin{aligned}\text{ITSL} &= \text{OEL}/100 \\ \text{ITSL} &= (52 \text{ mg}/\text{m}^3)/100 \\ \text{ITSL} &= 0.52 \text{ mg}/\text{m}^3 \times 1000 \mu\text{g}/\text{mg} \\ \text{ITSL} &= 520 \mu\text{g}/\text{m}^3\end{aligned}$$

Regarding the chronic ITSL, in 1998, the ITSL for naphthalene was derived from a USEPA reference dose (RfC) of 3 $\mu\text{g}/\text{m}^3$. The USEPA selected a two-year mouse study (NTP, 1992) as the critical study, and agreed that the lowest exposure level of 10 ppm (52 mg/m^3), 6 hours per day, 5 days per week, was a lowest-observed-adverse-effect-level (LOAEL). After adjustment to an equivalent continuous exposure concentration (9.3 mg/m^3), a total uncertainty factor (UF) of 3000 was applied to generate a RfC of 3 $\mu\text{g}/\text{m}^3$. Three UFs of 10 each for: LOAEL to no-observed-adverse-effect-level (NOAEL), animal to human, and sensitive individuals were applied. An additional UF of 3 for inadequacy of the database was used. Considering the insensitivity of rodents to hemolytic anemia, a key characteristic of naphthalene's hazard profile in humans, this extra conservatism was deemed appropriate. Rule 229(2)(b) was used to derive the ITSL instead of Rule 232(2)(b). Since Rule 229 does not have a subrule similar to Rule 232(2)(b) that specifies an averaging time, annual averaging time was applied. It was reasoned that because the screening level is specifically derived to be protective of chronic effects an annual averaging time is most appropriate.

References

- ACGIH. 2001. Naphthalene. Documentation of the Threshold Limit Values and Biological Exposure Indices for Chemical Substances. 7th Edition. American Conference of Governmental Industrial Hygienists. Cincinnati, OH.
- National Toxicology Program (NTP). (1992). Toxicology and carcinogenesis studies of naphthalene in B6C3F1 mice (inhalation studies). Technical Report Series No. 410. NIH Publication No. 92-3141.