Health Based Guidance for Water
Health Risk Assessment Unit, Environmental Health Division
651-201-4899

Adopted as Rule: August 2018

Toxicological Summary for: Acenaphthene

CAS: **83-32-9**

Synonyms: 1,2-Dihydroacenaphthylene (IUPAC), 1,8-Ethylenenaphthalene, *peri*-Ethylenenaphthalene, Naphthyleneethylene

Acute Non-Cancer Health Risk Limit ($nHRL_{acute}$) = Not Derived (Insufficient Data)

Short-term Non-Cancer Health Risk Limit ($nHRL_{Short\text{-}term}$) = Not Derived (Insufficient Data)

Subchronic Non-Cancer Health Risk Limit ($nHRL_{Subchronic}$) = 200 µg/L

$$\frac{\text{(Reference Dose, mg/kg-d) x (Relative Source Contribution) x (Conversion Factor)}}{\text{(Subchronic Intake Rate, L/kg-d)}}$$

$$= \frac{\text{(0.070 mg/kg-d) x (0.2)}^{*} \text{ x (1000 µg/mg)}}{\text{(0.070 L/kg-d)}^{**}}$$

$$= \mathbf{200\ \mu g/L}$$

*Relative Source Contribution: MDH 2008, Section IV.E.1.
**Intake Rate: MDH 2008, Section IV.E.1. and US EPA 2011, Exposure Factors Handbook, Tables 3-1 and 3-81

Reference Dose:	HED/Total UF = 21/300 = 0.070 mg/kg-d (CD-1 mice)
Source of toxicity value:	Determined by MDH in 2015
Point of Departure (POD):	162 mg/kg-d ($BMDL_{10}$, U.S Environmental Protection Agency, 1989)
Dose Adjustment Factor (DAF):	0.13 Body weight scaling, default (US EPA 2011 and MDH 2011)
Human Equivalent Dose (HED):	POD x DAF = 162 mg/kg-d x 0.13 = 21 mg/kg-d
Total uncertainty factor (UF):	300
Uncertainty factor allocation:	3 for interspecies differences (for toxicodynamics), 10 for intraspecies variability, and 10 for database uncertainty due to a lack of reproductive/developmental studies and a lack of testing in a second species
Critical effect(s):	Increased relative liver weight in female mice
Co-critical effect(s):	Decreased relative adrenal weight
Additivity endpoint(s):	Adrenal, Hepatic (liver) system

Chronic Non-Cancer Health Risk Limit ($nHRL_{Chronic}$) = 100 µg/L

$$\frac{\text{(Reference Dose, mg/kg-d) x (Relative Source Contribution) x (Conversion Factor)}}{\text{(Chronic Intake Rate, L/kg-d)}}$$

$$= \frac{\text{(0.021 mg/kg-d) x (0.2)}^{*} \text{ x (1000 µg/mg)}}{\text{(0.044 L/kg-d)}^{**}}$$

= 95.5 rounded to **100 µg/L**

*Relative Source Contribution: MDH 2008, Section IV.E.1.
**Intake Rate: MDH 2008, Section IV.E.1. and US EPA 2011, Exposure Factors Handbook, Tables 3-1 and 3-81

Reference Dose:	HED/Total UF = 21/1000 = 0.021 mg/kg-d (CD-1 mice)
Source of toxicity value:	Determined by MDH in 2015
Point of Departure (POD):	162 mg/kg-d ($BMDL_{10}$, U.S. Environmental Protection Agency, 1989, subchronic study)
Dose Adjustment Factor (DAF):	0.13 Body weight scaling, default (US EPA 2011 and MDH 2011)
Human Equivalent Dose (HED):	POD x DAF = 162 mg/kg-d x 0.13 = 21 mg/kg-d
Total uncertainty factor (UF):	1000
Uncertainty factor allocation:	3 for interspecies differences (for toxicodynamics), 10 for intraspecies variability, 3 for extrapolation from a subchronic to a chronic study, and 10 for database uncertainty due to a lack of reproductive/developmental studies and a lack of testing in a second species
Critical effect(s):	Increased relative liver weight in female mice
Co-critical effect(s):	Decreased relative adrenal weight
Additivity endpoint(s):	Adrenal, Hepatic (liver) system

Cancer Health Risk Limit (cHRL) = Not Applicable

Cancer classification:	Not Applicable
Slope factor (SF):	Not Applicable
Source of cancer slope factor (SF):	Not Applicable
Tumor site(s):	Not Applicable

Volatile: Yes (moderate)

Summary of Guidance Value History:
Acenaphthene has a 1993 chronic HRL of 400 µg/L. In addition, a Pesticide Rapid Assessment Result of 40 µg/L was derived in 2014 and was lower than the HRL due to the conservative rapid assessment method (MDH 2014). Subchronic and Chronic HBVs of 200 µg/L and 100 µg/L were derived in 2015.

The 2015 Chronic HBV was 4 times lower than the 1993 HRL as the result of: 1) using updated risk assessment methodology, including use of body weight scaling and updated water intake rates, and 2) rounding to one significant digit. In 2016 MDH updated the intake rate values used to derive guidance values. The updated intake rates did not result in changes to the values derived in 2015. The 2015 guidance was adopted into rule as HRLs in 2018.

Summary of toxicity testing for health effects identified in the Health Standards Statute (144.0751):
Even if testing for a specific health effect was not conducted for this chemical, information about that effect might be available from studies conducted for other purposes. MDH has considered the following information in developing health protective guidance.

	Endocrine	Immunotoxicity	Development	Reproductive	Neurotoxicity
Tested for specific effect?	No	No	No	No	No
Effects observed?	--[1]	No	No	No	No

Comments on extent of testing or effects:
[1] A study in mice reported that the adrenal gland weight was decreased at dose levels more than 300 times the subchronic reference dose. Hormone levels were not assessed.

Resources Consulted During Review:

Dutch National Institute for Public Health and the Environment (RIVM). (2001). Re-evaluation of human-toxicological maximum permissible risk levels. Retrieved from: http://www.rivm.nl/bibliotheek/rapporten/711701025.pdf

International Agency for Research on Cancer (IARC). (2010). Monograph 92: Some non-heterocyclic polycyclic aromatic hydrocarbons and some related exposures. Retrieved from: http://monographs.iarc.fr/ENG/Monographs/vol92/mono92-14.pdf

Minnesota Department of Health (MDH). (2008). Statement of Need and Reasonableness (SONAR), July 11, 2008. Support document relating to Health Risk Limits for Groundwater Rules. Retrieved from http://www.health.state.mn.us/divs/eh/risk/rules/water/hrlsonar08.pdf

Minnesota Department of Health (MDH). (2011). MDH Health Risk Assessment Methods to Incorporate Human Equivalent Dose Calculations into Derivation of Oral Reference Doses (May 2011, revised 2017) from http://www.health.state.mn.us/divs/eh/risk/guidance/hedrefguide.pdf

Minnesota Department of Health (MDH). (2014). Report on Pesticide Rapid Assessments. Retrieved from: http://www.health.state.mn.us/divs/eh/risk/guidance/dwec/rapassrept.pdf

U.S. Department of Health and Human Services Agency for Toxic Substances and Disease Registry (ATSDR). (1995). Toxicological Profile for Polycyclic Aromatic Hydrocarbons. Retrieved from: http://www.atsdr.cdc.gov/toxprofiles/tp69.pdf

U.S. Environmental Protection Agency - Office of Drinking Water. (2012). 2012 Edition of the Drinking Water Standards and Health Advisories. from http://water.epa.gov/action/advisories/drinking/upload/dwstandards2012.pdf

U.S. Environmental Protection Agency - Office of Research and Development. (1988). Recommendations for and Documentation of Biological Values for Use in Risk Assessment. from http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=34855

U.S. Environmental Protection Agency - Office of the Science Advisor. (2011). Recommended Use of Body Weight¾ as the Default Method in Derivation of the Oral Reference Dose. from http://www.epa.gov/raf/publications/pdfs/recommended-use-of-bw34.pdf

U.S. Environmental Protection Agency - Regional Screening Tables. Mid-Atlantic Risk Assessment - Regional Screening Table. from http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/index.htm

U.S. Environmental Protection Agency. (1987). Health Effects Assessment for Acenaphthene. Retrieved from: http://hero.epa.gov/index.cfm/reference/details/reference_id/625843

U.S. Environmental Protection Agency. (1989). IRIS Summary for Acenaphthene (CASRN 83-32-9). Retrieved from: http://www.epa.gov/iris/subst/0442.htm

U.S. Environmental Protection Agency. (1994). IRIS Summary for Acenaphthene (CASRN 83-32-9). Retrieved from: http://www.epa.gov/iris/subst/0442.htm

U.S. Environmental Protection Agency. (2011). Peer-Reviewed Provisional Toxicity Value for Acenaphthene (CASRN 83-32-9). Retrieved from: http://hhpprtv.ornl.gov/issue_papers/Acenaphthene.pdf

U.S. Environmental Protection Agency (EPA) - Office of Research and Development. (2011). Exposure Factors Handbook: 2011 Edition. Retrieved from https://cfpub.epa.gov/ncea/risk/recordisplay.cfm?deid=236252

U.S. Environmental Protection Agency. (2012). Benchmark Dose Technical Guidance. Retrieved from: http://www.epa.gov/raf/publications/pdfs/benchmark_dose_guidance.pdf

U.S. Geological Survey - Health-Based Screening Levels. from https://cida.usgs.gov/hbsl/apex/f?p=104:1: