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

Adopted as Rule: August 2018

Toxicological Summary for: 1,1,1-Trichloroethane

CAS: **71-55-6**
Synonyms: Methyl chloroform, 1,1,1-TCA

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 ($nHRL_{Subchronic}$) = 9,000 µg/L

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

$$= \frac{\text{(3.0 mg/kg-d) x (0.2)}^{*} \text{ x (1000 µg/mg)}}{\text{(0.070 L/kg-d)}^{**}}$$

= 8,571 rounded to **9,000 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/Concentration:	HED/Total UF = 3.0 mg/kg-d (B6C3F1 mouse)
Source of toxicity value:	Determined by MDH in 2016
Point of Departure (POD):	2155 mg/kg-d ($BMDL_{10}$, NTP, 2000)
Dose Adjustment Factor (DAF):	0.14 (Body weight scaling, subchronic female B6C3F1 mouse) (USEPA, 2011) (MDH, 2017)
Human Equivalent Dose (HED):	POD x DAF = 2155 mg/kg-d x 0.14 = 302 mg/kg-d
Total uncertainty factor (UF):	100
Uncertainty factor allocation:	3 for interspecies differences (for toxicodynamics), 10 for intraspecies variability, and 3 for database uncertainty (inadequate evaluation of neurological endpoint (identified as critical endpoint in inhalation studies))
Critical effect(s):	Decreased adult body weight

Co-critical effect(s):	Decreased adult body weight/weight gain, decreased relative liver weight, decreased epididymal spermatozoal concentration
Additivity endpoint(s):	Hepatic (liver) system, Male reproductive system

Chronic Non-Cancer Health Risk Limit ($nHRL_{Chronic}$) = 5,000 µg/L

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

$$= \frac{\text{(1.0 mg/kg-d) x (0.2)}^{*} \text{ x (1000 µg/mg)}}{\text{(0.044L/kg-d)}^{**}}$$

= 4,545 rounded to **5,000 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/Concentration:	HED/Total UF = 1.0 mg/kg-d (B6C3F1 mouse)
Source of toxicity value:	Determined by MDH in 2016
Point of Departure (POD):	2155 mg/kg-d ($BMDL_{10}$, NTP, 2000; subchronic exposure)
Dose Adjustment Factor (DAF):	0.14 (Body weight scaling, subchronic female B6C3F1 mouse) (USEPA, 2011) (MDH, 2017)
Human Equivalent Dose (HED):	POD x DAF = 2155 mg/kg-d x 0.14 = 302 mg/kg-d
Total uncertainty factor (UF):	300
Uncertainty factor allocation:	3 for interspecies differences (for toxicodynamics), 10 for intraspecies variability, 3 for sub-chronic to chronic extrapolation, and 3 for database uncertainty (inadequate evaluation of neurological endpoint (identified as critical endpoint in inhalation studies))
Critical effect(s):	Decreased adult body weight
Co-critical effect(s):	Decreased adult body weight/weight gain, decreased relative liver weight, decreased epididymal spermatozoal concentration
Additivity endpoint(s):	Hepatic (liver) system, Male reproductive system

Cancer Health Risk Limit (cHRL) = Not Applicable

Cancer classification:	Group D: not classifiable as to human carcinogenicity (USEPA, 2007)

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

Volatile: Yes (high)

Summary of Guidance Value History:

A noncancer chronic Health Risk Limit (HRL) of 600 µg/L was promulgated in 1993/1994. In 2007, as required by a Legislative Session Law (Chapter 147, Article 17, section 2), the HRL was set equal to the MCL of 200 µg/L until MDH conducted a full review. Later in 2007, MDH derived subchronic and chronic noncancer Health Based Values (HBV) of 20,000 µg/L and 9,000 µg/L. The HBVs were adopted as HRLs in 2009. In 2016, MDH re-evaluated the noncancer HRLs resulting in new noncancer subchronic and chronic HBVs of 9,000 µg/L and 5,000 µg/L, respectively. The 2016 noncancer HVBs were lower than the previous HRLs as a result of 1) using MDH's most recent risk assessment methodology including the application of Human Equivalence Doses and 2) rounding to one significant digit. The 2016 guidance was adopted 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	Yes	Yes	Yes	Yes
Effects observed?	-	No[1]	No[2]	Yes [3]	Yes[4]

Comments on extent of testing or effects:

[1] There are no oral immunotoxicity studies. Inhalation exposure to moderate to high concentrations did not produce effects on spleen or thymus histopathology. Based on this limited inhalation data 1,1,1-TCA may not produce toxic effects on the immune system, however, sensitive immunological endpoints have not been evaluated.

[2] Epidemiological studies have not observed adverse pregnancy outcome. Low level, oral exposure did not produced adverse effects in laboratory animals. Minor developmental delays, accompanied by maternal toxicity, have been reported at high inhalation doses. A database uncertainty factor to, in part, address the absence of an established LOAEL for developmental effects has been incorporated into the derivation of the subchronic and chronic RfDs.

[3] Epidemiological studies have not observed adverse pregnancy outcome. Decreased sperm concentrations have been observed in laboratory animals exposed to concentrations similar to the critical study LOAEL. These effects are listed as co-critical effects.

[4] Inhalation of 1,1,1-TCA produces central nervous system depression, increasing with exposure concentration from mild motor impairment to euphoria, unconsciousness and death. Rats given a bolus oral dose exhibited a short period of hyperactivity followed by a period of prolonged narcosis. No clinical signs of neurotoxicity were seen in rats receiving similar doses from diet or drinking water. Since these studies did not evaluate subtle neurological endpoints a database uncertainty factor was added to, in part, address this data gap.

Resources Consulted During Review:

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