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

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Toxicological Summary for: Dichlorodifluoromethane

CAS: **75-71-8**
Synonyms: Freon 12, CFC-12, DCDFM

Acute Non-Cancer Risk Assessment Advice ($nRAA_{Acute}$) = Not Derived (Insufficient Data)

Short-term Non-Cancer Risk Assessment Advice ($nRAA_{Short\text{-}term}$) = Not Derived (Insufficient Data)

Subchronic Non-Cancer Risk Assessment Advice ($nRAA_{Subchronic}$) = Not Derived (Insufficient Data)

Chronic Non-Cancer Risk Assessment Advice ($nRAA_{Chronic}$) = 500 µg/L

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

$$= \frac{\text{(0.11 mg/kg-d) x (0.2)}^{*} \text{ x (1000 µg/mg)}}{\text{(0.044 L/kg-d)}^{**}}$$

$$= \mathbf{500\ \mu g/L}$$

*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/Concentration:	HED/Total UF = 33/300 = 0.11 mg/kg-d (laboratory rats)
Source of toxicity value:	Determined by MDH in 2017
Point of Departure (POD):	150 mg/kg-d (LOAEL, Sherman, 1974 aci EPA, 1987)
Dose Adjustment Factor (DAF):	0.22 (Body weight scaling, default) (MDH, 2017) (EPA, 2011)
Human Equivalent Dose (HED):	POD x DAF = 150 mg/kg-d x 0.22 = 33 mg/kg-d
Total uncertainty factor (UF):	300
Uncertainty factor allocation:	3 for interspecies differences (for toxicodynamics), 10 for intraspecies variability, 3 for the use of a LOAEL (used minimal effect LOAEL due to dose spacing), and 3 for database uncertainty (lack of developmental study and lack of detailed information)
Critical effect(s):	Decreased body weight
Co-critical effect(s):	None
Additivity endpoint(s):	None

Cancer Risk Assessment Advice (cRAA) = Not Applicable

Cancer classification:	EPA Group D: Not classifiable as to human carcinogenicity
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:

In 1993/1994, MDH derived a chronic non-cancer Health Risk Limit (HRL) of 1000 µg/L. In 2009, MDH derived a chronic non-cancer Health Based Value (HBV) of 700 µg/L, 1.4 fold lower than the 1993/94 HRL as the result of: 1) incorporating a time-weighted average intake rate which incorporates higher intake rates early in life; 2) utilization of a slightly lower RfD; and 3) rounding to one significant digit. The HBV was promulgated as a HRL in 2011. In 2017, MDH re-evaluated the non-cancer HRL, resulting in a new non-cancer chronic RAA of 500 µg/L. The chronic value is lower as a result of using MDH's most recent risk assessment methodology including the application of a Human Equivalent Dose (HED).

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	Yes	Yes
Effects observed?	--	--	--	No[1]	Yes[2]

Comments on extent of testing or effects:

[1] EPA 1995 (IRIS) reported that no effects were observed in a three generation study. However, no study details (e.g., dose levels, parameters evaluated) were included in the EPA summary.

[2] Behavioral neurotoxicity has been studied in animals exposed via inhalation, and has been observed after high doses in humans in cases of abuse (huffing) and in occupational studies. Inhalation exposures have not been compared to effects in feeding studies due to a lack of quantitative route-to-route extrapolation and lack of adequate study data.

Resources Consulted During Review:

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