Minnesota Department of Health

Health Based Guidance for Water
Health Risk Assessment Unit, Environmental Health Division
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Toxicological Summary for: Dichlorofluoromethane

CAS**: 75-43-4**

Synonyms: DCFM, Freon 21, Refrigerant 21, R-21, HCFC-21, dichloromonofluoromethane, fluorodichloromethane, monofluorofichloromethane

Health Based Guidance

Only inhalation studies have been conducted with dichlorofluoromethane (DCFM). Insufficient pharmacokinetic data are available for extrapolating from inhalation to oral toxicity. As a result, the toxicity data currently available for DCFM are not sufficient for MDH to develop chemical specific health-based guidance for drinking water.

Evidence suggests that DCFM and chloroform, which are structurally similar, are likely to have similar metabolites and share similar metabolic pathways. Inhalation toxicity data for DCFM and chloroform suggest that chloroform is likely to exhibit similar but slightly greater toxicity than DCFM. MDH has determined that the values derived for chloroform are appropriate to use as Risk Assessment Advice (RAA) for DCFM.

The Minnesota Department of Health (MDH) developed Health Risk Limits (HRLs) for chloroform in 2009. In 2017 MDH re-evaluated chloroform and derived revised health-based values (HBVs).

The RAA values for dichlorodifluormethane (chloroform 2017 nHBVs) are:

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

Short-term nRAA = 20 µg/L

Additivity endpoint(s): Developmental, Hepatic (liver) system, Immune system

Subchronic nRAA = 20* µg/L

Additivity endpoint(s): Developmental, Hepatic (liver) system, Immune system

Chronic nRAA = 20* µg/L

Additivity endpoint(s): Developmental, Hepatic (liver) system, Immune system

Cancer Health Based Value (cHBV) = Not Applicable

*Set at Short-Term value to be protective of shorter exposures that occur within the subchronic and chronic durations.

For additional information on the 2017 derivation of HBVs for chloroform and additivity endpoints see: Toxicological Summary for Chloroform

Volatile: Yes (moderate)

Summary of Guidance Value History:

In 2009, MDH conducted a review of the available toxicity data for DCFM. Oral guidance values were not developed at the time. A toxicological summary was published stating that Risk Assessment Advice (RAA) was considered but could not be derived due to insufficient chemical-specific data. In 2015, MDH re-evaluated DCFM and determined that a surrogate approach could be used to develop health-based guidance. The assessment identified chloroform as an appropriate surrogate for DCFM Risk Assessment Advice. In 2016, the short term, subchronic and chronic RAA values were lowered from 30 µg/L to 20 µg/L due a re-evaluation of the chloroform guidance.

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[1]	Yes	Yes	Yes
Effects observed?	-	-	Yes[2]	Yes[3]	Yes[4]

Comments on extent of testing or effects:

General note: There are no oral studies for DCFM available. The water guidance levels for chloroform are expected to be protective against the adverse effects of DCFM. For additional information see: Chloroform Chemical Summary Sheet.

[1] There are no known studies that evaluate the immunotoxicity of DCFM. The short-term and subchronic chloroform guidance values are based on decreased humoral immunity.

[2] In an inhalation study, pregnant rats exposed to DCFM at 10,000 ppm (42,700 mg/m^3) for 6 hours per day on gestational days 6 to 15 exhibited decreased maternal body weight gain and increased preimplantation loss. For comparison, decreased maternal body weight gain due to chloroform exposure occurred at 10 ppm (49 mg/m^3) for 7 hours per day on gestational days 7 to 16. Oral developmental studies of chloroform show that doses that are maternally toxic may also be toxic to the fetus and cause the same types of liver damage as observed in adult animals. Developmental effects are identified as short-term co-critical effects for chloroform.

[3] A single oral two-generation study on chloroform has been conducted. Changes in the epididymis were noted at doses over 800 times higher than the short-term and subchronic reference doses; reproductive capacity was not affected. The epididymal effects are subchronic co-critical effects for chloroform.

[4] High inhalation exposures to DCFM lead to CNS depression and narcotic effects. Similar effects were seen for chloroform at very high acute oral doses (> 9000 times higher than the short-term, subchronic, and chronic reference dose). Additional neurotoxic effects of changes in operant behavior occur at chloroform doses >2000 times higher than the subchronic and chronic reference dose.

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