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Chemical Name: 1,1-Dichloroethylene

CAS: 75-35-4

Synonyms: Vinylidene chloride

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

$$= \frac{\text{(Reference Dose, mg/kg/d) x (Relative Source Contribution) x (Conversion Factor)}}{\text{(Subchronic intake rate, L/kg/d)}}$$

$$= \frac{\text{(0.09 mg/kg/d) x (0.2) x (1000 µg/mg)}}{\text{(0.077 L/kg-d)}}$$

= 233 rounded to **200 µg/L**

Reference Dose / Concentration:	0.09 mg/kg-d (laboratory animal)
Source of toxicity value:	MDH, 2009
Point of Departure:	9 mg/kg-d (NOAEL, Nitschke et al 1983 with support from Quast et al 1977 and 1983)
Human Equivalent Dose Adjustment:	Insufficient data
Total uncertainty factor:	100
UF allocation:	10 interspecies extrapolation, 10 intraspecies variability
Critical effect(s):	Fatty changes in the liver
Co-critical effect(s):	None
Additivity endpoint(s):	Hepatic (liver) system
Secondary effect(s):	None

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

$$= \frac{\text{(Reference Dose, mg/kg/d) x (Relative Source Contribution) x (Conversion Factor)}}{\text{(Chronic intake rate, L/kg/d)}}$$

$$= \frac{\text{(0.046 mg/kg/d) x (0.2) x (1000 µg/mg)}}{\text{(0.043 L/kg-d)}}$$

= 214 rounded to **200 µg/L**

Reference Dose / Concentration:	0.046 mg/kg-d (laboratory animal)
Source of toxicity value:	MDH, 2009
Point of Departure:	4.6 mg/kg-d ($BMDL_{10}$, Quast et al 1983)
Human Equivalent Dose Adjustment:	Insufficient data
Total uncertainty factor:	100
UF allocation:	10 interspecies extrapolation, 10 intraspecies variability
Critical effect(s):	Fatty changes in the liver
Co-critical effect(s):	None
Additivity endpoint(s):	Hepatic (liver) system
Secondary effect(s):	Increased liver weight and enzyme activity

Cancer Health Risk Limit ($cHRL_{cancer}$) = "Not Applicable"

Cancer classification:	Inadequate for assessment of human carcinogenic potential by the oral route, based on the absence of statistically or biologically significant tumors in limited bioassays in rats and mice balanced against the suggestive evidence in male mice in a single bioassay by inhalation and limited evidence of genotoxicity (EPA 2002)
Slope factor:	NA
Source of slope factor:	NA
Tumor site(s):	NA

Volatile: Yes (highly volatile)

Summary of changes since 1993/1994 HRL promulgation:
The subchronic and chronic 2011 nHRL (200 µg/L) is approximately 33 times higher than the 1993/94 HRL (6 µg/L) as the result of: 1) a nearly 6 fold increase in the RfD due to a reassessment of toxicity; 2) carcinogenicity re-classification (resulting in the removal of the 10 fold uncertainty factor for Class C); and 3) rounding to one significant figure.

Summary of toxicity testing for health effects identified in the Health Standards Statute

	Endocrine	Immunotox	Development	Reproductive	Neurotoxicity
Tested?	No[1]	No[1]	Yes	Yes	Yes
Effects?	--	--	Yes[2]	Yes[2]	No[3]

Lack of testing specific for a health effect does not necessarily imply that the toxicity value is not protective of the health effect. Most chemicals have been subject to a number of studies in which researchers identify those effects that occur at the lowest doses; subsequent testing is done to narrow in on the threshold dose for those effects.

Comments on extent of testing or effects:

[1] No focused studies on endocrine or immune effects have been performed; however, the existing bioassays provide no evidence of effects.

[2] Two developmental and one three generational reproductive oral studies were conducted. No developmental or reproductive effects were observed in these studies. The highest dose tested was approximately 4-fold higher than the chronic critical study LOAEL. Developmental effects have been observed in inhalation studies, however, maternal toxicity was typically evident at the levels that resulted in developmental toxicity. Inhalation studies also indicate that the liver is the most sensitive organ.

[3] A single inhalation neurodevelopmental toxicity study has been conducted and although there was evidence of maternal and developmental toxicity (e.g., weight loss) no effects were observed in behavioral tests. There are no other focused studies on neurotoxicity, however, there is no indication from chronic, reproductive, and developmental bioassays in rats and mice by oral or inhalation exposure that neurotoxicity is a sensitive endpoint.

References:

Agency for Toxic Substances and Disease Registry. Toxicological Profile for 1,1-Dichloroethene. May 1994. http://www.atsdr.cdc.gov/toxprofiles/tp39.pdf. (Printed 9/18/2002.)

ATSDR (Agency for Toxic Substances and Disease Registry). Minimal Risk Levels. http://www.atsdr.cdc.gov/mrls.html

California Environmental Protection Agency, OEHHA Toxicity Criteria Database. http://www.oehha.ca.gov/risk/ChemicalDB/index.asp; http://www.oehha.ca.gov/risk/pdf/cancerpotalpha81005.pdf

CalEPA 1999. California Office of Environmental Health Hazard Assessment. Public Health Goal for 1,1-Dichloroethylene in Drinking Water. (February 1999) http://www.oehha.ca.gov/water/phg/pdf/11dce_f.pdf (Printed 9/9/02)

EPA 2002. Environmental Protection Agency. Integrated Risk Information System. 1,1-Dichloroethylene (08/13/02, 08/13/02) http://www.epa.gov/iris/subst/0039.htm (last updated: 8/21/02) (Printed 09/09/02).

EPA Region 9. Preliminary Remediation Goal. (click on Region 9 PRGs 2004 Table link) http://www.epa.gov/region09/waste/sfund/prg/files/04prgtable.pdf

EPA. Office of Drinking Water. Drinking Water Standards and Health Advisories (August, 2006) http://www.epa.gov/waterscience/criteria/drinking/dwstandards.pdf

EPA Region 3. Risk Based Concentrations, 2007. (click on RBC Tables PDF link) http://www.epa.gov/reg3hwmd/risk/human/rbc/rbc1006.pdf

Nitschke KD, FA Smith, JF Quast, JM Norris, BA Schwetz. 1983. A Three-Generation Rat Reproductive Toxicity Study of Vinylidene Chloride in the Drinking Water. Fund Appl Tox 3:75-79.

Quast JF, Humiston CG, Schwetz RW, Balmer MF, Rampy LW, Norris JM, Gehring PJ. 1977. Results of 90-day toxicity study in rats given vinylidene chloride in their drinking water or exposed to VDC vapor by inhalation. Toxicol Appl Pharmacol 4:187. (abstract for 16th Annual Meeting of the Society of Toxicology)

Quast JF, CG Humiston, CE Wade, J Ballard, JE Beyer, RW Schwetz, JM Norris. 1983. A Chronic Toxicity and Oncogenicity Study in Rats and Subchronic Toxicity Study in Dogs on Ingested Vinylidene Chloride. Fund Appl Tox 3:55-62.

Roberts, Stephen M., Kristen E. Jodan, D. Alan Warren, Janice K. Britt, Robert C. James. Evaluation of the Carcinogenicity of 1,1-Dichloroethylene (Vinylidene Chloride). Regulatory Toxicology and Pharmacology 35:44-55 (2002).

World Health Organization. 2003. Concise International Chemical Assessment Document 51. 1,1-Dichloroethene (Vinylidene chloride)

World Health Organization. 2006 Guidelines for Drinking-Water Quality. Chapter 12 Chemical Fact Sheets. http://www.who.int/water_sanitation_health/dwq/gdwq0506_12.pdf