

8. REGULATIONS AND ADVISORIES

International and national regulations and guidelines pertinent to human exposure to 1,3- and 2,3-dichloropropene are summarized in Table 8-1.

2,3-Dichloropropene. An acute-duration inhalation MRL of 0.002 ppm was derived for very slight hyperplasia of the nasal respiratory epithelium in female rats exposed to 2,3-dichloropropene vapor at a minimal LOAEL of 5 ppm, 6 hours/day, for 9 out of 11 days (Zempel et al. 1987). The MRL was based on 0.14 ppm, the human equivalent concentration ($LOAEL_{HEC}$) to the duration-adjusted minimal LOAEL of 1.25 ppm. An uncertainty factor of 90 (3 for the use of a minimal LOAEL, 3 for extrapolation from animals to humans using dosimetric adjustment, and 10 for human variability) was applied to the $LOAEL_{HEC}$.

1,3-Dichloropropene. An intermediate-duration inhalation MRL of 0.008 ppm was derived for slight hypertrophy/hyperplasia of the nasal respiratory epithelium observed in male B6CF1 mice exposed to 1,3-dichloropropene vapor (92.1% purity) at a concentration of 60 ppm, 6 hours/day, 5 days/week, for 6 months (Lomax et al. 1989). The MRL was based on 0.23 ppm, the human equivalent concentration (HEC) to the benchmark concentration limit ($BMCL_{10}$), the 95% lower confidence limit on the maximum likelihood estimate of the concentration corresponding to 10% risk; concentrations were adjusted for compound purity and intermittent exposure before modeling. An uncertainty factor of 30 (3 for extrapolation between animal and human using dosimetric adjustment and 10 for human variability) was applied to the $(BMCL_{10})_{HEC}$. A chronic-duration inhalation MRL of 0.007 ppm has been derived for hypertrophy/hyperplasia of the nasal respiratory epithelium in female B6CF1 mice exposed to 1,3-dichloropropene vapor at a concentration of 20 ppm, 6 hours/day, 5 days/week for 2 years (Lomax et al. 1989). The MRL was based on 0.20 ppm, the human equivalent concentration to a benchmark concentration limit (95% lower confidence limit on the maximum likelihood estimate of the concentration corresponding to 10% risk) ($[BMCL_{10}]_{HEC}$). An uncertainty factor of 30 (3 for extrapolation between animal and human using dosimetric adjustment and 10 for human variability) was applied to the $(BMCL_{10})_{HEC}$. An intermediate-duration oral MRL of 0.04 mg/kg/day has been derived based on a $BMDL_{10}$ of 3.6 mg/kg/day for basal cell hyperplasia of the nonglandular stomach in male Fischer rats (Haut et al. 1996) exposed to Telone II^{®b} in the diet at a dose of 15 mg/kg/day for 13 weeks; a composite uncertainty factor of 100 (10 for extrapolation between animals and humans and 10 for human variability) was applied to the $BMDL_{10}$. The chronic-duration oral MRL is based on benchmark dose modeling of the

8. REGULATIONS AND ADVISORIES

incidence of basal cell hyperplasia in female Fischer rats (Stebbins et al. 2000) exposed to Telone II[®] in the diet at a dose of 12.5 mg/kg/day for 2 years. Application of a composite uncertainty factor of 100 (10 for extrapolation between animals and humans and 10 for human variability) to the BMDL₁₀ of 3.51 mg/kg/day would result in a chronic oral MRL of 0.04 mg/kg/day. This value is in agreement with EPA's chronic oral RfD of 0.03 mg/kg/day, which was based on a point of departure of 3.4 mg/kg/day for the same data set. Therefore, 0.03 mg/kg/day was selected as the chronic-duration oral MRL for 1,3-dichloropropene.

In 2000, EPA derived an oral reference dose (RfD) value for 1,3-dichloropropene of 0.03 mg/kg/day based on a benchmark dose limit (95% lower confidence limit on the maximum likelihood estimate of the dose corresponding to 10% risk) (BMDL₁₀) of 3.4 mg/kg/day for chronic irritation in Fischer 344 rats in a chronic feeding study (IRIS 2006); an uncertainty factor of 100 was applied (10 for interspecies extrapolation and 10 for intraspecies variation) (IRIS 2006).

In 2000, EPA derived an inhalation reference concentration (RfC) value for 1,3-dichloropropene of 0.02 mg/m³ based on a benchmark concentration limit (95% lower confidence limit on the maximum likelihood estimate of the dose corresponding to 10% risk) (BMCL₁₀) of 3.7 mg/m³ (adjusted) (IRIS 2006) for hypertrophy/hyperplasia of the nasal respiratory epithelium in B6C3F1 mice during a chronic inhalation study (Lomax et al. 1989); an uncertainty factor of 30 was applied (3 for interspecies extrapolation to reflect the pharmacodynamic component of interspecies uncertainty and 10 for intraspecies variation) (IRIS 2006).

In 1999, the International Agency for Research on Cancer (IARC) classified 1,3-dichloropropene as a Group 2B carcinogen (possibly carcinogenic to humans) (IARC 2004). In 2000, EPA classified 1,3-dichloropropene as a B2 carcinogen (probable human carcinogen) (IRIS 2006). The National Toxicology Program (NTP) has classified 1,3-dichloropropene as reasonably anticipated to be a human carcinogen (NTP 2004). The American Conference of Governmental Industrial Hygienists (ACGIH) has classified 1,3-dichloropropene as an A3 carcinogen (confirmed animal carcinogen with unknown relevance to humans) (ACGIH 2005). The National Institute of Occupational Safety and Health (NIOSH) has also identified 1,3-dichloropropene as a potential occupational carcinogen (NIOSH 2005).

OSHA has not required employers of workers who are occupationally exposed to 1,3-dichloropropene to institute engineering controls and work practices to reduce and maintain employee exposure at or below permissible exposure limits (PELs) (OSHA 2005), although both ACGIH and NIOSH have recommended

8. REGULATIONS AND ADVISORIES

an 8- and 10-hour time-weighted averages (TWAs) of 1 ppm for 1,3-dichloropropene (ACGIH 2005; NIOSH 2005).

1,3-Dichloropropene is regulated by the Clean Water Effluent Guidelines for the following industrial point sources: electroplating, organic chemicals production, steam electricity power generation, asbestos product manufacturing, timber products processing, metal finishing, paving, roofing, paint formulating, ink formulating, gum and wood chemicals manufacturing, and carbon black manufacturing; see the electronic Code of Federal Regulations for details (NARA 2006).

EPA regulates 1,3-dichloropropene under the Clean Water Act (CWA) and the Clean Air Act (CAA) and has designated it as a hazardous substance and a hazardous air pollutant (HAP) (EPA 2006b, 2006c). 1,3- and 2,3-Dichloropropene are on the list of chemicals appearing in "Toxic Chemicals Subject to Section 313 of the Emergency Planning and Community Right-to-Know Act of 1986" (EPA 2006g). 1,3- and 2,3-Dichloropropene has been assigned a reportable quantity (RQ) limit of 100 pounds (EPA 2006f). The RQ represents the amount of a designated hazardous substance which, when released to the environment, must be reported to the appropriate authority.

8. REGULATIONS AND ADVISORIES

Table 8-1. Regulations and Guidelines Applicable to Dichloropropenes^a

Agency	Description	Information	Reference
<u>INTERNATIONAL</u>			
Guidelines:			
IARC	Carcinogenicity classification	Group 2B ^b	IARC 2004
WHO	Air quality guidelines	No data	WHO 2000
	Drinking water quality guidelines	0.02 mg/L ^c	WHO 2004
<u>NATIONAL</u>			
Regulations and Guidelines:			
a. Air			
ACGIH	TLV (8-hour TWA)	1 ppm ^d	ACGIH 2005
EPA	AEGL	No data	EPA 2006a
	Hazardous air pollutant	Yes	EPA 2006c 42 USC 7412
NIOSH	REL (10-hour TWA)	1 ppm ^{e,f}	NIOSH 2005
	IDLH	No data	
OSHA	PEL (8-hour TWA) for general industry	No data	OSHA 2005 29 CFR 1910.1000
b. Water			
EPA	Designated as hazardous substances in accordance with Section 311(b)(2)(A) of the Clean Water Act for 1,3-dichloropropene and 2,3-dichloropropene	Yes	EPA 2006b 40 CFR 116.4
	Drinking water standards and health advisories		EPA 2004
	1-day health advisory for a 10-kg child	0.03 mg/L	
	10-day health advisory for a 10-kg child	0.03 mg/L	
	DWEL	1 mg/L	
	10 ⁻⁴ Cancer risk	0.04 mg/L	
	National primary drinking water standards	No data	EPA 2003
	Toxics criteria for those states not complying with Clean Water Act Section 303(c)(2)(B); human health (10 ⁻⁶ risk for carcinogens) for consumption of:		EPA 2006h 40 CFR 131.36
	Water + organisms	10 µg/L ^g	
	Organism only	1,700 µg/L ^g	
	Water quality criteria for human health consumption of:		EPA 2006e
	Water + organism	0.34 µg/L ^h	
	Organism only	21 µg/L ^h	

8. REGULATIONS AND ADVISORIES

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Agency	Description	Information	Reference
NATIONAL (<i>cont.</i>)			
c. Food			
FDA	Bottled drinking water	No data	FDA 2005 21 CFR 165.110
d. Other			
ACGIH	Carcinogenicity classification	A3 ⁱ	ACGIH 2005
EPA	Carcinogenicity classification	B2 ^j	IRIS 2006
	Oral slope factor	0.01 per mg/kg/day	
	Drinking water unit risk	1x10 ⁻⁶ to 3x10 ⁻⁶ per mg/kg/day	
	Inhalation unit risk	4x10 ⁻⁶ per mg/m ³	
	RfC	0.02 mg/m ³	
	RfD	0.03 mg/kg/day	
	Identification and listing of hazardous substances	U084	EPA 2006d 40 CFR 261, Appendix VIII
	Superfund, emergency planning, and community right-to-know		EPA 2006f 40 CFR 302.4
	Designated CERCLA hazardous substance	Yes	
	Reportable quantity		
	1,3-Dichloropropene	100 pounds	
	2,3-Dichloropropene	100 pounds	
	Effective date of toxic chemical release reporting		EPA 2006g 40 CFR 372.65
	1,3-Dichloropropene	01/01/87	
	2,3-Dichloropropene	01/01/90	

8. REGULATIONS AND ADVISORIES

Table 8-1. Regulations and Guidelines Applicable to Dichloropropenes^a

Agency	Description	Information	Reference
NTP	Carcinogenicity classification	Reasonably anticipated to be a human carcinogen	NTP 2004

^aAll regulations cited are applicable to 1,3-dichloropropene except where indicated.

^bGroup 2B: possibly carcinogenic to humans

^cFor substances that are considered to be carcinogenic, the guideline value is the concentration in drinking-water associated with an upper-bound excess lifetime cancer risk of 10^{-5} (one additional cancer per 100,000 of the population ingesting drinking-water containing the substance at the guideline value for 70 years).

^dSkin notation: refers to the potential significant contribution to the overall exposure by the cutaneous route, including mucous membranes and the eyes, either by contact with vapors or, of probable greater significance, by direct skin contact with the substance.

^ePotential occupational carcinogen

^fSkin designation: indicates the potential for dermal absorption; skin exposure should be prevented as necessary through the use of good work practices, gloves, coveralls, goggles, and other appropriate equipment.

^gCriteria revised to reflect current agency q1* or RfD, as contained in the IRIS. The fish tissue bioconcentration factor from the 1980 criteria documents was retained in all cases.

^hThis criterion is based on carcinogenicity of 10^{-6} risk.

ⁱGroup A3: confirmed animal carcinogen with unknown relevance to humans

^jB2: probable human carcinogen

ACGIH = American Conference of Governmental Industrial Hygienists; AEGL = Acute Exposure Guideline Levels; CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act; CFR = Code of Federal Regulations; DWEL = drinking water equivalent level; EPA = Environmental Protection Agency; FDA = Food and Drug Administration; IARC = International Agency for Research on Cancer; IDLH = immediately dangerous to life or health; NIOSH = National Institute for Occupational Safety and Health; NTP = National Toxicology Program; OSHA = Occupational Safety and Health Administration; PEL = permissible exposure limit; REL = recommended exposure limit; RfC = inhalation reference concentration; RfD = oral reference dose; TLV = threshold limit values; TWA = time-weighted average; USC = United States Code; WHO = World Health Organization