

8. REGULATIONS, ADVISORIES, AND GUIDELINES

MRLs are substance specific estimates, which are intended to serve as screening levels, are used by ATSDR health assessors and other responders to identify contaminants and potential health effects that may be of concern at hazardous waste sites.

An MRL of 2 mg/m³ has been derived for acute-duration inhalation exposure (≤ 14 days) to ethylene glycol. The MRL is based on a NOAEL of 23 mg/m³ for respiratory tract irritation and systemic toxicity in humans (Wills et al. 1974), which was divided by an uncertainty factor of 10 (for human variability).

An MRL of 0.8 mg/kg/day has been derived for acute-duration oral exposure (14 days or less) to ethylene glycol. BMD dose modeling was conducted using developmental toxicity data in mice (total malformations and a skeletal variation) (Neeper-Bradley et al. 1995; Tyl 1989). The resulting BMDL₁₀ of 76 mg/kg/day was divided by an uncertainty factor of 100 (10 for extrapolation from animals to humans and 10 for human variability) to derive an MRL of 0.8 mg/kg/day for acute-duration oral exposure to ethylene glycol.

The acute-duration oral MRL of 0.8 mg/kg/day has been adopted for intermediate-duration oral exposure (15–364 days) to ethylene glycol. The critical effect for intermediate-duration exposure is kidney lesions in male Wistar rats (Cruzan et al. 2004). Basing the intermediate-duration MRL on the NOAEL for this effect yielded a value that is higher than the acute-duration MRL. Because available evidence indicates that the acute-duration MRL should be protective for kidney effects following longer-term exposure, the acute-duration value of 0.8 mg/kg/day was adopted for intermediate-duration exposure.

EPA (IRIS 2010) assigned ethylene glycol an oral reference dose (RfD) of 2 mg/kg/day with an uncertainty factor of 100 (10 for interspecies extrapolation and 10 for differences in individual human sensitivity) based on kidney toxicity in rats (DePass et al. 1986a).

EPA has not derived an inhalation reference concentration (RfC) for ethylene glycol.

Neither the International Agency for Research on Cancer (IARC) nor the EPA has classified ethylene glycol for human carcinogenicity (IARC 2006; IRIS 2010). The American Conference of Governmental Industrial Hygienists (ACGIH) has classified ethylene glycol as an A4 carcinogen (not classifiable as a human carcinogen) (ACGIH 2006). The National Toxicology Program (NTP) has not classified ethylene

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glycol for human carcinogenicity, but it appears on the Testing Status of Agents at NTP and has undergone standard toxicology, carcinogenesis, reproductive, developmental, and genetic toxicity studies (NTP 2007).

OSHA (2006) and NIOSH (2005) have not established a permissible exposure limit (PEL) or a recommended exposure limit (REL) for ethylene glycol. Under the "Proposed Rule on Air Contaminants" (29 CFR 1910, Docket No. H-020), NIOSH questioned whether the OSHA PEL for ethylene glycol (ceiling 50 ppm) was adequate to protect workers from potential health hazards (NIOSH 2005). ACGIH (2006) has established a 100 mg/m³ ceiling limit for ethylene glycol.

EPA (2007b) has designated ethylene glycol as a hazardous air pollutant (HAP) under the Clean Air Act (CAA). Ethylene glycol is 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" and has been assigned a reportable quantity (RQ) limit of 5,000 pounds (EPA 2007d). The RQ represents the amount of a designated hazardous substance which, when released to the environment, must be reported to the appropriate authority.

Under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), ethylene glycol is exempt from tolerances for residues when used in foliar applications to peanut plants (EPA 2007f).

The international and national regulations, advisories, and guidelines regarding ethylene glycol in air, water, and other media are summarized in Table 8-1.

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Table 8-1. Regulations, Advisories, and Guidelines Applicable to Ethylene Glycol

Agency	Description	Information	Reference
<u>INTERNATIONAL</u>			
Guidelines:			
IARC	Carcinogenicity classification	No data	IARC 2006
WHO	Air quality guidelines	No data	WHO 2000
	Drinking water quality guidelines	No data	WHO 2004
<u>NATIONAL</u>			
Regulations and Guidelines:			
a. Air			
ACGIH	TLV (8-hour TWA)	No data	ACGIH 2006
	TLV-ceiling (aerosol only)	100 mg/m ³	
EPA	The Second List of AEGL priority chemicals for guideline development ^a	Yes	EPA 2007a
	Hazardous air pollutant	Yes	EPA 2007b 42 USC 7412
NIOSH	REL (10-hour TWA)	Not established ^b	NIOSH 2005
	IDLH	No data	
OSHA	PEL (8-hour TWA) for general industry	No data	OSHA 2006 29 CFR 1910.1000
b. Water			
EPA	Drinking water standards and health advisories		EPA 2006b
	1-Day health advisory for a 10-kg child	20 mg/L	
	10-Day health advisory for a 10-kg child	6 mg/L	
	DWEL	70 mg/L	
	Lifetime	14 mg/L	
	10 ⁻⁴ Cancer risk	No data	
	National primary drinking water standards	No data	
c. Food			
EPA	Inert ingredients in pesticide products	List 3 ^c	EPA 2004a
	Exempt from the requirement of a tolerance	When used in foliar applications to peanut plants	EPA 2007f 40 CFR 180.1040
FDA	Substance for use only as components of adhesives	Yes	FDA 2006 21 CFR 175
d. Other			
ACGIH	Carcinogenicity classification	A4 ^d	ACGIH 2006

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Table 8-1. Regulations, Advisories, and Guidelines Applicable to Ethylene Glycol

Agency	Description	Information	Reference
NATIONAL (cont.)			
CPSC	Designated a hazardous substance under Section 3(b) of the Federal Hazardous Substances Act and requires special labeling	Ethylene glycol and mixtures containing 10% or more by weight of ethylene glycol ^e	CPSC 2007
EPA	Carcinogenicity classification	No data	IRIS 2010
	RfC	No data	
	RfD	2 mg/kg/day	
	Master Testing List	Yes ^f	EPA 2007c
	Superfund, emergency planning, and community right-to-know		
	Designated CERCLA hazardous substance	Yes ^g	EPA 2007d 40 CFR 302.4
	Reportable quantity	5,000 pounds	
	Effective date of toxic chemical release reporting	01/01/87	EPA 2007e 40 CFR 372.65
NTP	Carcinogenicity classification	No data ^h	NTP 2005

^aThe Second List of AEGL priority chemicals is a composite of 371 priority chemicals from numerous priority lists of acutely toxic chemicals and represents the selection of chemicals for AEGL development by the NAC/AEGL (EPA 2007a).

^bNIOSH has not established a REL for ethylene glycol under the "Proposed Rule on Air Contaminants" (29 CFR 1910, Docket No. H-020) in which NIOSH questioned whether the OSHA PEL for ethylene glycol (ceiling 50 ppm) was adequate enough to protect workers from potential health hazards (NIOSH 2005).

^cList 3: Inerts of unknown toxicity are placed on this list if there was no basis for listing it on any of the other lists. EPA continues to evaluate ethylene glycol as additional information becomes available, to determine if reclassification to List 1, 2, or 4 is appropriate (EPA 2004a).

^dA4: not classifiable as a human carcinogen

^eEthylene glycol requires special labeling with the word "warning" and the statement "harmful or fatal if swallowed" because ethylene glycol and mixtures containing 10% or more by weight of ethylene glycol are commonly marketed, stored, and used in a manner that increases the possibility of accidental ingestion (CPSC 2007).

^fEthylene glycol was recommended to the MTL by the U.S. EPA's Office of Air and Radiation on the basis that it is a hazardous air pollutant. Ethylene glycol was added to the MTL in 1995 and EPA is initiating development of a testing action via TSCA Section 4 FRM, a TSCA Section 4 ECA, or a VTA (EPA 2007c). The testing needs indicated for health effects include acute, subchronic toxicity/90 day, neurotoxicity, and immunotoxicity studies.

^gDesignated CERCLA hazardous substance pursuant to Section 112 of the Clean Air Act.

^hEthylene glycol has undergone the following testing at NTP: toxicology, carcinogenesis, reproductive, developmental, and genetic toxicity studies (NTP 2007).

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; CPSC = Consumer Product Safety Commission; DWEL = drinking water equivalent level; ECA = Enforceable Consent Agreement; EPA = Environmental Protection Agency; FDA = Food and Drug Administration; FRM = Final Rule-Making; IARC = International Agency for Research on Cancer; IDLH = immediately dangerous to life or health; IRIS = Integrated Risk Information System; MTL = Master Testing List; 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; STEL = short-term exposure limit; TLV = threshold limit values; TSCA = Toxic Substances Control Act; TWA = time-weighted average; USC = United States Code; VTA = Voluntary Testing Agreement; WHO = World Health Organization