

8. REGULATIONS AND ADVISORIES

International and national regulations and guidelines pertinent to human exposure to phenol are summarized in Table 8-1.

ATSDR has derived an acute-duration inhalation MRL of 0.02 ppm for phenol based on a NOAEL of 25 ppm for respiratory effects in the nasal region of rats exposed nose-only to phenol 6 hours/day, 5 days/week for 2 weeks (Hoffman et al. 2001). An uncertainty factor of 30 was used (3 for extrapolation from animals to humans with dosimetric adjustment and 10 for human variability).

ATSDR has derived an acute-duration oral MRL of 0.6 mg/kg/day based on a NOAEL of 60 mg/kg/day for changes in body weight gain in pregnant rats exposed to phenol by gavage using divided dosing during GDs 6–15 (York 1997). An uncertainty factor of 100 was used (10 for animal to human extrapolation and 10 for human variability).

EPA (IRIS 2006) derived an oral reference dose (RfD) of 0.3 mg/kg/day for phenol based on a BMDL of 93 mg/kg/day for decreased maternal weight gain observed in Sprague-Dawley rats dosed with phenol during gestation (York 1997).

The IARC classification for phenol is Group 3, not classifiable with regard to its carcinogenicity to humans (IARC 2004). The EPA cancer classification for phenol is D, not classifiable as to human carcinogenicity (IRIS 2006). The National Toxicology Program has not classified phenol for human carcinogenicity (NTP 2005). The American Conference of Governmental Industrial Hygienists (ACGIH) has classified phenol as an A4 carcinogen (not classifiable as a human carcinogen) (ACGIH 2005).

OSHA has required employers of workers who are occupationally exposed to phenol to institute engineering controls and work practices to reduce and maintain employee exposure at or below permissible exposure limits (PELs) (OSHA 2005a). The employer must use engineering and work practice controls to reduce exposures to or below an 8-hour time-weighted average (TWA) of 5 ppm for phenol (OSHA 2005a). ACGIH (2005) and NIOSH (2005) also recommend a TWA exposure limit of 5 ppm for occupational exposure.

8. REGULATIONS AND ADVISORIES

Table 8-1. Regulations and Guidelines Applicable to Phenol

Agency	Description	Information	Reference
<u>INTERNATIONAL</u>			
Guidelines:			
IARC	Carcinogenicity classification	Group 3 ^a	IARC 2004
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) ^b	5 ppm	ACGIH 2005
EPA	AEGL-1 ^{c,d}		EPA 2006a
	10 minutes	19 ppm	
	30 minutes	19 ppm	
	60 minutes	15 ppm	
	4 hours	9.5 ppm	
	8 hours	6.3 ppm	
	AEGL-2 ^{c,d}		
	10 minutes	29 ppm	
	30 minutes	29 ppm	
	60 minutes	23 ppm	
	4 hours	15 ppm	
	8 hours	12 ppm	
	AEGL-3 ^{c,d}	Not recommended due to insufficient data	
	Hazardous air pollutant	Yes	EPA 2006d 42 USC 7412
NIOSH	REL (10-hour TWA) ^e	5 ppm	NIOSH 2005
	Ceiling limit (15-minute TWA)	15.6 ppm	
	IDLH	250 ppm	
OSHA	PEL (8-hour TWA) for general industry ^f	5 ppm	OSHA 2005c 29 CFR 1910.1000
	PEL (8-hour TWA) for construction industry ^f	5 ppm	OSHA 2005b 29 CFR 1926.55, Appendix A
	PEL (8-hour TWA) for shipyard industry ^f	5 ppm	OSHA 2005a 29 CFR 1915.1000
b. Water			
EPA	Designated as a hazardous substances in accordance with Section 311(b)(2)(A) of the Clean Water Act	Yes	EPA 2006b 40 CFR 116.4
	Designated as a toxic pollutant in accordance with Section 307(a)(1) of the Federal Water Pollution Control Act	Yes	EPA 2006c 40 CFR 401.15

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Agency	Description	Information	Reference
<u>NATIONAL</u> (cont.)			
EPA	Drinking water standards and health advisories		EPA 2004
	1-day health advisory for a 10-kg child	6 mg/L	
	10-day health advisory for a 10-kg child	6 mg/L	
	DWEL	11 mg/L	
	Lifetime	2 mg/L	
	National primary drinking water standards	No data	EPA 2003
	Reportable quantities of hazardous substances designated pursuant to Section 311 of the Clean Water Act	1,000 pounds	EPA 2006g 40 CFR 117.3
	Toxics criteria for those states not complying with Clean Water Act Section 303(c)(2)(B) for human health (10 ⁻⁶ risk for carcinogens) for consumption of:		EPA 2006m 40 CFR 131.36
	Water + organism	21 mg/L	
	Organism only	4,600 mg/L	
	Water quality criteria for human health consumption of:		EPA 2006f
	Water + organism	21 mg/L	
	Organism only	1,700 mg/L	
c. Food			
EPA	Exemptions from the requirement of a tolerance as an inert ingredient (as a solvent) when used pre-harvest	Yes	EPA 2006k 40 CFR 180.920
	Exemptions from the requirement of a tolerance as an inert ingredients (as a solvent) when applied to animals	Yes	EPA 2006l 40 CFR 180.930
FDA	Bottled drinking water	0.001 mg/L	FDA 2005
	Included on the "Everything Added to Foods in the United States" List	Yes	FDA 2006
d. Other			
ACGIH	Carcinogenicity classification	A4 ^g	ACGIH 2005
	Biological exposure indices (end of shift) for total phenol in urine	250 mg/g creatinine	
CPSC	Substance named in the Federal Caustic Poison Act; phenol and any preparation containing phenol in a concentration	≤5%	CPSC 2005
EPA	Carcinogenicity classification	Group D ^h	IRIS 2006
	Oral slope factor	Not applicable	
	Inhalation unit risk	Not applicable	

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Agency	Description	Information	Reference
<u>NATIONAL</u> (cont.)			
	RfC	Not applicable ⁱ	IRIS 2006
	RfD	0.3 mg/kg/day	
	Identification and listing of hazardous waste; hazardous waste number	U188	EPA 2006e 40 CFR 261, Appendix VIII
	Superfund, emergency planning, and community right-to-know		
	Designated CERCLA hazardous substance	Yes	EPA 2006h 40 CFR 302.4
	Reportable quantity	1,000 pounds	
	Effective date of toxic chemical release reporting	01/01/87	EPA 2006j 40 CFR 372.65
	Extremely hazardous substances and their threshold planning quantities	500/10,000 pounds	EPA 2006i 40 CFR 355, Appendix A
NTP	Carcinogenicity classification	No data	NTP 2005

^aGroup 3: not classifiable as to carcinogenicity to humans

^bSkin 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, liquids, or solids.

^cAEGL-1 is the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic nonsensory effects. AEGL-2 is the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape. AEGL-3 is the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death.

^dLevel of distinct odor awareness = 0.25 ppm

^eSkin 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.

^fSkin designation

^gA4: not classifiable as a human carcinogen

^hGroup D: not classifiable as to human carcinogenicity

ⁱNot applicable: no adequate inhalation exposure studies exist from which an inhalation RfC may be derived. A route-to-route extrapolation is not appropriate, because phenol can be a direct contact irritant, and so portal-of-entry effects are a potential concern.

ACGIH = American Conference of Governmental Industrial Hygienists; AEGL = Acute Exposure Guideline Level; CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act; CFR = Code of Federal Regulations; CPSC = Consumer Product Safety Commission; 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; IRIS = Integrated Risk Information System; 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

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Phenol is regulated by the Clean Water Effluent Guidelines for the following industrial point sources: electroplating, organic chemicals, steam electric, asbestos, timber products processing, metal finishing, paving and roofing, paint formulating, ink formulating, gum and wood, carbon black, metal molding and casting, aluminum forming, and electrical and electronic components; see the electronic Code of Federal Regulations for a complete listing (NARA 2006).

EPA regulates phenol 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). Phenol 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" (EPA 2006j) and has been assigned a reportable quantity (RQ) limit of 1,000 pounds (EPA 2006h). The RQ represents the amount of a designated hazardous substance which, when released to the environment, must be reported to the appropriate authority. Phenol is also considered to be an extremely hazardous substance (EPA 2006i).