

8. REGULATIONS AND ADVISORIES

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

An acute-duration oral MRL of 0.005 mg/kg/day has been derived for pentachlorophenol. This MRL is based on a LOAEL of 5 mg/kg/day for developmental effects (increased occurrence of delayed ossification of the skull) in the offspring of rats (Schwetz et al. 1974). The MRL was derived by dividing the LOAEL by an uncertainty factor of 1,000 (10 to account for the use of a LOAEL, 10 for interspecies extrapolation, and 10 for human variability).

An intermediate-duration oral MRL of 0.001 mg/kg/day has been derived for pentachlorophenol. This MRL is based on a LOAEL of 1 mg/kg/day for reproductive effects (increased severity of cystic uterine glands and decreased proportions of mink accepting a second mating and number of mink whelping) in mink (Beard et al. 1997). The MRL was derived by dividing the LOAEL by an uncertainty factor of 1,000 (10 to account for the use of a LOAEL, 10 for interspecies extrapolation, and 10 for human variability).

An MRL of 0.001 mg/kg/day has been derived for chronic-duration oral exposure to pentachlorophenol. The MRL is based on a LOAEL of 1 mg/kg/day for decreased serum thyroxine concentrations and decreased relative thyroid weight in mink (Beard and Rawlings 1998). The LOAEL was divided by an uncertainty factor of 1,000 (10 to account for the use of a LOAEL, 10 for interspecies extrapolation, and 10 for human variability) to derive the MRL.

EPA (IRIS 2001) derived an oral reference dose (RfD) of 0.03 mg/kg/day for pentachlorophenol. The RfD was based on a NOAEL of 3 mg/kg/day for liver and kidney pathology in rats (Schwetz et al. 1978). The MRL was derived by dividing the NOAEL by an uncertainty factor of 100 (10 for interspecies extrapolation and 10 for human variability).

EPA (IRIS 2001) has assigned pentachlorophenol a weight-of-evidence classification of B2, probable human carcinogen.

The International Agency for Research on Cancer (IARC 2001) assigned pentachlorophenol a group 2B cancer classification, possibly carcinogenic to humans.

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EPA has restricted the sale and use of pesticide products containing pentachlorophenol (EPA 1987d). This was effective July 13, 1984 (EPA 1984a).

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Table 8-1. Regulations and Guidelines Applicable to Pentachlorophenol

Agency	Description	Information	References
<u>INTERNATIONAL</u>			
Guidelines:			
IARC	Carcinogenicity classification	Group 2B ^a	IARC 2001
WHO	Drinking water quality	9 µg/L	WHO 2001
<u>NATIONAL</u>			
Regulations and Guidelines:			
a. Air			
ACGIH	TLV–TWA ^b	0.5 mg/m ³	ACGIH 2000
EPA	RAC	30 µg/m ³	EPA 2001k 40CFR266 Appendix IV
NIOSH	REL (TWA) ^b	0.5 mg/m ³	NIOSH 2001a
	IDLH	2.5 mg/m ³	NIOSH 2001b
OSHA	PEL (8-hour TWA) ^b General industry	0.5 mg/m ³	OSHA 2001b 29CFR1910.1000 Table Z-1
	PEL (8-hour TWA) ^b Construction industry	0.5 mg/m ³	OSHA 2001c 29CFR1926.55 Appendix A
	PEL (8-hour TWA) ^b Shipyard construction	0.5 mg/m ³	OSHA 2001a 29CFR1915.100 Table Z
USC	HAP		USC 2001 42USC7412
b. Water			
DOT	Marine pollutant— pentachlorophenol and sodium pentachlorophenate		DOT 2001b 49CFR172.101 Appendix B
EPA	Drinking water standard	1x10 ⁻³ ppm	EPA 2001j 40CFR141.32
	Groundwater monitoring list—standards for TSD Suggested method PQL	8040 8270 5 µg/L 50 µg/L	EPA 2001i 40CFR264 Appendix IX

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**Table 8-1. Regulations and Guidelines Applicable to Pentachlorophenol
(continued)**

Agency	Description	Information	References
<u>NATIONAL</u> (cont.)			
EPA	MCL—applies to community and non-transient, non-community water systems	1×10^{-3} mg/L	EPA 2001h 40CFR141.61
	MCLG	0 mg/L	EPA 2001i 40CFR141.50
	Effluent guidelines—toxic pollutant		EPA 2001a 40CFR401.15
	1-Day health advisory (10-kg child)	1.0 mg/L	EPA 2000d
	10-Day health advisory (10-kg child)	0.3 mg/L	
	DWEL	1.0 mg/L	
	Concentration at cancer risk of 10^{-4}	0.03 mg/L	
	Organoleptic effect criteria	30 μ g/L	EPA 1999b
	Toxic criteria for those states not complying with Clean Water Act section 303(c)(2)(B)		EPA 2001o 40CFR131.36
	Freshwater		
	Maximum concentration	20 μ g/L	
	Continuous concentration	13 μ g/L	
	Saltwater		
Maximum concentration	13 μ g/L		
Continuous concentration	7 μ g/L		
Water pollution—designation of hazardous substance			EPA 2001p 40CFR116.4
Water programs—determination of reportable quantities of hazardous substances	10 pounds		EPA 2001q 40CFR177.3
c. Food			
FDA	Bottled water—allowable level	1×10^{-3} mg/L	FDA 2000a 21CFR165.110
	Indirect food additives— adhesives and components of coatings		FDA 2000b 21CFR175.105
	Indirect food additives—animal glue Sodium pentachlorophenate		FDA 2000c 21CFR178.3120 (d)(3)

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**Table 8-1. Regulations and Guidelines Applicable to Pentachlorophenol
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Agency	Description	Information	References
<u>NATIONAL</u> (cont.)			
FDA	Indirect food additives—rubber articles intended for repeated use Sodium pentachlorophenate		FDA 2000e 21CFR177.2600 (c)(4)
	Indirect food additives—textiles and textile fibers Sodium pentachlorophenate		FDA 2000f 21CFR177.2800 (d)(5)
	Indirect food additives—preservatives for wood Pentachlorophenol and sodium pentachlorophenate	Not to exceed 50 ppm in the treated wood	FDA 2000d 21CFR177.3800 (b)
d. Other			
ACGIH	BEI Total pentachlorophenol in urine Free pentachlorophenol in plasma	2 mg/g creatinine 5 mg/L	ACGIH 2000
	Carcinogenicity classification	A3 ^c	
DOT	Hazardous material—pentachlorophenol and sodium pentachlorophenate		DOT 2001a 49CFR172.101
	Use of tank cars—hazardous substance		DOT 2001c 49CFR173.31 (f)(2)
EPA	Carcinogenicity classification	B2 ^d	IRIS 2001
	Oral slope factor	12 (mg/kg/day) ⁻¹	
	RfD	3x10 ⁻² mg/kg/day	
	General pretreatment regulations for existing and new sources of pollution—pollutants eligible for a removal credit (land application)	30 mg/kg	EPA 2001b 40CFR403 Appendix G
	Identification and listing of hazardous waste—comparable/ Syngas fuel exclusion		EPA 2001f 40CFR261.38
	Minimum required detection limit for comparable fuel specification	2,400 mg/kg	

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**Table 8-1. Regulations and Guidelines Applicable to Pentachlorophenol
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Agency	Description	Information	References
<u>NATIONAL</u> (cont.)			
EPA	Identification and listing of hazardous waste—hazardous constituent		EPA 2001e 40CFR261 Appendix VIII
	Identification and listing of hazardous waste—maximum concentration of contaminant for the toxicity characteristic	100 mg/L	EPA 2001g 40CFR261.24
	Hazardous waste—concentration limits for health based limits for exclusion of waste-derived residues	1 mg/kg	EPA 2001c 40CFR266 Appendix VII
	Health and environmental protection standards for uranium and thorium mill tailings	Listed constituent	EPA 2001d 40CFR192 Appendix I
	Superfund—reportable quantity	10 pounds	EPA 2001m 40CFR302.4
	Toxic chemical release reporting; Community Right-to-Know—effective date	01/01/87	EPA 2001n 40CFR372.65
<u>STATE</u>			
Regulations and Guidelines:			
a. Air:			
Arkansas	RAC	30 µg/m ³	BNA 2001
California	RAC	30 µg/m ³	BNA 2001
	Toxic air contaminant		
Colorado	Hazardous air pollutant		BNA 2001
	8 hour	10 µg/m ³	
	30 minute	50 µg/m ³	
Delaware	RAC	30 µg/m ³	BNA 2001
Idaho	Toxic air pollutant		BNA 2001
	OEL	0.5 mg/m ³	
	EL	0.033 pounds/hour	
	AAC	0.025 mg/m ³	
Illinois	RAC	30 µg/m ³	BNA 2001
	Toxic air contaminant		

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**Table 8-1. Regulations and Guidelines Applicable to Pentachlorophenol
(continued)**

Agency	Description	Information	References
<i>STATE (cont.)</i>			
Kansas	HAP		BNA 2001
	Maximum air emissions allowed	0.7 tons/year	CDC 1999a
Kentucky	RAC	30 µg/m ³	BNA 2001
Minnesota	HAP threshold	0.7 tons/year	BNA 2001
New Hampshire	Regulated toxic air pollutant OEL	0.5 mg/m ³	BNA 2001
North Carolina	Emission rates requiring a permit		BNA 2001
	Chronic toxicants	0.063 pounds/day	
	Acute systemic toxicants	0.0064 pounds/day	
	Toxic air pollutants		BNA 2001
	Chronic toxicants (24 hour)	0.003 mg/m ³	
	Acute systemic toxicants (1 hour)	0.025 mg/m ³	
Rhode Island	HAP		BNA 2001
South Carolina	RAC	30 µg/m ³	BNA 2001
	Toxic air emissions—maximum allowable concentration	5 µg/m ³	BNA 2001
Tennessee	RAC	30 µg/m ³	BNA 2001
Vermont	Hazardous ambient air standard		BNA 2001
	Annual average	1.19 µg/m ³	
	Action level	0.10 µg/m ³	
Washington	Threshold for HAPs	0.35 tons/year	BNA 2001
Wisconsin	Proposed thresholds		Wisconsin DNR 2001
	24 hour <25 ft	0.0269 pounds/hour	
	24 hour \$25 ft <75 ft	0.104 pounds/hour	
	24 hour \$75 ft	0.811 pounds/hour	
	Proposed standard—AAC	12 µg/m ³	
Wyoming	RAC	30 µg/m ³	BNA 2001
b. Water:			
Alabama	MCL	1 ppb	BNA 2001
	Toxic pollutant criteria		BNA 2001
	Marine acute	13 µg/L	
	Marine chronic	7.9 µg/L	

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**Table 8-1. Regulations and Guidelines Applicable to Pentachlorophenol
(continued)**

Agency	Description	Information	References
<i>STATE (cont.)</i>			
Alaska	MCL	0.001 mg/L	BNA 2001
	Groundwater clean-up level	0.001 mg/L	BNA 2001
Arizona	MCL	0.001 mg/L	BNA 2001
	Aquifer water quality standard	0.001 mg/L	BNA 2001
	Drinking water guideline	220 µg/L	HSDB 2001
Arkansas	Groundwater monitoring (PQL)	5 mg/L	BNA 2001
Colorado	MCL	0.001 mg/L	BNA 2001
Florida	MCL	0.001 mg/L	BNA 2001
Georgia	MCL	0.001 mg/L	BNA 2001
	Instream concentrations		BNA 2001
	Freshwater	2.1 µg/L	
	Costal and marine estuarine waters	7.9 µg/L	
Hawaii	MCL—community, non-transient, and non-community water systems	1x10 ⁻³ mg/L	CDC 1999b
Idaho	Groundwater quality standard	0.001 mg/L	BNA 2001
Illinois	MCL	0.001 mg/L	BNA 2001
	Groundwater monitoring	5 µg/L	BNA 2001
Indiana	MCL	0.001 mg/L	BNA 2001
Iowa	MCL	0.001 mg/L	BNA 2001
Kansas	MCL	0.001 mg/L	BNA 2001
Kentucky	MCL	0.001 mg/L	BNA 2001
	Hazardous constituent for groundwater monitoring		BNA 2001
	Maximum allowable instream concentrations	0.28 mg/L	BNA 2001
Maine	Drinking water guideline	1 µg/L	HSDB 2001
Maryland	MCL	0.001 mg/L	BNA 2001
Massachusetts	Groundwater monitoring (PQL)	5 µg/L	BNA 2001
Michigan	MCL	0.001 mg/L	BNA 2001
Minnesota	Drinking water guideline	3 µg/L	HSDB 2001

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Agency	Description	Information	References
<i>STATE (cont.)</i>			
Mississippi	Groundwater standard	1 ppb	BNA 2001
	Freshwater		BNA 2001
	Acute	3.32 µg/L	
	Chronic	2.1 µg/L	
	Salt water		
	Acute	13 µg/L	
	Chronic	7.9 µg/L	
Missouri	MCL	0.001 mg/L	BNA 2001
Montana	MCL	0.001 mg/L	BNA 2001
Nebraska	MCL	0.001 mg/L	BNA 2001
	Drinking water standard	0.001 mg/L	BNA 2001
Nevada	Standards for toxic materials applicable to municipal or domestic supply	1,010 µg/L	BNA 2001
New Hampshire	MCL	0.001 mg/L	BNA 2001
	MCLG	0	
	Ambient groundwater quality standard	1 µg/L	BNA 2001
New Hampshire	Water quality criteria		BNA 2001
	Fresh acute	5.28 µg/L	
	Fresh chronic	4.05 µg/L	
	Marine acute	13.0 µg/L	
	Marine chronic	7.9 µg/L	
	Water and fish ingestion	0.28 µg/L	
	Fish consumption only	8.2 µg/L	
New Jersey	Groundwater quality criteria	0.3 µg/L	BNA 2001
	PQL	1.0 µg/L	
New Mexico	MCL	0.001 mg/L	BNA 2001
	Groundwater parameters (PQL)	0.005 mg/L	BNA 2001
New York	MCL	0.001 mg/L	BNA 2001
	Groundwater monitoring (PQL)	5 µg/L	BNA 2001
North Dakota	MCL	0.001 mg/L	BNA 2001
Ohio	MCL	0.001 mg/L	BNA 2001
Oklahoma	MCL	0.001 mg/L	BNA 2001
	Water column criteria to protect for the consumption of fish flesh	29,370 µg/L	BNA 2001

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**Table 8-1. Regulations and Guidelines Applicable to Pentachlorophenol
(continued)**

Agency	Description	Information	References
<i>STATE (cont.)</i>			
Oklahoma	Hazardous constituent (PQL)	5 µg/L	BNA 2001
Rhode Island	MCLG	0	BNA 2001
	MCL	0.001 mg/L	
	Groundwater quality standard Preventive action limit	0.001 mg/L 0.0005 mg/L	BNA 2001
South Carolina	Groundwater monitoring (PQL)	5 µg/L	BNA 2001
	Water quality criteria		BNA 2001
	MCL Organism consumption	1.0 µg/L 82 µg/L	
South Dakota	MCL	0.001 mg/L	BNA 2001
	Groundwater standard	1x10 ⁻³ mg/L	FSTRAC 1999b
Tennessee	Toxic substance criteria	1.0 µg/L	BNA 2001
	Maximum concentration	20 µg/L	
	Continuous concentration	13 µg/L	
	Water and organism	2.8 µg/L	
	Organism only	82 µg/L	
Texas	MCL	0.001 mg/L	BNA 2001
Utah	MCL	0.001 mg/L	BNA 2001
	Groundwater quality standard	0.001 mg/L	BNA 2001
Vermont	MCL	0.001 mg/L	BNA 2001
	MCLG	0	BNA 2001
Vermont	Consumption of water and organism	0.28 µg/L	BNA 2001
	Consumption of organism only	8.2 µg/L	
	Enforcement standard Preventive action level	1.0 µg/L 0.3 µg/L	BNA 2001
Virginia	Hazardous constituent (PQL)	5 µg/L	BNA 2001
	Public water supplies	2.8 µg/L	BNA 2001
	All other surface waters	82 µg/L	
Washington	MCL	0.001 mg/L	BNA 2001
West Virginia	Groundwater standard	0.001 mg/L	BNA 2001
Wisconsin	MCLG	0.003 mg/L	BNA 2001
<i>c. Food</i>			
Nebraska	Standards for bottled water	0.001 mg/L	BNA 2001

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**Table 8-1. Regulations and Guidelines Applicable to Pentachlorophenol
(continued)**

Agency	Description	Information	References
<i>STATE (cont.)</i>			
d. Other			
Arizona	Soil remedial level Residential Non-residential	25.0 mg/kg 79.0 mg/kg	BNA 2001
Connecticut	Direct exposure criteria for soil Residential Industrial/commercial	5.1 ppm 48 ppm	BNA 2001
Hawaii	Restricted use pesticide	Restricted concentration above 5%	BNA 2001
Massachusetts	RfD Oral slope factor Toxic pollutant	3×10^{-2} mg/kg/day $12 \text{ (mg/kg/day)}^{-1}$	BNA 2001
Minnesota	Slope factor Health risk limit	$0.12 \text{ (mg/kg/day)}^{-1}$ 3 µg/L	BNA 2001
Missouri	Hazardous constituent		BNA 2001
New Hampshire	Restricted use pesticide	All concentrations	BNA 2001
New Jersey	Restricted use pesticide	All concentrations above 5%	BNA 2001
New York	Restricted use pesticide	All concentrations above 5%	BNA 2001

^aGroup2B: possibly carcinogenic to humans

^bSkin notation: danger of cutaneous absorption

^cA3: confirmed animal carcinogen with unknown relevance to humans

^dGroup B2: probable human carcinogen

AAC = acceptable ambient concentrations; ACGIH = American Conference of Governmental Industrial Hygienists; BEI = biological exposure index; BNA = Bureau of National Affairs; CDC = Center for Disease Control; CFR = Code of Federal Regulations; DNR = Department of Natural Resources; DOT = Department of Transportation; DWEL = drinking water equivalent level; EL = emissions level; EPA = Environmental Protection Agency; FDA = Food and Drug Administration; FSTRAC = Federal–State Toxicology Risk Analysis Committee; HAP = hazardous air pollutant; HSDB = Hazardous Substances Data Bank; IARC = International Agency for Research on Cancer; IDLH = immediately dangerous to life and health; IRIS = Integrated Risk Information System; MCL = maximum contaminant level; MCLG = maximum contaminant level goal; NIOSH = National Institute of Occupational Safety and Health; OEL = occupational exposure level; OSHA = Occupational Safety and Health Administration; PEL = permissible exposure limit; PQL = practical quantitation limit; RAC = reference air concentration; REL = recommended exposure release; RfD = reference dose; TLV = threshold limit value; TSD = treatment, storage, and disposal; TWA = time-weighted average; USC = United States Code; WHO = World Health Organization