

US EPA ARCHIVE DOCUMENT

Technical Factsheet on: PENTACHLOROPHENOL

[List of Contaminants](#)

As part of the Drinking Water and Health pages, this fact sheet is part of a larger publication:
National Primary Drinking Water Regulations

Drinking Water Standards

MCLG: zero mg/L

MCL: 0.001 mg/L

HAL(child): 1 day: 1 mg/L; Longer-term: 0.3 mg/L

Health Effects Summary

Acute: EPA has found pentachlorophenol to potentially cause central nervous system effects from short-term exposures at levels above the MCL.

Drinking water levels which are considered "safe" for short-term exposures: For a 10-kg (22 lb.) child consuming 1 liter of water per day, an exposure to 1 mg/L for one day or an exposure to 0.3 mg/L for up to 7 years.

Chronic: Pentachlorophenol has the potential to cause reproductive effects and damage to liver and kidneys from long-term exposure at levels above the MCL.

Cancer: There is some evidence that pentachlorophenol may have the potential to cause cancer from a lifetime exposure at levels above the MCL.

Usage Patterns

The greatest uses of pentachlorophenol are as a wood preservative (fungicide). Though once widely used as an herbicide, was banned in 1987 for these and other uses, as well as for any over-the-counter sales.

Other uses included: soil fumigant for termites; seed treating agent for beans; antibacterial agent in disinfectants/cleaners; preharvest defoliant on some crops; preservative for glues, starches, photographic papers.

Production of pentachlorophenol was 45 million lbs in 1983. In 1983 it was estimated that industries consumed PCP as follows: Wood Preservative, 90%; Sodium Pentachlorophenate, 10%

Release Patterns

Pentachlorophenol may be released to the environment as a result of its manufacture, storage, transport, or use as an industrial wood preservative for utility poles, cross arms, and fenceposts, and other items that consumes about 90% of its production.

Other former uses that may have lead to its release were the manufacture of sodium pentachlorophenolate and minor uses as a fungicide, bactericide, algicide, and herbicide for crops, leathers and textiles. Pentachlorophenol's used on wood is "restricted" and its non-wood use is undergoing special review by EPA.

From 1987 to 1993, according to EPA's Toxic Chemical Release Inventory, pentachlorophenol releases to land and water totalled nearly 100,000 lbs., of which about 80 percent was to land. The most

widespread releases were primarily from wood preserving industries in many states. However, the great majority of releases occurred at a military munitions plant in Nevada.

Environmental Fate

Releases to soil can decrease in concentrations due to slow biodegradation and leaching into groundwater. Pentachlorophenol has a tendency to adsorb to soil and sediment; calculated K_{oc} = 1000, measured sediment K_{oc} = 3,000-4,000. Adsorption to oxidized sediment is higher than to reduced sediment. Adsorption to soil and sediment appears to be pH dependent, stronger under acid conditions. The K_{oc} values for the total dissociated phenol was calculated to be 1250 and 1800 for light and heavy loam, respectively, while for the undissociated species, the K_{oc} is 25,000.

Pentachlorophenol does biodegrade but may require several weeks for acclimation. Half-life in soil is approximately weeks to months. In an artificial stream, microbial degradation became significant after 3 weeks and accounted for 26-46% removal.

Pentachlorophenol mineralization in water from several sites was very low (<5 ng/L per day). 3 and 5 ppm PCP were completely degraded in 38 and 57 days respectively when incubated in unsaturated soils taken at 4 and 4.5 m depths.

If released in water, pentachlorophenol will adsorb to sediment, photodegrade (especially at higher pHs) and slowly biodegrade. The low water solubility and moderate vapor pressure would suggest that evaporation from water is not rapid, especially at natural pHs where pentachlorophenol is present in the dissociated form (pK_a = 4.74). Biodegradation in the streams, or in specific stream compartments such as the sediment or water column, was characterized by an adaptation period (3-5 weeks for the stream as a whole, and reproducible from the previous year), which was inversely dependent on the concentration of pentachlorophenol and microbial biomass.

Pentachlorophenol does not appear to oxidize or hydrolyze under environmental conditions; however, photolysis of the dissociated form in water appears to be a significant process. A measured photolysis half-life has been reported to be 0.86 hrs.

In air, pentachlorophenol will be lost due to photolysis and reaction with photochemically produced hydroxyl radicals. Bioconcentration in fish will be moderate. Pentachlorophenol is expected to bioconcentrate because of its low water solubility, but the bioconcentration factor will be dependent upon the pH of the water since pentachlorophenol will be more dissociated at higher pHs.

The log BCF with goldfish varied from 0.30 at pH 10 to 1.75 at pH 7 to 2.12 at pH 5.5. Other reported log BCF values are 2.89 in fathead minnow; 2.4-3.73 in rainbow trout; 0.7-1.7 in sheepshead minnows; and 2.47 in mosquito fish; 2.85 in zebra fish; 2.62 in golden orfe. The accumulation increased with temperature in orfe and decreased with temperature in zebra fish. The BCF of PCP in humans was measured from daily intake of PCP and measured concentration in different tissues, giving the following results: 5.7, 3.3, 1.4, 1.4, and 1.0 in liver, brain blood, spleen and adipose tissue respectively.

Humans will be occupationally exposed to pentachlorophenol via inhalation and dermal contact primarily in situations where they use this preservative or are in contact with treated wood product. The general population will be exposed primarily from ingesting food contaminated with pentachlorophenol.

Chemical/ Physical Properties

CAS Number: 87-86-5

Color/ Form/Odor: White solid with needle-like crystals and phenolic odor. Available as: sodium salt in prills/pellets; emulsifiable concentrate; or in organic solvents

M.P.: 190-191 C B.P.: 309-310 C

Vapor Pressure: 0.00011mm Hg at 25 C

Density/Spec. Grav.: 1.98 at 22 C

Octanol/Water Partition: Log Kow= 5.12

Solubility: 0.02 g/L of water at 30 C; Slightly soluble in water

Odor/Taste Thresholds (water): Taste: 0.03 mg/L; odor: 1.6 mg/L

Soil sorption coefficient: Koc = 3000 to 4000 in sediments; low mobility in soil

Henry's Law Coefficient: N/A

Bioconcentration Factor: Log BCFs of 1 to 5.7 in humans, 1 to 4 in fish; expected to bioconcentrate in aquatic organisms.

Trade Names/Synonyms: PCP, Penchlorol, Dowicide 7, Permasan, Fungifen, Grundier arbezol, Lauxtol, Liroprem, Chlon, Dura Treet II, Santophen 20, Woodtreat, Penta Ready, Penta WR, Forpen-50, Ontrack WE Herbicide, Ortho Triox, Osmoster WPC, Watershed WP, Weed and Brush Killer

Other Regulatory Information

Monitoring For Ground/Surface Water Sources:

Initial Frequency- 4 quarterly samples every 3 years
 Repeat Frequency- If no detections during initial round:
 2 quarterly per year if serving >3300 persons;
 1 sample per 3 years for smaller systems
 Triggers - Return to Initial Freq. if detect at > 0.00004 mg/L

Analysis:

Reference Source Method Numbers

EPA 600/4-88-039 515.1; 515.2; 525.2; 555

Treatment- Best Available Technologies:
 Granular Activated Charcoal

Toxic Release Inventory - Releases to Water and Land, 1987 to 1993 (in pounds):

	Water		Land
TOTALS	18,700		79,780
Top Five States			
NV	0	64,100	
OR	4,313	5,405	
WA	3,310	5,995	
AR	2,735	1,615	
GA	783	1,255	
Major Industries			
Explosives		0	34,100

Wood preserving	17,720	15,678
Misc. Chemicals	250	30,000

* Water/Land totals only include facilities with releases greater than a certain amount - usually 1000 to 10,000 lbs.

For Additional Information:

EPA can provide further regulatory and other general information:
EPA Safe Drinking Water Hotline - 800/426-4791

Other sources of toxicological and environmental fate data include:
Toxic Substance Control Act Information Line - 202/554-1404
Toxics Release Inventory, National Library of Medicine - 301/496-6531
Agency for Toxic Substances and Disease Registry - 404/639-6000
National Pesticide Hotline - 800/858-7378