United States Environmental Protection Agency | Office of Water 4601 | EPA 811-F-95-004o-T October 1995

National Primary Drinking Water Regulations

Tetrachloroethylene

Chemical/ Physical Properties

CAS Number: 127-18-4

Color/ Form/Odor: Colorless liquid with mildy sweet, chloroform-like odor; available in many forms, from worm pills to dry-cleaning grades containing various stabilizers.

M.P.: -19° C **B.P.:** 121° C

Vapor Pressure: 18.47 mm Hg at 25° C

Octanol/Water Partition (Kow): Log Kow = 3.40

Density/Spec. Grav.: 1.62 at 20° C

Solubility: 0.15 g/L of water at 25° C; Slightly soluble in water

Soil sorption coefficient: Koc = 210 (exp.) to 238 (est.); low to moderate mobility in soil

Odor/Taste Thresholds: Taste threshold in water is 0.3 mg/L

Bioconcentration Factor: BCFs of 39 to 49 reported in fish; not expected to bioconcentrate in aquatic organisms.

Henry's Law Coefficient: N/A

Trade Names/Synonyms: Ethylene tetrachloride, Perchloroethylene, PCE, Ankilostin, Didakene, Fedal-un, Nema, Perclene, Persec, Tetlen, Tetracap, Tetraleno, Tetropil, Antisal 1, Dow-per, Perawin, Perchlor, Percosolv, Perk, Perklone, Tetraguer, Tetralex, Tetravec

Drinking Water Standards

MCLG:	zero mg/L
MCL:	0.005 mg/L
HAL(child):	1- to 10-day: 2 mg/L
	Longer-term: 1 mg/L

Health Effects Summary

Acute: EPA has found tetrachloroethylene to potentially cause the following health effects from acute exposures at levels above the MCL: detrimental effects to liver, kidney, and central nervous system.

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: a one- to ten-day exposure to 2 mg/L; upto a 7-year exposure to 1 mg/L.

Chronic: Tetrachloroethylene has the potential to cause the following health effects from long-term exposures at levels above the MCL: detrimental effects to liver, kidney, and central nervous system.

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

Usage Patterns

Production of tetrachloroethylene has decreased: from 736 million lbs. in 1978 to 405 million lbs in 1986.

In 1989 it was estimated that industries consumed tetrachloroethylene as follows: Dry cleaning and textile processing, 50%; chemical intermediate (mostly fluorocarbon F-113), 28%; industrial metal cleaning, 9%; exports, 10%; other, 3%.

The greatest use of tetrachloroethylene is in the textile industry for processing, finishing, sizing, and as a component of aerosol dry-cleaning products.

Other uses include: an intermediate in the synthesis of

Toxic Release Inventory - Releases to Water and Land: 1987 to 1993

	Water	Land
TOTALS (in pounds)	297,602	750,104
Top Seven States*		
LA	23,639	610,518
SC	104,728	0
NH	62,150	0
NC	42,192	13,102
IL	0	40,500
TX	36,144	720
OH	0	32,170
Major Industries*		
Alkalis, chlorine	63,472	611,242
Leather tanning,finishing	62,150	0
Cotton fabric finishing	51,577	0
Misc textile finishing	48,082	2,000
Knit outwear mills	45,808	0
Misc. apparel, access.	0	40,500
Transportation Equip.	3,750	27,000
Ammunition	0	20,575

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

fluorocarbons, an insulating/cooling fluid in electric transformers, in typewriter correction fluids, as veterinary medication against worms, once used as grain protectant/ fumigant.

Release Patterns

Major releases of tetrachloroethylene are: via vaporization losses from dry cleaning and industrial metal cleaning; wastewater, particularly from metal finishing, laundries, aluminum forming, organic chemical/plastics manufacturing and municipal treatment plants. It is also estimated that emissions account for approximately 90% of the tetrachloroethylene produced in the United States.

Water pollution can occur from tetrachloroethylene leaching from vinyl liners in asbestos-cement water pipelines for water distribution, and during chlorination water treatment, where it can be formed in small quantities.

From 1987 to 1993, according to EPA's Toxic Chemical Release Inventory, tetrachloroethylene releases to land and water totalled over 1 million lbs., of which about 75 percent was to land.

These releases were primarily from alkali and chlorine industries which use tetrachloroethylene in making other chemicals. The largest releases occurred in Louisiana and South Carolina.

Environmental Fate

If PCE is released to soil, it will be subject to evaporation into the atmosphere and to leaching to the groundwater. Tetrachloroethylene was slightly adsorbed on sand and clay minerals. The Henry's adsorption coefficients were approximately in proportion to the organic content of the soil samples. Based on the reported and estimated Koc's (209 to 1685), tetrachloroethylene will be expected to exhibit low to medium mobility in soil and therefore may leach slowly to the groundwater.

There is evidence that slow biodegradation of PCE occurs under anaerobic conditions when the microorganisms have been acclimated. In experiments using continuous-flow laboratory methanogenic column with well acclimated mixed cultures and a 2-day detention time, there was an average PCE removal rate of 76%. Removal of 86% PCE occurred in a methanogenic biofilm column (8 weeks of activation followed by 9-12 weeks ofacclimation). In a microcosm containing muck from an aquifer recharge basin, 72.8% loss was observed in 21 days against 12-17% in controls. In one field ground water recharge project, degradation was observed in the 50 day recharge period.

If PCE is released to water, it will be subject to rapid volatilization with estimated half-lives ranging from <1 day to several weeks. Measured volatilization half-lives in a mesocosm simulating Narraganset Bay, RI were 11 days in winter, 25 days in spring, and 14 days in summer.

PCE will not be expected to significantly biodegrade in water or adsorb to sediment. PCE will not be expected to significantly hydrolyze in soil or water under normal environmental conditions (half-life 9 months at 25 deg C).

If PCE is released to the atmosphere, it will exist mainly in the gas-phase and it will be subject to photooxidation with estimates of degradation time scales ranging from an approximate half-life of 2 months to complete degradation in an hour. Some of the PCE in the atmosphere may be subject to washout in rain based on the solubility of PCE in water and the fact that PCE has been detected in rain.

Based on the reported and estimated BCF's, tetrachloroethylene will not be expected to significantly bioconcentrate in aquatic organisms. BCFs of 39 to 49 were measured in fish; a BCF of 226 was estimated from octanol water partition coefficient.

Major human exposure is from inhalation of contaminated urban air, especially near point sources such as dry cleaners, drinking contaminated water from contaminated aquifers and drinking water distributed in pipelines with vinyl liners, and inhalation of contaminated occupational atmospheres in metal degreasing and dry cleaning industries.

Other Regulatory Information

Monitoring:

For Ground/Surface Water Sources:

Initial Frequency- 4 quarterly samples every 3 years

Repeat Frequency- Annually after 1 year of no detection

Triggers - Return to Initial Freq. if detect at > 0.0005 mg/L

Analysis:

Reference Source	Method Numbers
EPA 600/4-88-039	502.2; 524.2; 551

Treatment:

Best Available Technologies

Granular Activated Charcoal and Packed Tower Aeration

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