

# Hazardous Substance Fact Sheet

## Perchloroethylene (PCE)



### What is perchloroethylene?

- Perchloroethylene is a man-made chemical used for dry-cleaning clothes, degreasing metal parts, and as an ingredient in the manufacturing of other chemicals.
- Perchloroethylene was once used as a general anesthetic, but that use has been discontinued.
- Perchloroethylene is also known as PCE, tetrachloroethylene, tetrachloroethene, Perc, Percelene, and Perchlor.
- PCE is often confused with trichloroethylene (TCE), a different chemical with similar uses.

### What are PCE's physical properties?

- PCE is a nonflammable, colorless liquid that belongs to a class of chemicals known as volatile organic compounds (VOCs). This means PCE easily evaporates into air.
- PCE moves easily through soil to groundwater.
- PCE does not mix very well with water but over time may dissolve in sufficient amounts to become a health concern.
- PCE is denser than water and tends to sink to the bottom of aquifers.

### What health effects does PCE cause?

- High levels of PCE when inhaled can cause dizziness, headache, sleepiness, confusion, unconsciousness, and possibly death.
- Skin contact with high levels of PCE can cause irritation.
- Laboratory animals exposed to high levels of PCE over long-term experienced liver/kidney damage, liver/kidney cancer, and leukemia.
- Scientists are uncertain if low level, long-term exposure to PCE can cause adverse health effects such as cancer, nervous system effects, organ damage, or reproductive effects in humans. Scientists deal with this uncertainty by setting safe levels of PCE in air, water, and soil.

- Safe levels of PCE are set at levels many times lower than those shown to cause no adverse health effects in laboratory animals.

### Is it safe to eat garden fruits and vegetables watered with PCE contaminated groundwater?

- It is safe to eat garden fruits and vegetables if the garden was watered with groundwater that had passes through a wellhead treatment system installed by the California Regional Water Quality Control Board. It is also safe to eat garden fruits and vegetables if city water was used to water the garden.
- Some garden plants may accumulate PCE. We suggest that people with contaminated water use treated water sources to irrigate their gardens.

### What are the health risks if my drinking water has PCE levels above government standards?

- The U.S. EPA states "some people who drink water containing PCE in excess of the government standard over many years could have problems with their liver and may have an increased risk of getting cancer" (U.S. EPA, 2001).
- Your personal health risk will depend on how much PCE is in the water, how much water you consume, how frequently you use the water, and for how long you have used the water. Admittedly, this is often an unsatisfactory answer, but there is some uncertainty about the long-term health consequences of consuming PCE contaminated water.

## How can PCE contamination in soil be cleaned up?

- PCE contamination in soil may be cleaned up by excavating the soil, incinerating it, and disposing of the ash in a landfill.
- It can also be treated in place using a method known as **soil vapor extraction**. Soil vapor extraction uses a network of perforated pipes placed in the soil to remove PCE vapor from the pore spaces in soil and pass it through activated carbon where it can be captured and eventually destroyed.
- The particular method used to clean up PCE contamination in soil will depend upon conditions such as PCE concentration, access to contaminated soil, cost of soil disposal, and other site-specific factors.

## How can PCE contamination in groundwater be cleaned up?

- **Pump and Treat** is the most common method of treating PCE contamination in groundwater. The pump and treat method uses wells to pull contaminated groundwater from the water-bearing zone or aquifer, treat it above ground, and then discharge it to a sewage treatment plant or other approved location.
- **Bioremediation** uses microorganisms such as bacteria, fungi, and yeasts to transform PCE into harmless chemicals. Microorganisms use PCE as a food and energy source for their growth.
- **Phytoremediation** uses plants to remove PCE from soil and groundwater. Certain plants take in PCE through their roots as they absorb water and nutrients. Once inside the plants, PCE can be stored in roots, leaves, stems. PCE can also be changed into less harmful chemicals within the plants or released to the air as harmless gases when the plants breathe or transpire.
- A **Permeable Reactive Barrier** is a below ground wall made up of a chemically active material such as iron. Iron transforms PCE dissolved in groundwater to less harmful chemicals as it passes through the wall.
- The cleanup method most appropriate for use at a particular site will depend upon conditions at the site such as PCE concentration, the depth to contaminated groundwater, the types of microorganisms present in the aquifer, and other site-specific factors.

## Why does it take so long to clean up PCE-contaminated groundwater?

- PCE's physical properties make it very difficult to treat once it reaches groundwater.
- PCE tends to sink to the bottom of aquifers because it is denser than water and does not mix well with water.
- It often accumulates in pools of pure PCE at the bottom of aquifers where it very slowly dissolves into groundwater. When this happens, these pools can continue to be a source of contamination for many years. Common treatment methods cannot effectively remove the PCE unless they can treat these pools or cause them to dissolve more quickly.
- PCE also gets trapped between soil particles in the aquifer and is difficult to find as well as to treat.
- Although natural biological processes can break PCE down into harmless chemicals, these processes occur slowly at the cooler temperatures typically found in aquifers.

## References

*Toxicological Profile for Tetrachloroethylene*;  
Agency for Toxic Substances and Disease  
Registry: Atlanta, GA, September 1997.

The Citizen's Guide Series. U.S. Environmental  
Protection Agency. <http://www.cluin.org>. (accessed  
June 2001).

The U.S. EPA Consumer Fact Sheet:  
Tetrachloroethylene.  
[http://www.epa.gov/safewater/dwh/c-  
voc/tetrachl.html](http://www.epa.gov/safewater/dwh/c-voc/tetrachl.html) (accessed July 24, 2001).

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