

Sources of Exposure

Toxicokinetics and Normal Human Levels

Biomarkers/Environmental Levels

ToxGuide™ for Carbon Tetrachloride



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U.S. Department of Health and
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Public Health Service
Agency for Toxic Substances
and Disease Registry
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General Populations

- Carbon tetrachloride is found in air, water and soil. Inhalation of contaminated air and ingestion of contaminated drinking water are the primary routes of exposure.
- The general public is not likely to be exposed to large amounts of carbon tetrachloride. Populations living close to waste sites or areas of heavy carbon tetrachloride use may have increased risk of exposure.
- Exposure may occur through volatilization of carbon tetrachloride from tap water during showering, bathing or cooking.
- Carbon tetrachloride is currently banned from use in commercial products.

Occupational Populations

- Inhalation of contaminated air is the primary route of exposure in occupational settings.
- Workers involved in the manufacture of carbon tetrachloride are most likely to be exposed than the general public.

Toxicokinetics

- Carbon tetrachloride that is inhaled or ingested leaves the body quickly and can be found in the breath within a few hours.
- Carbon tetrachloride is readily absorbed from the gastrointestinal and respiratory tracts, and more slowly through the skin.
- Following exposure, carbon tetrachloride is distributed to all major organs, with highest concentrations in the fat, liver, bone marrow, adrenals, blood, brain, spinal cord, and kidney.
- Once absorbed, carbon tetrachloride is metabolized by cytochrome P-450 enzymes.
- Animal studies suggest that most carbon tetrachloride leaves the body in expired air and feces and only small amounts leave in urine.

Normal Human Levels

- No data available.

Biomarkers

- Measurement of parent carbon tetrachloride in expired air can be used to quantify exposure.

Environmental Levels

Air

- The average concentration of carbon tetrachloride in the United States is 0.168 ppb (1.1 µg/m³).

Sediment and Soil

- Carbon tetrachloride has been detected in less than 1% of soil samples; the median concentration was <5 mg/kg dry weight.

Water

- Most groundwater and surface water supplies contain <0.5 µg/L.

Reference

Agency for Toxic Substances and Disease Registry (ATSDR). 2005. Toxicological Profile for Carbon Tetrachloride. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Services.



Chemical and Physical Information

Routes of Exposure

Relevance to Public Health (Health Effects)

Carbon tetrachloride is a liquid

- Carbon tetrachloride is a manufactured clear liquid with a sweet odor that evaporates easily.
- Carbon tetrachloride is used to make refrigeration fluid and propellants for aerosol cans. It has also been used as a cleaning fluid in the dry cleaning industry, as a degreasing agent in household cleaners, and as a pesticide.
- Manufacture and use of carbon tetrachloride has diminished over the years as a result of environmental pollution. Use as a pesticide ceased in 1986.

- Inhalation – Predominant route of exposure for general population.
- Oral – Major route of exposure for the general population through ingestion of contaminated drinking water.
- Dermal – Minor route of exposure through dermal contact with contaminated soil.

Carbon tetrachloride in the Environment

- Carbon tetrachloride evaporates easily and is mainly found in the environment as a gas.
- It can remain in the air for several years before breaking down.
- Small amounts of carbon tetrachloride can be found in surface water, but will move into the air within a few days. Some may also go into groundwater, where it can remain for months before breaking down.
- In soil, carbon tetrachloride will volatilize rapidly.
- Carbon tetrachloride does not biodegrade readily in the atmosphere, thus significant global transport is expected.
- Bioaccumulation is possible under conditions of constant exposure such as occupational settings or dwellings near hazardous waste sites.

Health effects are determined by the dose (how much), the duration (how long), and the route of exposure.

Minimal Risk Levels (MRLs)

Inhalation

- No acute duration inhalation MRL was derived for carbon tetrachloride (≤ 14 days).
- An MRL of 0.03 ppm has been derived for intermediate-duration inhalation exposure (15–364 days).
- An MRL of 0.03 ppm has been derived for chronic-duration inhalation exposure (≥ 1 year).

Oral

- An MRL of 0.02 mg/kg/day has been derived for acute-duration oral exposure (≤ 14 days).
- An MRL of 0.007 mg/kg/day has been derived for intermediate-duration oral exposure (15–364 days).
- No chronic-duration oral MRL was derived for carbon tetrachloride (≥ 1 year).

Health Effects

- Studies in animals and humans indicate that inhalation exposure to carbon tetrachloride induces central nervous system depression, liver damage and kidney damage. Gastrointestinal irritation is associated with oral exposure following accidental dosing in humans.
- Dermal absorption can cause nausea, vomiting and neurological effects in humans, as well as liver damage in animals.
- Consumption of alcohol following exposure to carbon tetrachloride can facilitate the development of serious toxicological effects.
- IARC has classified carbon tetrachloride to Group 2B, possible carcinogenic to humans, and EPA has determined that carbon tetrachloride is a probable human carcinogen.

Children's Health

- The health effects of carbon tetrachloride have not been studied in children, but they are likely to be similar to those seen in adult.