
ENVIRONMENTAL Fact Sheet



29 Hazen Drive, Concord, New Hampshire 03301 • (603) 271-3503 • www.des.nh.gov

ARD-EHP-11

2006

Carbon Disulfide: Health Information Summary

Carbon disulfide is a clear to faintly yellow liquid. The pure chemical has a sweet, chloroform-like odor while less refined grades and naturally occurring carbon disulfide have a foul smell, described as "rotting radishes."

Carbon disulfide has wide industrial use in the manufacture of rubber, plywood glues, rayon, cellophane, electroplating, and metal rust removal. Carbon disulfide is also used in agriculture as a pesticide and fumigant. A significant percentage of total carbon disulfide in the environment naturally occurs in oceans, marshes, wetlands, and from volcanoes, although it is likely to be found at low concentrations relative to an industrial release of the chemical. Production of natural carbon disulfide is favored by microbes adapted to low oxygen conditions.

Carbon disulfide is very volatile, therefore, the most important overall source of environmental exposure will be from the air. Inhalation exposure to carbon disulfide present in the air from both natural and industrial sources is estimated to average about three to four micrograms per day (ug/day). Because it does not bind to soil strongly and is very water soluble, a significant percentage of carbon disulfide released to soil would be expected to leach to groundwater. Releases to surface water will evaporate into the air fairly quickly. Since it is used as an agricultural fumigant for stored products, carbon disulfide may be found in low levels in plant foods.

The odor threshold for carbon disulfide in water is reported to be about three parts per billion (ppb); the odor threshold in air has been reported to range from eight to 200 ppb.

Health Effects

Absorption/Metabolism

Carbon disulfide is quickly absorbed by ingestion, inhalation, and dermal exposure. In an animal study, inhalation absorption was about 70-80 percent. Study results indicate that carbon disulfide is absorbed through the skin although the percentage is not known. Information on the metabolism of absorbed carbon disulfide indicates that it does not build up in the body and is likely completely eliminated within a few days after exposure.

Short-term (Acute) Effects

Inhalation exposure to very high concentrations of carbon disulfide can cause unconsciousness, as was observed during an accidental occupational release. Liver toxicity was seen in animals exposed by inhalation to very high concentrations of carbon disulfide.

Long-term (Chronic) Effects

Occupational studies for which exposure is by inhalation have established that carbon disulfide increases the risk of heart and blood vessel diseases. There is also evidence that carbon disulfide exposure may interact with high fat diets to promote the buildup of deposits inside blood vessels, a condition known as arteriosclerosis. Carbon disulfide has been found to affect some liver enzymes involved in fat metabolism, which might partially explain its effects on blood vessels. Exposure in most occupational studies is relatively high compared to likely environmental exposures from inhalation or drinking water.

Occupational studies have indicated that carbon disulfide exposure can cause eye problems such as degeneration of the retina or hemorrhaging of blood vessels.

Both human and animal studies have found an association between inhalation exposure to carbon disulfide and toxic effects to the nervous system. In several human studies, the conduction of nerve impulses has been found to be altered. In animal studies, with considerably higher exposure, toxic changes to nerves such as swelling, degeneration, and loss of the insulation protecting nerve fibers have been observed.

Carcinogenic (cancer-causing) Effects

No increase in deaths due to cancer was seen in a study involving rayon plant workers exposed by inhalation to carbon disulfide. There are no adequate animal studies with which to evaluate carbon disulfide's carcinogenicity. The current data on carbon disulfide indicate that it does not possess any substantial carcinogenic potential. However, because only a few studies have been conducted and carbon disulfide's cancer causing potential has not been formally evaluated by the Environmental Protection Agency (EPA), carbon disulfide fits into the old EPA cancer categorization scheme as a Group D carcinogen, "inadequate evidence to classify" and under the new EPA cancer guidelines into the "inadequate information to assess carcinogenic potential" category.

Reproductive/Developmental Effects

Developmental effects have been observed in animal studies after inhalation and oral exposure to carbon disulfide. Malformations and fetal loss (resorptions) have been noted as well as changes in behavior and learning. These developmental effects are the most sensitive in that they occur at a lower concentration than all other adverse effects investigated to date.

Health Standards and Criteria

There is no federal drinking water standard or guideline for carbon disulfide. The EPA has a non-cancer toxicity value (Reference Dose or RfD) primarily based on an animal study investigating developmental effects from carbon disulfide exposure. Using the study that the RfD was based upon as well as other developmental studies in which fetal resorptions (prenatal death of the fetus) in rabbits were observed, DES has derived a drinking water guideline of 70 micrograms per liter (ug/l = ppb).

The Occupational Safety and Health Administration (OSHA) enforceable standard (permissible exposure limit or PEL) for carbon disulfide in workplace air is 20 parts per million (ppm) averaged over eight hours of exposure.

Suggested Reading and References

Casarett and Doull's Toxicology: The Basic Science of Poisons, Sixth Edition. Klaassen, C.D., ed. McGraw-Hill Publishing Co., Inc., New York, N.Y. 2001.

Toxicological Profile for Carbon Disulfide (Update). Agency for Toxic Substances and Disease Registry (ATSDR). Atlanta, Ga. August, 1996.

Toxicological information on carbon disulfide. Integrated Risk Information System (IRIS). U.S. EPA, Office of Health and Environmental Assessment. Last significant revision: August, 1995.

Toxicological information on carbon disulfide. Compiled on the Hazardous Substance Data Bank (HSDB). National Library of Medicine. Bethesda, Md. Address: <http://toxnet.nlm.nih.gov/cgi-bin/sis/htmlgen?HSDB>