



PUBLIC HEALTH STATEMENT CARBON DISULFIDE

CAS#: 75-15-0

Division of Toxicology

August 1996

This Public Health Statement is the summary chapter from the Toxicological Profile for Carbon Disulfide. It is one in a series of Public Health Statements about hazardous substances and their health effects. A shorter version, the ToxFAQs™ is also available. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present. For more information, call the ATSDR Information Center at 1-888-422-8737.

This public health statement tells you about carbon disulfide and the effects of exposure.

The Environmental Protection Agency (EPA) identifies the most serious hazardous waste sites in the nation. These sites make up the National Priorities List (NPL) and are the sites targeted for long-term federal cleanup. Carbon disulfide has been found in at least 200 of the 1,430 current or former NPL sites. However, it's unknown how many NPL sites have been evaluated for this substance. As more sites are evaluated, the sites with carbon disulfide may increase. This information is important because exposure to this substance may harm you and because these sites may be sources of exposure.

When a substance is released from a large area, such as an industrial plant, or from a container, such as a drum or bottle, it enters the environment. This release does not always lead to exposure. You can be exposed to a substance only when you come into contact with it. You may be exposed by breathing, eating, or drinking the substances or by skin contact.

If you are exposed to carbon disulfide, many factors determine whether you'll be harmed. These factors include the dose (how much), the duration (how long), and how you come in contact with it. You must also consider the other chemicals you're exposed to and your age, sex, diet, family traits, life-style, and state of health.

1.1 WHAT IS CARBON DISULFIDE?

Pure carbon disulfide is a colorless liquid with a pleasant odor that smells sweet. The impure carbon disulfide that is usually used in most industrial processes, however, is a yellowish liquid with an unpleasant odor like that of rotting radishes. Carbon disulfide evaporates at room temperature, and the vapor is more than twice as heavy as air. Carbon disulfide easily explodes in air and also catches fire very easily.

In nature, small amounts of carbon disulfide are found in gases released to the earth's surface, for example, in volcanic eruptions or over marshes. Microorganisms in the soil can also produce gas containing carbon disulfide. Commercial carbon disulfide is made by combining carbon and sulfur at very high temperatures. Several industries use carbon disulfide as a raw material to make such things as rayon, cellophane, and carbon tetrachloride. Currently, the largest user of this chemical is the viscose rayon industry. Carbon disulfide is also used to dissolve rubber to produce tires and as a raw material to make some pesticides.

**DEPARTMENT OF HEALTH AND HUMAN SERVICES, Public Health Service
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1.2 WHAT HAPPENS TO CARBON DISULFIDE WHEN IT ENTERS THE ENVIRONMENT?

Carbon disulfide evaporates rapidly when released to the environment. The amount of carbon disulfide released into the air through natural processes is difficult to judge because it is in such small amounts in nature. This also makes it hard to monitor carbon disulfide and to explain how it behaves when it comes into contact with other compounds. Most carbon disulfide in the air and in surface water is from manufacturing and processing activities. However, it is found naturally in coastal and ocean waters. Carbon disulfide has also been found in the groundwater and soil at some EPA research sites around the country, but the number of research sites that have carbon disulfide is small.

Once released to the environment, carbon disulfide moves quickly to the air. Once in the air, carbon disulfide stays close to the ground because it is heavier than the surrounding air. It is estimated that carbon disulfide will break down into simpler components after approximately 12 days. Carbon disulfide moves through soils fairly quickly. Carbon disulfide accidentally released to soils normally evaporates rapidly. However, since carbon disulfide does not bind tightly to soils, the amount that does not evaporate can easily move down through the soil into groundwater. Since it is very mobile, it is not likely to stay in the soil long enough to be broken down. It does not remain very long in water either because it evaporates within minutes. However, if dissolved in water, it is relatively stable and is not easily broken down. It is estimated that carbon disulfide is not taken up in significant amounts by the organisms living in water.

1.3 HOW MIGHT I BE EXPOSED TO CARBON DISULFIDE?

Carbon disulfide can enter your body if you breathe air, drink water, or eat foods that contain it. You can also be exposed by skin contact with soil, water, or other substances that contain it. Oceans are a major natural source. The amount of carbon disulfide found in the air from natural sources such as volcanoes is so low that good measurements are not available from many areas. One measurement shows that carbon disulfide produced by marshes contributes less than 8% of the sulfur in the upper atmosphere.

Small amounts of carbon disulfide can enter the air by evaporation and as a by-product of several manufacturing processes. It is not clear how long carbon disulfide stays in the air. Estimates range from 1 to 10 weeks. The people most often exposed to carbon disulfide are workers in plants that use carbon disulfide in their manufacturing processes. The main way they are exposed is through the air, and secondarily the skin. Carbon disulfide has also been found in small amounts in some drinking water in the United States.

1.4 HOW CAN CARBON DISULFIDE ENTER AND LEAVE MY BODY?

Most people are exposed to carbon disulfide by breathing air that contains it. Carbon disulfide easily and rapidly enters your bloodstream through the lungs. Carbon disulfide can also enter your body through your skin, or by eating or drinking foods that are contaminated with the chemical. About 10-30% of carbon disulfide that the body absorbs leaves through the lungs; less than 1% leaves in the urine. The rest of the absorbed carbon disulfide (70-

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90%) is changed in the body and leaves the body in the urine in the form of other chemicals. Small amounts of carbon disulfide also leave the body in sweat and saliva.

1.5 HOW CAN CARBON DISULFIDE AFFECT MY HEALTH?

At very high levels (10,000 parts of carbon disulfide per million parts [ppm] of air), carbon disulfide may be life threatening because of its effects on the nervous system. Studies in animals show that high levels of carbon disulfide can damage the heart. People who breathed carbon disulfide near an accident involving a railroad car showed changes in breathing and some chest pains. Among workers who breathed about 8 ppm, some developed very slight changes in their nerves. Some workers who breathed more than 20 ppm during working hours for at least 6 months had headaches, tiredness, and trouble sleeping. However, the workers may have been exposed to other chemicals besides carbon disulfide. The current standard for exposure in the workplace is 20 ppm over an 8-hour day and a 5-day work week.

Studies in animals indicate that carbon disulfide can affect the normal functions of the brain, liver, and heart. However, the amount of carbon disulfide in the air to which animals in these studies were exposed was much higher than the amounts in the air that the general public usually breathes. The brains, livers, and hearts of the animals were affected only after breathing air that contained carbon disulfide for days, months, or years. After pregnant rats breathed 225 ppm carbon disulfide in the air, some of the newborn rats died or had birth defects.

There is no information on health effects in people who eat food or drink water contaminated with carbon disulfide. Animals fed food that contained carbon disulfide developed liver and heart disease, and some showed abnormal behavior. These amounts, however, were very much higher than those that occur in drinking water supplies. When pregnant animals received large doses of carbon disulfide in their diet, some of the newborns died or had birth defects.

Skin contact with spilt carbon disulfide can lead to burns at the contact site. In studies that examined the harmful effects of skin contact with carbon disulfide, workers in a rayon plant who handled fibers made with carbon disulfide for more than 14 days developed blisters on their fingers. Rabbits developed blisters and ulcers on the treated areas of their ears.

1.6 IS THERE A MEDICAL TEST TO DETERMINE WHETHER I HAVE BEEN EXPOSED TO CARBON DISULFIDE?

Carbon disulfide itself can be measured in breath, urine, and blood. It breaks down in the body into other chemical substances called metabolites. These substances can be found and measured in the urine. After carbon disulfide enters your body, these substances reach higher levels than normally found. One chemical test using urine can be done to tell whether the levels of these breakdown substances from carbon disulfide are higher than normal. This test requires special equipment and is not routinely available in a doctor's office. The test is not specific for carbon disulfide exposure because other chemicals can also produce these metabolites. Therefore, it cannot be used to find out exactly how much carbon disulfide you were exposed to or to

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predict whether you'll be harmed. Also, the test can only be used if you have breathed in at least 16 ppm; this test can be used for determining longer term exposure to carbon disulfide. A second test based on a specific metabolite is more sensitive and specific. It also requires special equipment and cannot tell you exactly how much carbon disulfide you were exposed to or predict whether you'll be harmed. Carbon disulfide leaves the body quickly in the breath and in the urine.

1.7 WHAT RECOMMENDATIONS HAS THE FEDERAL GOVERNMENT MADE TO PROTECT HUMAN HEALTH?

The federal government has set regulations to protect individuals from the possible health effects of eating, drinking, or breathing carbon disulfide. The EPA suggested that taking into your body each day an amount equal to 0.1 mg (milligram) of carbon disulfide per kg (kilogram) of your body weight is not likely to cause any significant (noncancer) harmful health effects.

The Occupational Safety and Health Administration (OSHA) regulates levels of carbon disulfide in the workplace. OSHA requires that workroom air contain no more than an average of 20 ppm of carbon disulfide over an 8-hour working shift for 5 consecutive days in a work week.

The National Institute for Occupational Safety and Health (NIOSH) recommends that the average workroom air levels of carbon disulfide not exceed 1 ppm over a 10-hour period.

1.8 WHERE CAN I GET MORE INFORMATION?

If you have any more questions or concerns, please contact your community or state health or environmental quality department or:

Agency for Toxic Substances and Disease Registry
Division of Toxicology
1600 Clifton Road NE, Mailstop F-32
Atlanta, GA 30333

Information line and technical assistance:

Phone: 888-422-8737
FAX: (770)-488-4178

ATSDR can also tell you the location of occupational and environmental health clinics. These clinics specialize in recognizing, evaluating, and treating illnesses resulting from exposure to hazardous substances.

To order toxicological profiles, contact:

National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
Phone: 800-553-6847 or 703-605-6000

Reference

Agency for Toxic Substances and Disease Registry (ATSDR). 1996. Toxicological profile for carbon disulfide. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

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