



PUBLIC HEALTH STATEMENT

1,1,1-Trichloroethane

CAS#: 71-55-6

Division of Toxicology

September 2004

This Public Health Statement is the summary chapter from the Toxicological Profile for 1,1,1-Trichloroethane. 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 1,1,1-trichloroethane (also called 1,1,1-TCE) and the effects of exposure to it.

The Environmental Protection Agency (EPA) identifies the most serious hazardous waste sites in the nation. EPA then places these sites on the National Priorities List (NPL) and targets them for federal long-term cleanup activities. 1,1,1-TCE has been found in at least 809 of the 1,647 current or former NPL sites. Although the total number of NPL sites evaluated for this substance is not known, the number of sites at which 1,1,1-TCE is found could increase as more sites are evaluated. This information is important because these sites may be sources of exposure, and exposure to this substance can harm you.

When a substance is released either from a large area, such as an industrial plant, or a container, such as a drum or bottle, it enters the environment. Such a release does not always lead to exposure. You can be exposed to a substance only when you

contact it—by breathing, eating, or drinking the substance or by skin contact.

Many factors will determine whether exposure to 1,1,1-TCE will harm you. These factors include the dose (how much), the duration (how long), and the way you contacted it. You also must consider any other chemicals to which you are exposed and your age, sex, diet, family traits, lifestyle, and state of health.

1.1 WHAT IS 1,1,1-TRICHLOROETHANE?

1,1,1-TCE is a synthetic chemical that does not occur naturally in the environment. It also is known as methylchloroform, methyltrichloromethane, trichloromethylmethane, and α -trichloromethane. Its registered trade names are chloroethene NU® and Aerothene TT®. It is a colorless liquid with a sweet, sharp odor. 1,1,1-TCE dissolves slightly in water. The liquid evaporates quickly and becomes a vapor. Most people begin to smell 1,1,1-TCE in the air when its levels reach 120–500 parts per million (ppm). If the chemical makes up 8–10.5% (80,000–105,000 ppm) of the air, it can burn easily when it contacts a spark or flame. A poisonous gas known as phosgene can be produced during welding if 1,1,1-TCE is used to clean the metal. 1,1,1-TCE also can be found in soil and water, particularly at hazardous waste sites. Because of its tendency to evaporate easily, the vapor form is most commonly found in the environment.

1,1,1-TCE was used in commercial products, mostly to dissolve other chemicals. About 800 million pounds were produced in 1990, but less than 500 million pounds are being made today. No

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1,1,1-TCE is supposed to be manufactured for domestic use in the United States after January 1, 2002 because it affects the ozone layer. Most of 1,1,1-TCE that is manufactured today is exported to developing countries. 1,1,1-TCE had many industrial and household uses. It often was used as a solvent to dissolve other substances, such as glues and paints. In industry, it was used widely to remove oil or grease from manufactured metal parts. In the home, it used to be an ingredient of products such as spot cleaners, glues, and aerosol sprays.

1.2 WHAT HAPPENS TO 1,1,1-TRICHLOROETHANE WHEN IT ENTERS THE ENVIRONMENT?

Most of the 1,1,1-TCE released into the environment enters the air, where it lasts for about 6 years. Once in the air, it can travel to the upper part of the earth's atmosphere, which is called the stratosphere. There, sunlight breaks it down into other chemicals that may reduce the stratospheric ozone layer. This ozone layer blocks certain damaging ultraviolet rays of the sun from reaching the earth's surface. Some scientists think the gradual thinning of the ozone layer is increasing the number of skin cancer cases in humans.

Spills, improper disposal, industrial emissions, and consumer use can release large amounts of 1,1,1-TCE into the environment. Contaminated water from landfills and hazardous waste sites can contaminate surrounding soil and nearby surface water or groundwater. However, most of the chemical probably will evaporate eventually into the air. It will not build up in plants or animals.

Industrial operations release the largest amount of 1,1,1-TCE into the environment, mostly by emissions into the air. The vapor also enters the air because many products containing the chemical are used in the home and workplace.

We do not know how long 1,1,1-TCE lasts in water or soil. In surface waters, such as lakes and rivers, where it partially mixes with water, much of the chemical evaporates quickly. 1,1,1-TCE also evaporates from soil surfaces. Water can easily carry it through soil into groundwater. 1,1,1-TCE in groundwater can evaporate and pass through soil as a gas and finally be released to the air. Also, organisms that live in soil and water may break down 1,1,1-TCE. One study suggests that half of the chemical takes 200–300 days to break down in contaminated groundwater. However, the number of days can vary widely, depending on specific site conditions.

1.3 HOW MIGHT I BE EXPOSED TO 1,1,1-TRICHLOROETHANE?

You are not likely to be exposed to large enough amounts of 1,1,1-TCE to cause adverse health effects. 1,1,1-TCE has been found in air samples taken from all over the world. In the United States, city air typically contains about 0.1–1.0 parts per billion (ppb) of 1,1,1-TCE; rural air usually contains less than 0.1 ppb. Because 1,1,1-TCE was used so frequently in home and office products, much more was found in the air inside buildings (0.3–4.4 ppb) than in the outside air (0.1–0.9 ppb). Since this chemical was found in many building materials, new buildings used to have higher indoor levels than old buildings. Thus, you were likely to

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be exposed to 1,1,1-TCE vapor at higher levels indoors than outdoors or near hazardous waste sites. However, since 2002, 1,1,1-TCE is not expected to be commonly used, and therefore, the likelihood of being exposed to it is remote.

Common consumer products that used to contain 1,1,1-TCE included glues, household cleaners, and aerosol sprays. In the workplace, you could have been exposed to 1,1,1-TCE while using some metal degreasing agents, paints, glues, and cleaning products. You could have been exposed to 1,1,1-TCE by breathing the vapors from these products or by letting the liquid contact your skin. High levels of exposure have occurred in people who deliberately inhaled the vapors, as in glue-sniffing or solvent abuse.

1,1,1-TCE has been found in rivers and lakes (up to 0.01 ppm), in soil (up to 120 ppm), in drinking water (up to 0.0035 ppm), and in drinking water from underground wells (up to 5.4 ppm). In one case, drinking water from a private well contained up to 12 ppm, possibly as a result of illegal discharge or spill from a nearby industrial plant. Releases during manufacture and transportation and during industrial or household use can cause these high levels, but the levels vary substantially from one location to another. Certain foods you eat and water you drink or bathe in may be contaminated with 1,1,1-TCE. However, you can be exposed to 1,1,1-TCE primarily by drinking contaminated water and eating contaminated food.

1.4 HOW CAN 1,1,1-TRICHLOROETHANE ENTER AND LEAVE MY BODY?

1,1,1-TCE can quickly enter your body if you breathe in air containing it in vapor form. It also enters your body if you drink water or eat food containing 1,1,1-TCE. If you spill 1,1,1-TCE on your skin, most of it quickly evaporates into the air, but small amounts enter your body through your skin. Regardless of how 1,1,1-TCE enters your body, nearly all of it quickly leaves your body in the air you exhale. The small amount that is not breathed out can be changed in your body into other substances, known as metabolites. Most of the metabolites leave your body in the urine and breath within a few days.

1.5 HOW CAN 1,1,1-TRICHLOROETHANE AFFECT MY HEALTH?

Scientists use many tests to protect the public from harmful effects of toxic chemicals and to find ways to treat people who have been harmed.

One way to learn whether a chemical will harm people is to determine how the body absorbs, uses, and releases the chemical. For some chemicals, animal testing may be necessary. Animal testing can help identify health problems such as cancer or birth defects. Without laboratory animals, scientists would lose a basic method for getting information needed to make wise decisions that protect public health. Scientists have the responsibility to treat research animals with care and compassion. Scientists must comply with strict animal-care guidelines because laws today protect the welfare of research animals.

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If you breathe air containing high levels of 1,1,1-TCE (1,000 ppm or higher) for a short time, you may become dizzy and lightheaded and possibly lose your coordination. These effects rapidly disappear after you stop breathing contaminated air. If you breathe in much higher levels of 1,1,1-TCE, either intentionally or accidentally, you may become unconscious, your blood pressure may decrease, and your heart may stop beating. Whether breathing low levels of 1,1,1-TCE for a long time causes harmful effects is not known. Studies in animals show that breathing air that contains very high levels of 1,1,1-TCE (higher than 2,000 ppm) damages the breathing passages and causes mild effects in the liver, in addition to affecting the nervous system. There are no studies in humans that determine whether eating food or drinking water contaminated with 1,1,1-TCE could harm health. Placing large amounts of 1,1,1-TCE in the stomachs of animals has caused effects on the nervous system, mild liver damage, unconsciousness, and even death. If your skin contacts 1,1,1-TCE, you might feel some irritation. Studies in animals suggest that repeated exposure of the skin might affect the liver and that very large amounts on the skin can cause death. These effects occurred only when evaporation was prevented.

Available information does not indicate that 1,1,1-TCE causes cancer. The International Agency for Research on Cancer (IARC) has determined that 1,1,1-TCE is not classifiable as to its carcinogenicity in humans. EPA has also determined that 1,1,1-TCE is not classifiable as to its human carcinogenicity. The likelihood is very low that exposure to 1,1,1-TCE levels found near hazardous waste sites would cause significant health effects.

1.6 HOW CAN 1,1,1-TRICHLOROETHANE AFFECT CHILDREN?

This section discusses potential health problems in people from exposures during conception to maturity (18 years of age).

Children exposed to large amounts of 1,1,1-TCE probably would be affected in the same manner as adults. In animals, it has been shown that 1,1,1-TCE can pass from the mother's blood into a fetus. When pregnant mice were exposed to high levels of 1,1,1-TCE in air, their babies developed more slowly than normal and had some behavioral problems. However, whether similar effects occur in humans has not been demonstrated.

1.7 HOW CAN FAMILIES REDUCE THE RISK OF EXPOSURE TO 1,1,1-TRICHLOROETHANE?

If your doctor finds you (or a family member) have been exposed to substantial amounts of 1,1,1-TCE, ask whether your children also might have been exposed. Your doctor might need to ask your state health department to investigate.

Children can be exposed to 1,1,1-TCE in household products, such as adhesives and cleaners. Parents should store household chemicals out of reach of young children to prevent accidental poisonings or skin irritation. Always store household chemicals in their original labeled containers. Never store household chemicals in containers that children would find attractive to eat or drink from, such as old soda bottles. Keep your Poison Control Center's number near the phone.

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Sometimes older children sniff household chemicals in an attempt to get high. Your children may be exposed to 1,1,1-TCE by inhaling products containing it. Talk with your children about the dangers of sniffing chemicals.

1.8 IS THERE A MEDICAL TEST TO DETERMINE WHETHER I HAVE BEEN EXPOSED TO 1,1,1-TRICHLOROETHANE?

Samples of your breath, blood, and urine can be tested to determine if you have recently been exposed to 1,1,1-TCE. In some cases, these tests can estimate how much 1,1,1-TCE has entered your body. To be of any value, samples of your breath or blood have to be taken within hours after exposure, and samples of urine have to be taken within 2 days after exposure. However, these tests will not tell you whether your health will be affected by exposure to 1,1,1-TCE. The exposure tests are not routinely available in hospitals and clinics because they require special analytical equipment.

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

The federal government develops regulations and recommendations to protect public health. Regulations can be enforced by law. EPA, the Occupational Safety and Health Administration (OSHA), and the Food and Drug Administration (FDA) are some federal agencies that develop regulations for toxic substances. Recommendations

provide valuable guidelines to protect public health but cannot be enforced by law. The Agency for Toxic Substances and Disease Registry (ATSDR) and the National Institute for Occupational Safety and Health (NIOSH) of the Centers for Disease Control (CDC) are two federal organizations that develop recommendations for toxic substances.

Regulations and recommendations can be expressed as “not-to-exceed” levels—in other words, levels of a toxic substance in air, water, soil, or food that do not exceed critical levels that usually are based on levels that affect animals; they are then adjusted to levels that will help protect people. Sometimes these not-to-exceed levels differ among federal agencies because the agencies use different exposure times (for example, an 8-hour workday or a 24-hour day), different animal studies, or other factors.

Recommendations and regulations are updated periodically as more information becomes available. For the most current information, check with the federal agency that provides it.

EPA regulates the levels of 1,1,1-TCE that are allowable in drinking water. The highest level of 1,1,1-TCE allowed in drinking water is 0.2 ppm. EPA has determined that the level of 1,1,1-TCE in lakes and streams should not be more than 18 ppm. This level is not expected to result in harmful health effects from drinking water or eating fish contaminated with 1,1,1-TCE. Any releases or spills of 1,1,1-TCE of 1,000 pounds or more must be reported to the National Response Center. OSHA regulates 1,1,1-TCE levels in the workplace. The workplace exposure limit for an 8-hour workday, 40-hour workweek is 350 ppm in air.

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1.10 WHERE CAN I GET MORE INFORMATION?

If you have questions or concerns, please contact your community or state health or environmental quality department, or contact ATSDR at the address and phone number below.

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

Toxicological profiles are available on-line at www.atsdr.cdc.gov and on CD-ROM. You may request a copy of the ATSDR ToxProfiles™ CD-ROM by calling the toll-free information and technical assistance number at 1-888-42ATSDR (1-888-422-8737), by e-mailing atsdric@cdc.gov, or by writing to:

Agency for Toxic Substances and Disease Registry
Division of Toxicology
1600 Clifton Road NE
Mailstop F-32
Atlanta, GA 30333
Fax: 1-770-488-4178

For-profit organizations may request copies of final Toxicological Profiles

National Technical Information Service (NTIS)
5285 Port Royal Road
Springfield, VA 22161
Phone: 1-800-553-6847 or 1-703-605-6000
Web site: <http://www.ntis.gov/>

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