

1. PUBLIC HEALTH STATEMENT

This statement was prepared to give you information about hexachloroethane and to emphasize the human health effects that may result from exposure to it. The Environmental Protection Agency (EPA) has identified 1,416 hazardous waste sites as the most serious in the nation. These sites make up the National Priorities List (NPL) and are the sites targeted for long-term federal clean-up activities. Hexachloroethane has been found in at least 45 of the sites on the NPL. However, the number of NPL sites evaluated for hexachloroethane is not known. As EPA evaluates more sites, the number of sites at which hexachloroethane is found may increase. This information is important because exposure to hexachloroethane may cause harmful health effects and because these sites are potential or actual sources of human exposure to hexachloroethane.

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 in contact with it. You may be exposed by breathing, eating, or drinking substances containing it or by touching it.

If you are exposed to a substance such as hexachloroethane, many factors will determine whether harmful health effects will occur and what the type and severity of those health effects will be. These factors include the dose (how much), the duration (how long), the route or pathway by which you are exposed (breathing, eating, drinking, or skin contact), the other chemicals to which you are exposed, and your individual characteristics such as age, sex, nutritional status, family traits, lifestyle, and state of health.

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1.1 WHAT IS HEXACHLOROETHANE?

Hexachloroethane is a colorless solid that gradually evaporates when it is exposed to air. This compound is also called perchloroethane, carbon hexachloride, and HCE. It is sold under the trade names Avlothane, Distokal, Distopan, and Distopin. In the United States, about half of the hexachloroethane is used by the military for smoke-producing devices. It is also sold as degassing pellets that are used to remove the air bubbles in melted aluminum. Hexachloroethane may be present as an ingredient in some fungicides, insecticides, lubricants, plastics, and cellulose. At one time, hexachloroethane was prescribed for deworming animals.

Hexachloroethane does not occur naturally in the environment. It is made by adding chlorine to tetrachloroethylene. Hexachloroethane is no longer made in the United States, but it is formed as a by-product in the production of some chemicals. For example, it is a by-product in the high temperature synthesis of tetrachloroethylene from carbon tetrachloride. Some hexachloroethane can be formed by incinerators when materials containing chlorinated hydrocarbons are burned.

Hexachloroethane itself does not easily catch fire. Some hexachloroethane can also be formed when chlorine reacts with carbon compounds in drinking water.

Hexachloroethane vapors smell like camphor. You can begin to smell hexachloroethane in air when there are 150 parts present in a billion parts of air (ppb). You can smell it in water at 10 ppb. Neither a description of the taste nor the amount of hexachloroethane that gives a taste to water were found.

For more information on the properties and uses of hexachloroethane, see Chapters 3,4, and 5.

1.2 WHAT HAPPENS TO HEXACHLOROETHANE WHEN IT ENTERS THE ENVIRONMENT?

Hexachloroethane is released to the air during military operations and training exercises when smoke-producing devices containing it are used. In a smoke pot or grenade, most of it is used up

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by the smoke-producing reaction. Only small amounts (5% or less) remain after the smoke has formed. However, these small amounts can collect in the atmosphere and in the soil. At one military training site, about 14,700 pounds of hexachloroethane were released to the air over a 2-year period.

Hexachloroethane also enters the environment as part of the waste from companies that make or use it. Vapors can be released to the air during production, use, or transport. Solid wastes containing it are buried in landfills or burned. In landfills, it can dissolve in underground water because it does not bind strongly to soil. Once dissolved, it can reach rivers, lakes, streams, or well water.

Hexachloroethane in the air does not break down to other compounds. It gradually escapes into the upper atmosphere. Some hexachloroethane that is in lakes or streams and surface soils will evaporate into the air. Some will be broken down by microscopic organisms. Microbes can break down hexachloroethane more easily without oxygen than with oxygen. That is why hexachloroethane will break down more quickly when it is buried in the soil or trapped in underground water than when it is near the surface. In one study, it took only 4 days for 99% of the hexachloroethane in soil to break down when oxygen was not present. It took 4 weeks when oxygen was present.

Hexachloroethane does not appear to collect in plants or animals used for food. It has a slight tendency to build up in fish, but the fish break it down quickly, so the amount found in fish from polluted waters is very low. Rainbow trout from Lake Ontario had only 0.03 parts hexachloroethane per trillion (ppt) parts of fish.

More information on what happens to hexachloroethane in the environment is in Chapters 4 and 5.

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1.3 HOW MIGHT I BE EXPOSED TO HEXACHLOROETHANE?

You can be exposed to hexachloroethane from the air. Background levels in air range from 5 to 7 ppt. Larger amounts may be found near military installations where smoke pots and grenades that contain hexachloroethane are used during training. When a smoke pot or grenade is used, the heat will cause other chemicals to be formed, including tetrachloroethylene, carbon tetrachloride, phosgene, and hexachlorobenzene. These chemicals can also be toxic. Higher than average amounts can occur near aluminum smelters that use hexachloroethane as a degassing agent. Incinerators that burn industrial wastes containing chlorine can release hexachloroethane to the air.

If you live near a hazardous waste site, you might be exposed to hexachloroethane by breathing or by drinking contaminated water. Private wells within one mile of a hazardous waste site contained 4.6 ppb hexachloroethane. Children who play in soil near a waste site that contains hexachloroethane could be exposed if they put soil or soiled fingers into their mouths.

You are not likely to be exposed to hexachloroethane from your food. However, you might be exposed if you use insecticides, fungicides, or plastics that contain this chemical. You may also be exposed to small amounts of this chemical from your drinking water if chlorine is used to kill germs. Hexachloroethane has occasionally been reported in drinking water at concentrations of 0.03-4.3 ppb in some locations in the United States.

If you work in an industry that uses hexachloroethane, such as aluminum smelting, or a chemical plant, you could be exposed by breathing it or touching it. About 8,500 people in the United States are exposed to hexachloroethane at work.

People who work with smoke-producing devices that contain hexachloroethane are exposed to it in the smoke. They can contact it through smoke particles on plants and in the soil.

More information on how you can be exposed to hexachloroethane is in Chapter 5.

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1.4 HOW CAN HEXACHLOROETHANE ENTER AND LEAVE MY BODY?

Hexachloroethane can enter your body through your lungs if you breathe its vapors. Of the amount that enters your lungs, only a small fraction of the hexachloroethane will enter your bloodstream and ultimately your body tissues. It can enter your body if you eat or drink something contaminated with it. Based on studies in animals, about half of the hexachloroethane you eat will get into your bloodstream. Very little will enter your body if you get it on your skin.

The hexachloroethane that enters your bloodstream will go to your liver where it is turned into other compounds. Some of these compounds are harmful and will affect your health in almost the same way hexachloroethane does. If you are exposed to carbon tetrachloride, your liver can make hexachloroethane from it.

When hexachloroethane gets into your body, some is temporarily stored in your body fat. Most of it leaves your body in 1 or 2 days in the air you breathe out, in your urine, and in your feces.

More information on how hexachloroethane enters and leaves your body is in Chapter 2.

1.5 HOW CAN HEXACHLOROETHANE AFFECT MY HEALTH?

Mild skin irritation has been reported by workers at a munitions factory who were exposed to low levels of hexachloroethane. The workers were wearing protective clothing that greatly reduced exposure. No other information is available concerning health effects in people exposed to hexachloroethane. However, results of animal studies can be used to show how it can affect your health. Based on the animal data, hexachloroethane in the air can irritate your nose and lungs and cause some buildup of mucus in your nose, much like an allergy. It can also irritate your eyes and make them tear.

If you are in an area that has a lot of hexachloroethane vapor, your facial muscles may twitch or you may have difficulty moving. These effects have been observed in animals during exposure

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at levels far greater than those found in industrial use of hexachloroethane or those which would be expected in areas near a hazardous waste site.

Hexachloroethane is not a highly toxic substance. If you are exposed to a large amount for a long time, some of your liver cells could be destroyed and fat could build up in your liver. There is also a slight chance that your kidneys could be damaged.

No results from animal studies suggest that hexachloroethane would make it hard for you to become pregnant or that it would hurt your baby while you are pregnant. However, animal studies that have looked at the effects of hexachloroethane during pregnancy are limited.

Liver tumors developed in mice that were orally exposed to hexachloroethane for their whole lifetime. Tumors of this kind are common in mice. Hexachloroethane will not necessarily have the same effect on people. Male rats that were exposed to hexachloroethane for their lifetime developed kidney tumors. This type of tumor is not found in people, so it is unlikely that exposure to hexachloroethane would cause you to develop cancer of the kidney. The Department of Health and Human Services has determined that hexachloroethane may reasonably be anticipated to be a carcinogen (can cause cancer). The International Agency for Research on Cancer (IARC) has determined that hexachloroethane is not classifiable as to its carcinogenicity in people. EPA has determined that hexachloroethane is a possible human carcinogen.

More information on the health effects from hexachloroethane exposure is in Chapter 2.

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

Samples of your blood, urine, or feces can be tested to see if you were exposed to hexachloroethane. The tests are not routinely available at most doctors' offices, but your doctor can collect blood, urine, or fecal samples and send them to a special laboratory for testing. These tests are useful only if you were exposed 24-48 hours before you saw the doctor. Your body changes hexachloroethane into the same compounds that it makes from other chemicals like

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tetrachloroethylene or pentachloroethane. Your body can also make hexachloroethane from carbon tetrachloride. Therefore, if a laboratory finds hexachloroethane in your body blood or excretions, your doctor will ask you if you were exposed to carbon tetrachloride. More information on medical tests that can be used to determine if you have been exposed to hexachloroethane is in Chapters 2 and 6.

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

The federal government is concerned about the amount of hexachloroethane that you are exposed to in the environment. The government has established standards and guidelines to prevent you from being overexposed. The Occupational Safety and Health Administration (OSHA) has set a limit of 1 part per million (ppm) for the hexachloroethane in workplace air over an 8-hour workday. The National Institute for Occupational Safety and Health (NIOSH) considers hexachloroethane as a potential occupational carcinogen (can cause cancer) and recommends 1 ppm in air as a tolerance value.

The EPA recommends that children not drink water with more than 5 ppm hexachloroethane for more than 10 days or more than 100 ppb for any longer than 7 years. Adults should not drink water with more than 450 ppb any longer than 7 years. EPA suggests that water consumed over a lifetime contain no more than 1 ppb hexachloroethane.

Industrial releases of more than 100 pounds of hexachloroethane into the environment must be reported to EPA.

More information on government regulations for hexachloroethane is in Chapter 7.

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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 E-29
Atlanta, Georgia 30333
(404) 639-6000

This agency can also provide you with information on the location of occupational and environmental health clinics. These clinics specialize in the recognition, evaluation, and treatment of illness resulting from exposure to hazardous substances.