1. PUBLIC HEALTH STATEMENT

This public health statement tells you about chloroethane 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 activities. Chloroethane has been found in at least 282 of the 1,467 current or former NPL sites. However, the total number of NPL sites evaluated for this substance is not known. As more sites are evaluated, the sites at which chloroethane is found 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 are exposed to a substance only when you come in contact with it. You may be exposed by breathing, eating, or drinking the substance or by skin contact.

If you are exposed to chloroethane, 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, lifestyle, and state of health.

1.1 WHAT IS CHLOROETHANE?

Chloroethane, also called ethyl chloride, is a colorless gas at room temperature and pressure, with a characteristically sharp odor. People can smell chloroethane in the air at levels above 4 parts

chloroethane in a million parts of air by volume (ppm). It can be smelled in water at levels above 0.02 parts chloroethane in a million parts of water (ppm). In pressurized containers, chloroethane exists as a liquid. However, the liquid evaporates quickly when exposed to air. It catches fire easily and is very dangerous when exposed to heat or flame. Chloroethane does not occur naturally in the environment. It is present in the environment as a result of human activity.

In the past, the largest single use for chloroethane was for the production of tetraethyl lead, which is a gasoline additive. However, production of chloroethane has decreased dramatically as a result of stricter government regulations controlling lead in gasoline. Other applications include use in the production of ethyl cellulose, dyes, medicinal drugs, and other commercial chemicals, and use as a solvent and refrigerant. It is used to numb skin prior to medical procedures such as ear piercing and skin biopsies, and it is used in the treatment of sports injuries.

1.2 WHAT HAPPENS TO CHLOROETHANE WHEN IT ENTERS THE ENVIRONMENT?

Most of the chloroethane released to the environment ends up as a gas in the atmosphere, while much smaller amounts enter groundwater as a result of passage through soil. Once in the atmosphere, chloroethane breaks down fairly rapidly by reaction with substances in the air. It takes about 40 days for half of any given amount of chloroethane that is released to the atmosphere to disappear. In groundwater, chloroethane changes slowly to ethanol and a chloride salt as a result of reaction with water. In addition, some types of bacteria present in the water may break down chloroethane to smaller compounds. However, not enough is known about chloroethane to be sure if this occurs or how long it may remain in groundwater. For more information, see Chapters 3,4, and 5.

1.3 HOW MIGHT I BE EXPOSED TO CHLOROETHANE?

Humans can be exposed to chloroethane from environmental, occupational, and consumer sources. During the mid-to-late 1970s and the early 1980s chloroethane was detected in samples of outdoor air. Air samples collected in urban and suburban areas contained

chloroethane at an average level of 41-140 parts of chloroethane in a trillion parts of air (ppt; 1 ppt is l,000,000 times less than 1 ppm). Rural air samples contained less than 5 ppt. Current levels of chloroethane in the air are expected to be even lower than levels found in the past because of the sharp decrease in chloroethane production in the United States and the decrease in chloroethane release. Occurrences of chloroethane in air can be attributed to releases from factories that manufacture or use chloroethane; evaporation from some landfills, solvents, refrigerants, and anesthetics; and releases in fumes from the burning of plastics and other materials found in trash. Based on the limited amount of information available on the occurrence of chloroethane in drinking water, it can be concluded that extremely low levels of chloroethane may occur in some drinking water supplies as a result of formation during chlorination, contamination of rivers and lakes used as drinking water supplies, or seepage into groundwater resulting from storage of chemical wastes or disposal at waste sites. However, there is not enough information available to indicate what levels of chloroethane occur in drinking water under these circumstances. No data were located that indicate that chloroethane is found in food.

Exposure may also result from contact with various consumer products including some solvents, paints, and refrigerants. People may be exposed to chloroethane through skin contact as the result of its use as an agent to numb skin before ear piercing, before skin biopsy, as a treatment for sports injury, and for other medical reasons. Occupational exposure may result from inhalation or skin contact. Workers who may be exposed to chloroethane include physicians, nurses, and other medical workers, automobile mechanics, office machine mechanics, household appliance and accessory installers, assemblers, professional painters, heavy-equipment mechanics, diesel mechanics, plumbers, and pipe fitters. According to a National Institute for Occupational Safety and Health (NIOSH) survey conducted between 1981 and 1983, au estimated 49,212 workers in the United States were exposed to chloroethane in the workplace. More recent data are not available to determine how many workers might be exposed to chloroethane per year in the United States. For further information, see Chapter 5.

1.4 HOW CAN CHLOROETHANE ENTER AND LEAVE MY BODY?

Chloroethane can enter the body when a person breathes air containing chloroethane vapor. Chloroethane may also enter the body through the skin, although most of it quickly evaporates from the skin's surface. When a person drinks water containing chloroethane, it enters the body through the digestive tract. After chloroethane enters the body, it may leave the body through the lungs. Some chloroethane may also be changed to acetate, which is normally found in the body. Other chemicals formed from chloroethane leave the body in the urine.

People who happen to be near hazardous waste sites containing chloroethane are most likely to be exposed to the compound by breathing potentially contaminated air. People may also be exposed to chloroethane by drinking potentially contaminated water. See Chapter 2 for more information.

1.5 HOW CAN CHLOROETHANE AFFECT MY HEALTH?

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

One way to see if a chemical will hurt people is to learn how the chemical is absorbed, used, and released by the body; for some chemicals, animal testing may be necessary. Animal testing may also be used to identify health effects such as cancer or birth defects. Without laboratory animals, scientists would lose a basic method to get information needed to make wise decisions to protect public health. Scientists have the responsibility to treat research animals with care and compassion. Laws today protect the welfare of research animals, and scientists must comply with strict animal care guidelines.

Brief exposure to high levels of chloroethane vapor can produce temporary feelings of drunkenness, and at still higher levels, lack of muscle coordination and unconsciousness. Adults have felt dizzy and have suffered decreased reaction times as a result of inhaling chloroethane. They have

also experienced stomach cramps, nausea, vomiting, and eye irritation after breathing high concentrations of chloroethane for a short time.

Workers who breathed chloroethane vapors for 1.5 to 3 years (levels of chloroethane unknown) had significantly decreased defensive responses against illness. Inhalant abusers who intentionally breathe chloroethane vapors at much higher concentrations than those found in any work environment or near any hazardous waste site have experienced these neurological effects. Long term abuse of high chloroethane concentrations causes the most adverse effects of chloroethane exposure, namely, those to the nervous system. In the worst recorded cases of chloroethane abuse by sniffing, the abusers have had severe symptoms including jerking eye movements, an inability to control muscles in voluntary movements, difficulty in speaking clearly, an inability to perform finger tapping exercises, sluggish lower limb reflexes, seizures, difficulties in walking, disorientation, short-term memory loss, and hallucinations affecting their sight and hearing. In one case, damage to motor and sensory nerves occurred.

Human patients have died after breathing chloroethane concentrations high enough to induce anesthesia. Dogs have suffered irregular heart rhythms, followed by death, when given anesthetic doses of chloroethane. Due to the risk of accidental death, chloroethane is no longer medically used as a general anesthetic during major surgery. Chloroethane can, however, be applied to the skin in the form of chloroethane spray as a numbing agent prior to minor surgery. If this spray is applied for too long, frostbite can result. Some adults have had allergic reactions to the chloroethane spray while others experienced mild pain after being sprayed for 10 seconds.

Studies have shown that chloroethane can enhance the effects of alcohol in rats. It is unknown if similar interactions between chloroethane and alcohol occur in humans.

It is not known whether chloroethane produces cancer in humans. However, long-term exposure to high levels of chloroethane vapor has been shown to produce cancer in mice. There have been no animal or human studies involving the ability of chloroethane to cause cancer when either eaten or applied to the skin. The International Agency for Research on Cancer (IARC) has reviewed

the information available concerning the abiIity of chloroethane to cause cancer. They concluded that chloroethane is not classifiable as to its carcinogenicity in humans. See Chapter 2 for more information.

1.6 HOW CAN CHLOROETHANE AFFECT CHILDREN?

This section discusses potential health effects from exposures during the period from conception to maturity at 18 years of age in humans. Potential effects on children resulting from exposures of the parents are also considered.

There are no known unique exposure pathways by which children may be exposed to chloroethane.

In children, there have been few recorded reports of exposures to chloroethane or adverse health effects resulting from this exposure. Brief inhalation exposure of children to very high concentrations of chloroethane has resulted in stimulation of certain nerves followed by a decrease in heart rate. One teenager died from lung paralysis during general anesthesia with chloroethane. In addition to these health effects seen specifically in children, the observed adverse effects of chloroethane exposure in adults are also expected in children. It is unknown whether children differ from adults in their susceptibility to health effects from chloroethane exposure.

We do not know whether chloroethane exposure can affect development in humans. There is not enough information to know whether chloroethane affects development in animals. Only one developmental study has been done in animals. This study with mice showed that exposure to high levels of chloroethane during pregnancy delayed bone development in the offspring.

We do not know whether chloroethane or its breakdown products within the body can reach and cross the mother's placenta into her developing baby. One study has shown that chloroethane can be found in mother's milk, but we do not know if the mothers were exposed to the compound by breathing it, eating it, or having it sprayed on their skin.

1.7 HOW CAN FAMILIES REDUCE THE RISK OF EXPOSURE TO CHLOROETHANE?

If your doctor finds that you have been exposed to significant amounts of chloroethane, ask if children may also be exposed. When necessary your doctor may need to ask your state Department of Public Health to investigate.

Little information exists concerning the concentrations of chloroethane that might be present in drinking water. However, past data indicate that chloroethane is not a frequent contaminant in drinking water, and therefore the risk to families from drinking water containing chloroethane is low.

Chloroethane is found in common household products such as paints, solvents, air fresheners, and deodorant sprays. Inhaling or ingesting toxic amounts of chloroethane from these products is possible. Therefore, household products such as these should be stored out of reach of young children to prevent accidental poisonings. Always store household chemicals in their original labeled containers; never store household chemicals in containers children would find attractive to eat or drink from, such as old soda bottles. Keep your Poison Control Center's number by the phone.

Sometimes older children sniff household chemicals in an attempt to get high. Chloroethane is sold in drug paraphernalia shops as Ethyl Gaz, Ethyl Four Star, Black Jac, and Maximum Impact. Your children may be exposed to chloroethane by inhaling products containing it and are putting their health at serious risk if they do so. Talk with your children about the dangers of sniffing chemicals.

When household products that contain chloroethane are used properly and are not abused, the concentrations of chloroethane within them are not high enough to pose a risk of significant exposure to children.

The tendency of chloroethane to evaporate upon contact with air makes it highly unlikely that the compound could be taken home on the parents' work clothes.

1.8 IS THERE A MEDICAL TEST TO DETERMINE WHETHER I HAVE BEEN EXPOSED TO CHLOROETHANE?

Although there are complex analytical tests that chemists use to measure chloroethane in the blood, milk, or urine, there are no commonly used medical tests available to determine whether or not a person has been exposed to chloroethane. A breath test to determine exposure may be possible but is not commonly used.

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. Federal agencies that develop regulations for toxic substances include the Environmental Protection Agency (EPA), the Occupational Safety and Health Administration (OSHA), and the Food and Drug Administration (FDA). Recommendations provide valuable guidelines to protect public health but cannot be enforced by law. Federal organizations that develop recommendations for toxic substances include the Agency for Toxic Substances and Disease Registry (ATSDR) and the National Institute for Occupational Safety and Health (NIOSH).

Regulations and recommendations can be expressed in not-to-exceed levels in air, water, soil, or food that are usually based on levels that affect animals, then they are adjusted to help protect people. Sometimes these not-to-exceed levels differ among federal organizations because of different exposure times (an 8-hour workday or a 24-hour day), the use of different animal studies, or other factors.

Recommendations and regulations are also periodically updated as more information becomes available. For the most current information, check with the federal agency or organization that provides it. Some regulations and recommendations for chloroethane include the following:

Chloroethane levels in the workplace are regulated by QSHA. The occupational exposure limit for an g-hour work day of a 40-hour work week is 1,000 ppm. The EPA requires industry to report discharges or spills of 100 pounds or more. See Chapter 7 for more information.

1.10 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, GA 30333

* Information line and technical assistance

Phone: l-800-447- 1544
Fax: (404) 639-6359

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 nrofnes. contact

National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
Phone: (800) 553-6847 or (703) 487-4650