1. PUBLIC HEALTH STATEMENT

This public health statement tells you about ethion 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. Ethion has been found in at least 9 of the 1,577 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 ethion 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 ethion, 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 ETHION?

Ethion is a chemical used in agriculture as a pesticide. Ethion does not occur naturally in the environment but is manufactured by industry. Pure ethion is a clear-to-yellowish liquid with an unpleasant sulfur type of smell. Most of the ethion used in pest control is diluted with other liquids and used as a spray. It is also sometimes used as a liquid adsorbed on dust or granules. Ethion is sold under many trade names including Bladan®, Rodicide®, and Nialate®. The ethion

present at hazardous waste sites will most likely be in a liquid solution or adsorbed on solid granules.

Ethion is a member of a group of pesticides known as organophosphates. Diazinon and chlorpyrifos (Dursban®) are other members of this group.

In 1989, about one million pounds of ethion were used in the United States. In 1992, about 868,218 pounds of ethion were used in the United States in farming. The main use of ethion is for insect control on citrus trees. It is also used on cotton, fruit and nut trees, and a variety of vegetables. Ethion may also be used on lawns and turf grasses. Ethion is not used in the home for pest control.

You will find further information on the properties and uses of ethion in Chapters 3 and 4 of this profile.

1.2 WHAT HAPPENS TO ETHION WHEN IT ENTERS THE ENVIRONMENT?

Ethion enters the air, water, and soil during its manufacture and use. Wastes containing ethion that are generated during its manufacture and use are sometimes disposed of in landfills. Ethion can enter the environment from these landfills. Ethion also enters the environment from accidental spills during transport and leaks from storage containers.

Ethion evaporates only slightly into the air. Ethion that does evaporate can react with oxygen in the air. Ethion in air is estimated to break down in a day or two. These breakdown products are not believed to be harmful.

If ethion is spilled into a lake or river, a small portion will dissolve, but most of it will bind to particles in the water. Ethion can react with water and be broken down. In a test in an irrigation canal, one-half of the ethion broke down in 26 days. Laboratory experiments show that the less acidic the water is, the more rapidly ethion is broken down.

Ethion binds tightly to soil. This means it will not move through soil. Bacteria and other microorganisms (microscopic plants and animals) in the soil break down ethion. The breakdown in soil is less rapid than in air or water. Depending on the temperature and type of soil, it can take anywhere from 1 month to 1 year for half of the ethion in soil to break down.

Ethion does not seem to be stored or concentrated in the bodies of people or most animals. It is not known if ethion is stored or concentrated by plants or fish.

You will find further information about what happens to ethion in the environment in Chapter 5 of this profile.

1.3 HOW MIGHT I BE EXPOSED TO ETHION?

The general population may be exposed to very small amounts of ethion by eating or drinking. Ethion has been found only rarely in drinking water in the United States. Ethion has been found on raw foods (fruits, vegetables) at very low concentrations. These concentrations are usually far below the maximum limits established by the EPA.

People living near hazardous waste sites containing ethion or near its manufacturing, processing, or storage facilities could potentially be exposed. Because of the chemical properties of ethion, the most likely way a person would be exposed is by skin contact with soil contaminated by ethion.

You are most likely to be exposed to ethion if you are involved in manufacturing or using it. Chemical plant workers, transport workers, and pesticide applicators are the major occupational groups that might be exposed to ethion. People in these groups are mainly exposed by skin contact, but some exposure can also occur by breathing in air containing ethion.

You will find further information on the potential for exposure to ethion in Chapter 5.

1.4 HOW CAN ETHION ENTER AND LEAVE MY BODY?

Ethion can enter your body through your lungs if it is in the air you breathe. It can also enter your body through your stomach if it is in your drinking water or food. It can also enter through your skin. How much ethion enters your body depends on how long you are exposed and the amount to which you are exposed.

Once ethion enters your body, it goes into your bloodstream and is carried to all the organs in your body. Ethion is converted by an enzyme in your liver to its active form, called ethion monoxon. There are other enzymes in your liver and blood that rapidly break down both ethion and ethion monoxon. These breakdown products are less harmful than ethion. Most of these breakdown products quickly leave your body in the urine. Ethion and its breakdown products are not stored in your body.

You will find further information on how ethion enters and leaves your body in Chapter 2.

1.5 HOW CAN ETHION 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.

1. PUBLIC HEALTH STATEMENT

Ethion is a member of a group of chemicals called organophosphates. Some of these chemicals can kill insects and are widely used as insecticides. At higher doses than those used to kill insects, these chemicals can also be harmful to people. Ethion can chemically react with an important enzyme in your brain and nerves called acetylcholinesterase and stop it from working properly. When this happens, signals sent between your nerve cells and to your muscles are disrupted.

We do not know how much ethion is necessary to cause harmful effects in people. This is because few people have been exposed to enough ethion to cause symptoms of poisoning. If you have been poisoned by ethion, you will suddenly feel nauseated, anxious, and restless. You may also vomit, have tearing of the eyes, and heavy sweating. If this happens, you should seek medical attention immediately. Emergency rooms have drugs that stop the harmful effects of ethion. Further symptoms can include loss of bladder control, blurring or dimness of vision, muscle tremors, and labored breathing. Severe poisoning can result in coma, inability to breathe, and death.

Poisoning cases have occurred in people who accidentally drank ethion or who got it on their skin. If you use ethion in your work, it is extremely important that you follow all directions printed on the container.

People who have survived poisoning by ethion make a complete recovery, although this can sometimes take several months. Ethion poisoning does not appear to cause permanent damage to the nerves (a condition called "delayed neuropathy").

Volunteers who took capsules containing 0.15 milligrams ethion per kilogram of body weight (0.15 mg/kg) daily for 21 days showed no harmful effects. In studies where animals (rats and mice) have been fed ethion, about half the animals died when given approximately 100 mg/kg. Before the animals died, they showed signs of harmful effects to their nervous systems similar to those seen in human poisoning cases.

It is not known if exposure to ethion can affect fertility in people. Results of experiments done in animals that were fed ethion did not show any effect on fertility.

There is no evidence that exposure to ethion increases the risk of cancer in people. Rats and mice that were fed ethion for 2 years had the same rate of cancer as rats and mice that did not receive ethion. Ethion has not been classified for carcinogenicity by the Department of Health and Human Services (DHHS), the International Agency for Research on Cancer (IARC) or the EPA.

You will find further information on how ethion may affect your health in Chapter 2.

1.6 HOW CAN ETHION AFFECT CHILDREN?

This section discusses potential health effects from exposures during the period from conception to maturity at 18 years of age in humans.

Children playing on or near hazardous waste sites may be exposed to ethion in soil by skin contact, accidentally putting soil into their mouths, through hand to mouth activity, or eating dirt on purpose. They can also be exposed through food and drink. Since children have more fruit and fruit drinks in their diets, their exposure to ethion may be higher than for adults when you adjust for the difference in weight.

One case of ethion poisoning occurred in a 6-month-old boy. He had symptoms of harmful effects on his nervous system (muscle twitching, lack of coordination, pinpoint pupils, difficulty breathing). These symptoms are the same as those seen in adults and can be treated with drugs. It is not known if there are health effects in adults who were exposed as children. There is not enough information to tell if ethion is more harmful to young animals than adult animals.

We do not know whether children differ from adults in their susceptibility to health effects from ethion.

Newborn babies of pregnant animals that were exposed to very high doses of ethion showed a delayed development of the skeleton. Animals that were fed ethion at doses that did not cause symptoms of poisoning did not show significant effects on the health or development of their newborn babies. It is not known if ethion exposure to parents can affect development of the fetus in the womb or the newborn child.

Ethion and one of its metabolites (a substance created when something is changed in the body, soil, or water), ethion monoxon, can probably cross the placenta; however, no measurements have been made in people or animals. Ethion and ethion monoxon can appear in breast milk. Ethion appeared in goat milk after skin exposure in an animal experiment. Additional information about ethion in breast milk can be found in Chapters 2 and 5.

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

If your doctor finds that you have been exposed to significant amounts of ethion, ask whether your children might also be exposed. Your doctor might need to ask your state health department to investigate.

It may be possible to carry ethion from work on your clothing, skin, hair, tools, or other objects removed from the workplace. This might happen if you work as a pesticide applicator in agriculture, but no actual incidents where this has happened have been observed before. You might contaminate your car, home, or other locations outside work where children might be exposed to ethion. You should know about this possibility if you work with ethion.

Your occupational health and safety officer at work can and should tell you whether chemicals you work with are dangerous and likely to be carried home on your clothes, body, or tools, and whether you should be showering and changing clothes before you leave work, storing your street clothes in a separate area of the workplace, or laundering your work clothes at home separately from other clothes. Material safety data sheets (MSDS) should be found at your place of work for many of the chemicals used there, as required by the Occupational Safety and Health

Administration (OSHA). MSDS information should include chemical names and hazardous ingredients, and important properties, such as fire and explosion information, potential health effects, how you get the chemical(s) in your body, how to handle the materials properly, and what to do in the case of emergencies. Your employer is legally responsible for providing a safe workplace and should freely answer your questions about hazardous chemicals. OSHA or your state OSHA-approved occupational safety and health program can answer any further questions and help your employer identify and correct problems with hazardous substances. Your state OSHA-approved occupational safety and health program or OSHA will listen to your formal complaints about workplace health hazards and inspect your workplace when necessary. Employees have a right to safety and health on the job without fear of punishment.

If you buy over-the-counter pesticide products to apply yourself, be sure that the products are in unopened pesticide containers that are labeled and contain an EPA registration number. Carefully follow the instructions that are labeled on the pesticide container. In the case of ethion, it is not intended for indoor use except in greenhouses. The use of ethion is only permitted for use by proper personnel and it is illegal for the general public to use this compound at their residence. Pesticides and household chemicals should be stored out of reach of young children to prevent unintentional poisonings. Always store pesticides and household chemicals in their original labeled containers. Never store pesticides or household chemicals in containers children would find attractive to eat or drink from, such as old soda bottles.

Your children may be exposed to ethion if unqualified people apply pesticides around your home. In some cases, the improper use of pesticides banned for use in homes has turned homes into hazardous waste sites. Make sure that any person you hire is licensed and, if appropriate, certified to apply pesticides. Your state licenses each person qualified to apply pesticides using EPA standards and further certifies each person qualified to apply “restricted use” pesticides. Ask to see the license and certification. Also ask for the brand name of the pesticide, an MSDS, the name of the product's active ingredient(s), and the EPA registration number. Ask whether EPA has designated the pesticide “for restricted use” and what the approved uses are. If you feel sick after the use of ethion, consult your doctor or local poison control center.

Children can be exposed to pesticides by playing on a lawn too soon after a pesticide has been applied. Carefully read and follow the directions on the pesticide label about how long to wait before re-entering the treated area.

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

Two blood tests are available that can determine whether you have been exposed to significant amounts of ethion. These tests can be performed by any hospital or clinical laboratory. These tests measure the activity of two enzymes (called plasma cholinesterase and erythrocyte [red blood cell] acetylcholinesterase) that are affected by ethion. Ethion affects these enzymes at lower levels of exposure than are necessary to produce harmful effects. This means that if these enzymes have been affected, you will not necessarily have effects on your health. Many other insecticides also affect these enzymes. To determine whether you have been exposed specifically to ethion, a laboratory test must measure its breakdown products in your urine. Tests of this type are not routinely done in hospital laboratories, and your doctor will have to send a sample to a special laboratory. Both the blood and urine tests are most accurate if done within a few days of exposure. These tests cannot tell you if you have been exposed to ethion if the exposure took place more than 2–3 months before the test is done.

You will find further information on how you can be tested for exposure to ethion in Chapter 2.

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 ethion include the following:

Regulations for maximum limits of ethion on food products, ranging from 0.1 to 14 parts per million (ppm), have been established by EPA.

NIOSH recommends that ethion concentrations in workplace air not exceed 0.4 milligrams per cubic meter (mg/m^3) for a 10-hour time-weighted average (TWA).

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: 1-888-42-ATSDR (1-888-422-8737)
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 profiles, contact

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