1. PUBLIC HEALTH STATEMENT

This public health statement tells you about guthion and the effects of exposure to it.

The Environmental Protection Agency (EPA) identifies the most serious hazardous waste sites in the nation. These sites are then placed on the National Priorities List (NPL) and are targeted for long-term federal clean-up activities. Guthion has been found in at least 5 of the 1,678 current or former NPL sites. Although the total number of NPL sites evaluated for this substance is not known, the possibility exists that the number of sites at which guthion is found may increase in the future as more sites are evaluated. This information is important because these sites may be sources of exposure and exposure to guthion may harm you.

When a substance is released either from a large area, such as an industrial plant, or from 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 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 guthion, many factors will determine whether you will 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 any other chemicals you are exposed to and your age, sex, diet, family traits, lifestyle, and state of health.

1.1 WHAT IS GUTHION?

Guthion is a formulation containing the pesticidal active ingredient azinphos-methyl. Formulation names and chemical names are often used interchangeably when describing pesticides. Guthion is an organophosphate insecticide that was used on many crops, especially apples, pears, cherries, peaches, almonds, and cotton. Many of its former uses have been cancelled by the EPA, and its few remaining uses are currently in the process of being phased out. Pure guthion is a colorless to white odorless crystalline solid that melts at about 72–74 °C. Technical-grade guthion is a cream to yellow-brown granular solid.

1.2 WHAT HAPPENS TO GUTHION WHEN IT ENTERS THE ENVIRONMENT?

Guthion is primarily released to air from its use as an insecticide. Guthion is sprayed on crops primarily using ground-based spray equipment, although it can also be sprayed on crops from light-weight planes. Although a large part of the spray lands directly on the crop, some of the smaller droplets that make up the spray can be carried away from the crop by the wind (a process called drift) to nearby water bodies and soils. These environmental deposits of the chemical resulting from spraying, whether they occur on the crop or in water, soil, and air, are called residues. In addition to guthion residues drifting during spraying, residues may also reach nearby rivers, streams, lakes, or ponds by water runoff and erosion that occurs during rainfall. Manufacturing facilities that produce guthion can also release it to the environment during the production process.

Guthion does not evaporate very quickly from soil and water. It attaches (adsorbs) strongly to soil surfaces and does not easily move into groundwater below the soil surface (a process called leaching). Guthion is not very persistent in the environment. It is degraded to many other compounds by microorganisms found in soil and water. Guthion is also degraded by sunlight (a process called photolysis) and by reacting with water (hydrolysis).

1.3 HOW MIGHT I BE EXPOSED TO GUTHION?

You are primarily exposed to guthion by ingesting foods treated with this pesticide. Apples, pears, cherries, and peaches are crops most likely to contain guthion residues, but fewer residues are being found as guthion use in agriculture has been diminishing. If you live close to fruit orchards or other crops that are frequently treated with guthion, you may be exposed to higher levels of guthion than the average person. People who work in agricultural occupations such as pesticide applicators, fruit pickers, and other farm workers can be exposed to higher levels of guthion than the average individual, probably by skin contact with the insecticide and by inhalation. The families of workers can also be exposed, even if the families do not work with this insecticide. This is because guthion residues can get on workers' hands, clothing, vehicles, or other personal items and then be brought home with them after work.

1.4 HOW CAN GUTHION ENTER AND LEAVE MY BODY?

Guthion may enter your body when you breathe air, swallow food or water, or touch surfaces that contain guthion. The available information indicates that more guthion may enter your body when you eat it than when you get it on your skin. Studies in humans and animals suggest that 16–60% of the guthion applied to the skin is absorbed, whereas approximately 80% or more of the guthion administered orally is absorbed.

After you breathe, ingest, or touch guthion, it enters your bloodstream and is transported to all of the organs in your body. In the body, guthion is converted into several other chemicals. Animal studies indicate that guthion breakdown products (also known as metabolites) can be detected in exhaled air, urine, feces, blood, and internal organs, with a large fraction of the metabolites found in muscle tissue shortly after dosing. After 48 hours, there were no detectable guthion metabolites in blood or any internal organ, and metabolites were found only in exhaled air, urine, and feces.

1.5 HOW CAN GUTHION AFFECT MY HEALTH?

Scientists use many tests to protect the public from harmful effects of toxic chemicals and to find ways for treating persons 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 may also help identify health effects 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.

Guthion is an insecticide that belongs to a group of pesticides known as organophosphates. Guthion affects the normal function of the nervous system by interfering with an important enzyme called acetylcholinesterase. Acetylcholinesterase is found in the brain and nerves.

Guthion can also interfere with another type of enzyme known as butyrylcholinesterase, which is found in plasma; however, the effect of a reduction in the function of butyrylcholinesterase is unclear.

Acetylcholinesterase is important to the normal functioning of muscles and many organs. Exposure to high levels of guthion can cause muscle twitching, watery eyes, diarrhea, salivation, and death. If people are exposed to levels of guthion below those that affect nerve function, few or no health problems seem to occur.

We do not know if guthion affects the ability of humans to reproduce. Guthion exposure did not affect fertility in animal studies. No studies have looked at whether guthion can cause cancer in humans. Long-term studies with rats and mice did not indicate that guthion is a cancer-causing chemical. Guthion was not carcinogenic in male or female mice or in female rats that were fed guthion for more than 1 year. Although male rats showed some tumors in parts of the pancreas or the thyroid, it could not be shown that these tumors were clearly related to exposure to guthion. The Department of Health and Human Services and International Agency for Research on Cancer (IARC) have not classified guthion as to its carcinogenicity. In 1993, EPA concluded that there was a lack of evidence of carcinogenicity of guthion in male and female mice and rats. Currently, the EPA has no carcinogenicity classification for guthion.

1.6 HOW CAN GUTHION AFFECT CHILDREN?

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

Children playing on or near areas that have been treated with guthion may be exposed to guthion in soil by skin contact, when they accidentally or intentionally put soil into their mouths, and through hand-to-mouth activity. Children can also be exposed through food and drink. Since children have more fruit in their diets, their exposure to guthion may be higher than for adults on a body weight basis.

We do not know whether children are more susceptible than adults to the health effects of guthion. The main target for guthion in adults is the nervous system, in particular cholinesterase. It is expected that this will also be the main target in children.

We do not know if guthion can cause birth defects or other damage to developing children. Studies in animals have found decreases in fetal growth, nervous system damage, and reduced survival, but only at doses that also caused harmful health effects in the mothers.

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

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

The most effective way to reduce your exposure to guthion is to thoroughly wash any fruits or vegetables that you purchase. This is especially true for apples, pears, peaches, and cherries, since these fruits often contain guthion residues. If you go to an orchard and pick your own fruit, make sure you wash your hands when you are finished since guthion residues can be absorbed through the skin. If you live near a farm where frequent ground or aerial spraying takes place, you may want to remain indoors with your children and pets while the crops are being sprayed to lessen your exposure.

Guthion and other pesticides are often detected in soils and dust samples in agricultural areas where it is being used. You should discourage your children from entering areas treated with guthion. Discourage your children from eating dirt (a behavior known as pica). Make certain your children wash their hands frequently, especially before eating. Discourage your children from putting their hands in their mouths or any other hand-to-mouth activity. Children also play in grass fields or orchards and any pesticides used in these areas could collect on clothing. Regular laundering of clothing can reduce the potential for this exposure.

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

Because guthion changes to other compounds in the body quickly, it is difficult to directly analyze the amount of guthion in a person's body. Three chemicals formed when guthion breaks down can be measured in the urine. However, these three compounds are not specific to guthion only, but may also indicate exposure to other organophosphate chemicals. These tests are usually not available in a doctor's office because special equipment is required. However, a sample taken in a doctor's office can be shipped to a special medical laboratory, if necessary.

Guthion, like other organophosphates pesticides, interferes in the human body with an enzyme called cholinesterase. A blood test that measures this enzyme in the plasma or red blood cells may be useful for detecting exposures to potentially harmful levels of a variety of pesticides including guthion.

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. The 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) are two federal organizations that develop recommendations for toxic substances.

Regulations and recommendations can be expressed as "not-to-exceed" levels, that is, levels of a toxic substance in air, water, soil, or food that do not exceed a critical value that is usually based on levels that affect animals; they are then adjusted to levels that will help protect humans. Sometimes these not-to-exceed levels differ among federal organizations because they used

different exposure times (an 8-hour workday or a 24-hour day), different animal studies, or other factors.

Recommendations and regulations are also updated periodically 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 guthion include the following:

Guthion is classified as a restricted use pesticide, meaning that guthion is limited to use by or under the direct supervision of a certified applicator for agricultural crop uses. The EPA has established tolerances for guthion residues in raw agricultural commodities that range from 0.2 to 5 parts per million. OSHA has set a limit for guthion of 0.2 milligrams per cubic meter (mg/m^3) in workplace air to protect workers during an 8-hour workday for a 40-hour workweek. NIOSH designated a limit of 10 mg/m^3 as a concentration that is Immediately Dangerous to Life and Health.

For more information on standards and guidelines for guthion, see Chapter 8.

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 contact ATSDR at the address and phone number below.

ATSDR can also 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 also available on-line at www.atsdr.cdc.gov and on CD-ROM. You may request a copy of the ATSDR ToxProfilesTM CD-ROM by calling the toll-free information

and technical assistance number at 1-800-CDCINFO (1-800-232-4636), by e-mail at cdcinfo@cdc.gov, or by writing to:

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

Organizations for-profit may request copies of final Toxicological Profiles from the following:

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/