

1. PUBLIC HEALTH STATEMENT

This Statement was prepared to give you information about disulfoton and to emphasize the human health effects that may result from exposure to it. The Environmental Protection Agency (EPA) has identified 1,408 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. Disulfoton has been found in at least 7 of the sites on the NPL. However, the number of NPL sites evaluated for disulfoton is not known. As EPA evaluates more sites, the number of sites at which disulfoton is found may increase. This information is important because exposure to disulfoton may cause harmful health effects and because these sites are potential or actual sources of human exposure to disulfoton.

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 the substance or by skin contact with it.

If you are exposed to substances such as disulfoton, 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, gender, nutritional status, family traits, life-style, and state of health.

1.1 WHAT IS DISULFOTON?

Disulfoton is a manufactured substance used as a pesticide to control a variety of harmful pests that attack many field and vegetable crops. Disulfoton does not occur naturally. The common trade names for disulfoton are Di-syston, Disystox, Frumin AL, and Solvirex. Pure disulfoton is a colorless oil with no identifiable odor and taste. The technical product is dark

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yellowish, and has an aromatic odor. It does not easily dissolve in water or evaporate to air. It is most likely to be present in hazardous waste sites with other wastes, either in drums or mixed with soil. Disulfoton is used to protect small grains, sorghum, corn, and other field crops; some vegetables, fruit, and nut crops; and ornamental and potted plants against certain insects. Although it is used primarily in agriculture, small quantities are used on home and garden plants. Small quantities also are used for other purposes, such as mosquito control in swamps. The use of disulfoton has decreased in recent years. Chapters 3 and 4 of this profile provide more information on the physical properties and uses of disulfoton.

1.2 WHAT HAPPENS TO DISULFOTON WHEN IT ENTERS THE ENVIRONMENT?

Disulfoton enters the environment principally when it is applied as a spray or as granules on field crops, vegetables, potted plants, and home gardens. Disulfoton also can enter the environment when it accidentally spills or leaks during storage and transport. Disulfoton may also enter the environment from hazardous waste sites. Environmental contamination by disulfoton mainly affects soil and water. Natural chemical reactions and bacterial attack remove disulfoton from soil and water. Such reactions form some by-products that are more toxic than disulfoton. Fish accumulate disulfoton in their bodies. The levels of disulfoton in fish can be hundreds of times higher than the level in water. Disulfoton binds moderately well to soil and typically does not travel deep into soil with rainwater. Disulfoton has been detected infrequently in groundwater from agricultural soil in California and Virginia. The estimated amount of time required for the concentration of disulfoton in river water to decrease to half of its initial level (half-life) is 7 days. The estimated half-life in soil ranges from 3.5 to 290 days, depending on the nature of the soil and climatic conditions. Chapter 5 provides more information about what happens to disulfoton in the environment.

1.3 HOW MIGHT I BE EXPOSED TO DISULFOTON?

You may be exposed to disulfoton by breathing contaminated air, drinking contaminated water, and eating contaminated food. Disulfoton is rarely detected in air. In 1980, a low level of disulfoton was detected in 1 of 123 air samples collected from 10 locations in the

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United States. The average concentration at this site was 0.1 nanogram (ng) in 1 cubic meter of air (1 ng = 1/1,000,000,000th [one billionth] of a gram). Disulfoton has not been detected in drinking water. Low levels of disulfoton (0.05-1.0 milligram in a kilogram [mg/kg] of food) (1 mg = 1/1,000 [one thousandth] of one gram) are sometimes found in some grains, fruits, and vegetables treated with this pesticide. Because the levels in food are higher than levels in air and water, you are more likely to be exposed to disulfoton by eating contaminated food. The Food and Drug Administration (FDA) estimated that the average intake of disulfoton in food per day for a 14- to 16-year-old male in the United States from 1986 to 1991 was 0.2 ng/kg (nanograms per kilogram) of body weight. The FDA estimate for disulfoton intake from foods is 0.07% or less than 1/1,000th of the Food and Agriculture Organization/World Health Organization (FAO/WHO) acceptable daily intake (ADI) value of 300 ng/kg. The FAO/WHO ADI value is the maximum amount of a chemical which if ingested over a person's lifetime appears to be without appreciable health risk. Workers in industries that manufacture and formulate disulfoton are at a higher risk of exposure. Workers who spray the pesticide in fields and some farm workers who enter the fields following spraying also are at a higher risk of exposure than the general population. Among the general population, people who frequently use the pesticide in their homes and gardens are potentially at higher risk. People who live near hazardous waste sites that contain disulfoton also are potentially at a higher risk of exposure. Children playing at or near these hazardous waste sites may be exposed by touching and eating soil that contains disulfoton. More information about disulfoton exposure can be found in Chapter 5 of this profile.

1.4 HOW CAN DISULFOTON ENTER AND LEAVE MY BODY?

Disulfoton can easily enter your body when you breathe it in, swallow it, or have skin contact with it. The amount of disulfoton that enters your body depends on the amount in air, food, and water, and the length of time you are exposed to it. In an oily mixture, disulfoton may enter the body through the skin, lungs, or stomach more easily than it would in a water mixture. After disulfoton enters your body, the blood carries it to your organs and tissues. Disulfoton generally does not build up in your organs and tissues, but is initially changed to more harmful substances, which quickly break down to harmless by-products. The harmful

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breakdown products inhibit important enzymes (cholinesterases) in the nervous system, and this action can cause neurological effects. The harmless breakdown products do not have any known effects on the body. Studies in animals show that disulfoton and/or the breakdown products completely leave the body through the urine, feces, and exhaled air in about 10 days or less. More information on how disulfoton moves in the body can be found in Chapter 2.

1.5 HOW CAN DISULFOTON AFFECT MY HEALTH?

In people, disulfoton mainly causes harmful effects to the nervous system. The harmful breakdown products of disulfoton inhibit cholinesterase activity in the nervous system, which results in neurological effects. Depending on the amount of disulfoton that enters the body, neurological effects, such as inhibited cholinesterase activity, narrowing of the pupils, vomiting, diarrhea, drooling, difficulty in breathing, tremors, convulsions, and even death may occur. These effects can occur if you breathe in, swallow, or have skin contact with disulfoton. Exposure to small amounts of disulfoton can sometimes inhibit cholinesterase activity without causing obvious neurological effects. If you take in disulfoton from food or water for long periods, you may also become nearsighted. You are less likely to die from skin contact with disulfoton than from swallowing it, but you may become weak and tired after skin contact.

Breathing in, swallowing, or having skin contact with high levels of disulfoton can cause similar neurological effects in animals. The neurological effects of disulfoton are the most common effects. Animals that swallowed disulfoton for long periods became nearsighted, and the structures of their eyes were further damaged. Results of animal studies suggest that female rats and mice are more sensitive to disulfoton than male rats and mice.

We do not know whether disulfoton causes reproductive or birth defects, or cancer in people. However, some studies suggest that disulfoton may cause reproductive effects in animals. Some animals that swallowed disulfoton during pregnancy had newborns with underdeveloped bones, damaged livers and kidneys, and underdeveloped testes. Animals that swallowed disulfoton for long periods did not develop cancer. Chapter 2 provides more information on

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the harmful effects of disulfoton. Disulfoton has not been classified for carcinogenic effects by the Department of Health and Human Services (DHHS), the International Agency for Research on Cancer (IARC), or the EPA.

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

Disulfoton and its breakdown products can be measured in the blood, urine, feces, liver, kidney, or body fat of exposed people. In cases of occupational or accidental exposure to disulfoton, the breakdown products are often measured in the urine. The breakdown products are relatively specific for disulfoton and a few other similar organophosphate pesticides and can be detected in urine for up to one week after people were last exposed. Because disulfoton inhibits cholinesterase in blood and in blood cells, inhibition of this enzyme activity may also suggest exposure to disulfoton. Cholinesterase activity in blood and in blood cells may remain inhibited for as long as 1-2 weeks after the last exposure. Because other organophosphate pesticides also inhibit cholinesterase activity in blood and blood cells, this test is not specific for disulfoton. The measurement of cholinesterase in blood and blood cells and the amount of disulfoton breakdown products in the urine cannot always predict how much disulfoton you were exposed to. Your doctor can send samples of your blood or urine to special laboratories that perform these tests. Chapters 2 and 6 provide more information about medical tests.

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

The National Institute for Occupational Safety and Health (NIOSH) recommends an exposure limit of 0.1 mg disulfoton/ m³ of air for a 10-hour workday within a 40-hour workweek.

EPA recommends that no more than 10 parts of disulfoton per billion parts (ppb) of water be present in drinking water that children drink for periods of up to 10 days. Disulfoton in drinking water should not exceed 3 ppb for children or 9 ppb for adults if they drink the

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water for longer periods, and should not exceed 0.3 ppb for adults who will drink the water during an average lifetime. EPA has designated disulfoton as a hazardous substance, but it does not intend to cancel or restrict registration of pesticide products containing disulfoton. Federal regulations limit the amount of disulfoton that factories can release into waste water. EPA requires industries to report releases or spills of 1 pound or more. For more information on recommendations by the federal government, please see Chapter 7.

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.