

## 1. PUBLIC HEALTH STATEMENT

This Statement was prepared to give you information about heptachlor and heptachlor epoxide and to emphasize the human health effects that may result from exposure to them. The Environmental Protection Agency (EPA) has identified 1,300 hazardous waste sites as the most serious in the nation. These sites comprise the "National Priorities List: (NPL): Those sites which are targeted for long-term federal cleanup activities. Heptachlor and heptachlor epoxide have been found in at least 129 and 87 of these sites, respectively. However, we do not know how many of the 1,300 NPL sites have been evaluated for heptachlor and heptachlor epoxide. As EPA evaluates more sites, the number of sites at which heptachlor and heptachlor epoxide are found may change. This information is important for you to know because heptachlor and heptachlor epoxide may cause harmful health effects and because these sites are potential or actual sources of human exposure to heptachlor and heptachlor epoxide.

When a chemical 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 as a chemical emission. This emission, which is also called a release, does not always lead to exposure. You can be exposed to a chemical when you come into contact with it. You may be exposed to it in the environment by breathing, eating, or drinking substances containing the chemical or from skin contact with it.

If you are exposed to hazardous chemicals such as heptachlor and heptachlor epoxide, several 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, life style, and state of health.

### 1.1 WHAT ARE HEPTACHLOR AND HEPTACHLOR EPOXIDE?

Heptachlor is a synthetic chemical that was used in the past for killing insects in homes, buildings, and on food crops. It has not been used for these purposes since 1988. There are no natural sources of heptachlor or heptachlor epoxide. Trade names for heptachlor include Heptagran, Heptamul, Heptagranox, Heptamak, Basaklor, Drinox, Soleptax, Gold Crest H-60, Termide, and Velsicol 104. Heptachlor is both a breakdown product and a component of the pesticide chlordane (approximately 10% by weight). Pure heptachlor is a white powder. Technical-grade heptachlor is a tan powder and has a lower level of purity than pure heptachlor. Technical-grade heptachlor was the form of heptachlor used most often as a pesticide. Heptachlor smells somewhat like camphor. Heptachlor does not burn easily and does not explode. It does not dissolve easily in water.

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Heptachlor epoxide is a breakdown product of heptachlor. It was not manufactured and was not used as an insecticide like heptachlor. Like pure heptachlor, heptachlor epoxide is a white powder that does not explode easily. Heptachlor epoxide is made by bacteria in the environment. Animals and people also make heptachlor epoxide when heptachlor enters their bodies. This profile describes these two chemicals together because about 20% of heptachlor is changed within hours into heptachlor epoxide in the environment and in your body.

You might find heptachlor or heptachlor epoxide in the soil or air of homes treated for termites, dissolved in surface water or groundwater, or in the air near hazardous waste sites. You might also find heptachlor or its by-product, heptachlor epoxide, in plants and animals near hazardous waste sites. Heptachlor can no longer be used to kill insects on crops or in homes and buildings. However, heptachlor is still approved by EPA for killing fire ants in power transformers. More information on the chemical and physical properties of heptachlor and heptachlor epoxide is found in Chapter 3. More information on the production and use of heptachlor is found in Chapter 4.

### 1.2 WHAT HAPPENS TO HEPTACHLOR AND HEPTACHLOR EPOXIDE WHEN THEY ENTER THE ENVIRONMENT?

From 1953 to 1974, heptachlor entered the soil and surface water when farmers used it to kill insects in seed grains and on crops. It also entered the air and soil when professional insect exterminators and homeowners used it to kill termites. Today heptachlor is no longer used by homeowners to kill termites or other insects. However, exterminators can still use existing stocks of heptachlor to kill fire ants in power transformers. Heptachlor and heptachlor epoxide can enter the air, soil, groundwater, and surface water from leaks at hazardous waste sites or landfills. Heptachlor sticks to soil very strongly and evaporates slowly into the air. Heptachlor does not dissolve easily in water. Heptachlor epoxide dissolves more easily in water than heptachlor does and evaporates slowly from water. Like heptachlor, heptachlor epoxide sticks to soil. Both heptachlor and heptachlor epoxide can travel long distances in the wind from places where they are released, such as treated fields or manufacturing sites. In soil and water, heptachlor is changed by bacteria into the more harmful substance, heptachlor epoxide, or into other less harmful substances. Heptachlor in the soil can be taken up by plant roots. Heptachlor in the air can be deposited on plant leaves and enter the plant from contaminated soil. Animals that eat plants containing heptachlor can also absorb it. Animals can also change heptachlor to heptachlor epoxide in their bodies. Heptachlor epoxide breaks down very slowly in the environment. It can stay in soil and water for many years. Both heptachlor and heptachlor epoxide build up in fish and in cattle. People store heptachlor epoxide in their fatty tissue. Some studies show that heptachlor epoxide can still be measured in fatty tissue 3 years after a person is exposed.

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Most of the breakdown products of heptachlor are thought to be less harmful than heptachlor itself. However, in laboratory animals, heptachlor epoxide is more harmful than heptachlor. For more information on heptachlor and heptachlor epoxide in the environment, see Chapters 4 and 5.

### 1.3 HOW MIGHT I BE EXPOSED TO HEPTACHLOR AND HEPTACHLOR EPOXIDE?

Exposure to heptachlor and heptachlor epoxide most commonly occurs when you eat contaminated food. Contaminated foods might include fish, shellfish (e.g., clams), dairy products, meat, and poultry. Children and toddlers drink large amounts of milk and may have greater exposure if the milk is contaminated with heptachlor or heptachlor epoxide. Infants can be exposed to these compounds from consumption of contaminated maternal or cow's milk. Exposure can also occur when you drink water, breathe air, or touch contaminated soil at hazardous waste sites that contain heptachlor or heptachlor epoxide. People whose homes have been treated with heptachlor to kill termites can be exposed by breathing heptachlor in the air. After heptachlor is changed to heptachlor epoxide in the soil, it can get into the air. People who breathe this air will be exposed to heptachlor epoxide. Workers who use heptachlor to kill fire ants are also exposed if they breathe in the heptachlor or get it on their skin.

Background levels are levels found in the environment that cannot be traced to a specific source. Information on background levels of heptachlor and heptachlor epoxide in the air was not found. In a survey conducted more than 4 years ago, the background levels of heptachlor in drinking water and groundwater in the United States ranged from 20 to 800 parts of heptachlor in one trillion parts of water (ppt). Heptachlor was found in less than 2% of U.S. groundwater samples that are known to be contaminated from pesticide application. The average level of heptachlor in the contaminated groundwater samples was 800 ppt. No information was found for levels of heptachlor epoxide in groundwater or drinking water. Current information on background levels of heptachlor and heptachlor epoxide in groundwater or drinking water was not found. Heptachlor epoxide has been found in surface water (river, lakes) at levels between 0.1 and 10 parts of heptachlor epoxide in one billion parts of water (ppb, 1 ppb is 1 thousand times more than 1 ppt). Heptachlor and heptachlor epoxide stick to sediment and soil. The sediment in stream beds usually contains a lot of the heptachlor that enters the water. Heptachlor has been found in less than 1% of U.S. soil samples that are known to be contaminated. The average level of heptachlor detected in contaminated soil samples was 4 ppb. Heptachlor epoxide was not found in any of the contaminated soil samples. Contaminated fish and shellfish have been found to contain 2-750 ppb heptachlor and 0.1-480 ppb heptachlor epoxide. Heptachlor epoxide has been found in human milk samples at levels ranging from 0.13 to 128 ppb. The Food and Drug Administration (FDA) estimated that for

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1982-1984, the daily intake of heptachlor and heptachlor epoxide from food was 2.7 ppt for infants (up to 12 months of age), 6.1 ppt for toddlers (1-3 years of age), and  $1.5 \pm 2.8$  ppt for adults. See Chapter 5 for more information on how you might be exposed to heptachlor and heptachlor epoxide.

### 1.4 HOW CAN HEPTACHLOR AND HEPTACHLOR EPOXIDE ENTER AND LEAVE MY BODY?

When you breathe air containing heptachlor or heptachlor epoxide, both can enter your bloodstream through your lungs. It is not known how fast these compounds enter and remain in the bloodstream. Both heptachlor and heptachlor epoxide can also enter your body through your stomach after eating food or drinking water or milk containing them. Most of the heptachlor that is swallowed passes through your stomach into your blood. It can also enter your body through your skin, although it is not known how fast this happens and the exact amount has not been measured. Heptachlor and heptachlor epoxide can pass directly from a mother's blood to an unborn baby through the placenta.

Near a hazardous waste site, heptachlor and heptachlor epoxide can enter your body if you breathe contaminated air, drink contaminated water, or touch contaminated soil. Exposure around hazardous waste sites can also occur by eating plants or animals that have been contaminated with heptachlor or heptachlor epoxide. Sometimes small children eat soil. If the soil is contaminated with heptachlor or heptachlor epoxide, they will be exposed in this way. Heptachlor epoxide can enter an infant's body in mother's milk after the mother has been exposed to heptachlor or heptachlor epoxide. Heptachlor can enter the bodies of people who make it in factories if they breathe it in or get it on their skin.

Once inside your body, heptachlor is changed to heptachlor epoxide and other related chemicals. Heptachlor epoxide is more harmful than heptachlor. The other breakdown products are generally less harmful. Most of the heptachlor, heptachlor epoxide, and other breakdown products leave your body in the feces within a few days after exposure. Some breakdown products can also leave in the urine. Some heptachlor and heptachlor epoxide are stored in your body fat for long periods after exposure has occurred. Heptachlor can go from fat to other tissues in the body. Effects can thus be seen immediately as well as at a later time. The heptachlor and heptachlor epoxide that have been stored in fat leave your body much more slowly. Chapter 2 contains more information on how heptachlor and heptachlor epoxide can enter and leave the body.

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### 1.5 HOW CAN HEPTACHLOR AND HEPTACHLOR EPOXIDE AFFECT MY HEALTH?

People can begin to smell heptachlor or heptachlor epoxide at around 0.3 milligrams in a cubic meter of air (0.3 mg/m<sup>3</sup>). No reliable studies in humans were found that show whether harmful health effects occur as a result of breathing heptachlor or heptachlor epoxide. Also, no reliable human studies were found that show whether harmful effects occur from eating contaminated foods, drinking contaminated liquids, or from the chemicals passing through the skin. Blood tests suggest that these chemicals may cause mild liver changes. A few human cases show that breathing pesticide mixtures containing heptachlor may affect the nervous system causing dizziness, fainting, or convulsions. We do not know if the health effects were from heptachlor or other chemicals in the mixture. Studies of people who made or used pesticides that included heptachlor found no serious health effects. An accurate measure of how much heptachlor the workers were exposed to could not be determined. Heptachlor can cross the placental barrier and has also been detected in breast milk. However, it is not known if it affects the ability of men or women to reproduce.

We do not know if animals would have harmful effects after breathing in air that contains heptachlor or heptachlor epoxide for short or long periods. Studies have shown a number of harmful health effects when animals were fed heptachlor or heptachlor epoxide. These effects were more harmful when the exposure levels were high or when exposure lasted many weeks. When rats were fed high levels of heptachlor or heptachlor epoxide one time, half of them died. At these high levels, tremors and convulsions were seen. Some changes in the kidneys were also seen after rats were fed a very large amount of heptachlor one time. When mice were fed lower levels of heptachlor for several weeks, they had damage to their liver and adrenal glands. When exposures were low or when the exposure period was short, the changes in the liver disappeared. We do not know whether these effects also occur in people exposed to heptachlor or heptachlor epoxide in the same way. However, heptachlor kills insects by causing damage to their nervous systems. The effect of the substance on insects is in agreement with the tremors and convulsions seen in both animals and humans exposed to pesticides containing heptachlor. Therefore, human exposure to large amounts of heptachlor could probably affect the nervous system, at least in the short term.

Animals that ate food containing heptachlor before and/or during pregnancy, had smaller litters. Some of the offspring of these animals had damage to their eyes known as cataracts, and some of the offspring did not live very long after birth. Some animals that ate heptachlor for several weeks were unable to have offspring. We do not know whether these effects would also occur in people exposed to heptachlor in the same way.

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Animals fed heptachlor throughout their lifetime had more liver tumors than animals that ate food without heptachlor. The International Agency for Research on Cancer has determined that heptachlor and heptachlor epoxide are not classifiable as to their carcinogenicity to humans.

The levels of heptachlor or heptachlor epoxide that cause death in animals when placed one time on their skin are much higher than the levels that cause death after being eaten one time. Chapter 2 contains more information on the adverse health effects of heptachlor and heptachlor epoxide.

### 1.6 IS THERE A MEDICAL TEST TO DETERMINE WHETHER I HAVE BEEN EXPOSED TO HEPTACHLOR AND HEPTACHLOR EPOXIDE?

Laboratory tests can detect heptachlor and heptachlor epoxide in blood, fat, breast milk, and body tissues after exposure to high levels. These tests are not commonly available at your doctor's office. Most often, the test for heptachlor epoxide is used because heptachlor is quickly changed into heptachlor epoxide in your body. Blood samples are used most often because they are easy to collect. These tests are specific for heptachlor and heptachlor epoxide. However, heptachlor is both a breakdown product and a component of chlordane, another pesticide. So if heptachlor and heptachlor epoxide are measured in the blood, the actual exposure could have been to chlordane.

A few days after exposure, blood levels of heptachlor and heptachlor epoxide decrease and can no longer be measured. Therefore, blood tests for these chemicals must be done within a short period after exposure. Levels in fat can be measured for a much longer period after exposure. If heptachlor or heptachlor epoxide is found in your fat, it is not possible to tell when you were exposed to these chemicals or if harmful health effects will occur. See Chapters 2 and 6 for more information on detecting these chemicals in the environment or in human tissues.

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

The federal government has developed regulatory standards and guidelines to protect people from the harmful health effects of heptachlor and heptachlor epoxide. EPA has banned the sale of all heptachlor products and has restricted the use of heptachlor. EPA allows companies to use heptachlor only to kill fire ants in power transformers. However, people who bought heptachlor before it was banned can still use it for killing termites.

EPA concludes that the maximum amounts of heptachlor and heptachlor epoxide present in your drinking water and in the seafood you eat each day through your lifetime should

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not exceed 2.78 ppt. In theory, this would limit the risk of developing cancer to one in 100,000. For contaminated seafood alone, the maximum amounts of heptachlor and heptachlor epoxide that you consume each day throughout your lifetime should not exceed 2.85 ppt. This recommendation is made because harmful effects may occur in people after exposure to heptachlor. Because the exact levels that might cause these effects are not known, EPA has set a very low limit as a safety factor.

For short-term exposures of up to 10 days, EPA recommends that a child weighing 22 pounds or less not drink water containing levels of heptachlor greater than 10,000 ppt. For longer exposures, EPA recommends that a child not drink water containing levels of heptachlor greater than 5,000 ppt or water containing levels of heptachlor epoxide greater than 150 ppt.

FDA controls the amount of heptachlor and heptachlor epoxide on raw food crops and on edible seafood. The limit on food crops is from 0 to 10 ppb depending on the type of food product. The limit on edible seafood is 300 ppb. FDA limits the amount of heptachlor and heptachlor epoxide in the fat of food-producing animals to 200 ppb.

EPA has named heptachlor as a hazardous solid waste material. If quantities of heptachlor or heptachlor epoxide of greater than 1 pound enter the environment, the National Response Center of the federal government must be told immediately.

The American Conference of Governmental Industrial Hygienists (ACGIH) and the Occupational Safety and Health Administration (OSHA) recommend that the highest average amount of heptachlor in workplace air over an 8-hour workday for a 40-hour workweek not be more than 0.5 mg/m<sup>3</sup>. For more information on standards and guidelines for heptachlor and heptachlor epoxide, 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, E-29  
Atlanta, Georgia 30333

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

