



PUBLIC HEALTH STATEMENT CHLORPYRIFOS

CAS#: 2921-88-2

Division of Toxicology

August 1998

This Public Health Statement is the summary chapter from the Toxicological Profile for Chlorpyrifos. It is one in a series of Public Health Statements about hazardous substances and their health effects. A shorter version, the ToxFAQs™ is also available. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present. For more information, call the ATSDR Information Center at 1-888-422-8737.

This public health statement tells you about chlorpyrifos 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. Chlorpyrifos has been found in at least 7 of the 1,428 current or former NPL sites. However, it's unknown how many NPL sites have been evaluated for this substance. As more sites are evaluated, the sites with chlorpyrifos 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 chlorpyrifos, 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 CHLORPYRIFOS?

Chlorpyrifos is an organophosphorus insecticide that has been widely used in the home and on the farm. In the home, chlorpyrifos has been used to control cockroaches, fleas, and termites; it has also been an active ingredient in some pet flea and tick collars. On the farm, it is used to control ticks on cattle and as a spray to control crop pests. In 1997, chlorpyrifos was voluntarily withdrawn from most indoor and pet uses by the manufacturer, DowElanco.

Chlorpyrifos is a white crystal-like solid with a strong odor. It does not mix well with water, so it is usually mixed with oily liquids before it is applied to crops or animals. It may also be applied to crops in a microencapsulated form. Chlorpyrifos is the active ingredient of various commercial insecticides including Dursban® and Lorsban®.

1.2 WHAT HAPPENS TO CHLORPYRIFOS WHEN IT ENTERS THE ENVIRONMENT?

Chlorpyrifos enters the environment through direct application to crops, lawns, domesticated animals, and in the home and workplace. Chlorpyrifos may also enter the environment through volatilization, spills, and the disposal of chlorpyrifos waste.

**DEPARTMENT of HEALTH AND HUMAN SERVICES, Public Health Service
Agency for Toxic Substances and Disease Registry**

www.atsdr.cdc.gov/

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Chlorpyrifos that has been applied to the soil generally stays in the area where it has been applied because it sticks tightly to soil particles. Because of this, there is a low chance that chlorpyrifos will be washed off the soil and enter local water systems. Also, since it does not mix well with water, if it does get into the natural waters, it will be in small amounts and will remain on or near the surface and will evaporate. Volatilization is the major way in which chlorpyrifos disperses after it has been applied. Once in the environment (soil, air, or water), chlorpyrifos is broken down by sunlight, bacteria, or other chemical processes.

1.3 HOW MIGHT I BE EXPOSED TO CHLORPYRIFOS?

You can be exposed to chlorpyrifos in many places because of its wide range of uses. You can be exposed to it in your home or office if chlorpyrifos has recently been used to control household pests such as fleas or cockroaches. Exposure can also occur outside your home if chlorpyrifos has been applied to the ground around the foundation to control termites. Chlorpyrifos degrades rapidly in the environment; however, low levels may persist for long periods of time after it has been applied either inside or outside the home. Opening windows before and after chlorpyrifos spraying rapidly lowers airborne levels in a house.

You can also be exposed to chlorpyrifos in a farm setting. The greatest risk occurs soon after a crop has been sprayed, because that is when its levels will be the highest. However, chlorpyrifos rapidly degrades and becomes bound to plants and the ground. The EPA recommends a 24-hour waiting period before entering fields where chlorpyrifos has been applied. In addition, there is the risk of

exposure to chlorpyrifos when it is being prepared for use. Care should be taken to ensure that only a licensed applicator sprays chlorpyrifos, and that unnecessary or unprotected individuals remain away from the site of application during the spraying.

Chlorpyrifos can also be found at some waste disposal sites, so exposure to higher levels than what is commonly found after home or commercial use may occur there.

1.4 HOW CAN CHLORPYRIFOS ENTER AND LEAVE MY BODY?

Chlorpyrifos can enter your body through your mouth, lungs, and skin. After being eaten or drunk, chlorpyrifos quickly passes from the intestines to the bloodstream, where it is distributed to the rest of the body. It can also enter the body through the lungs by breathing chlorpyrifos sprays or dust. When chlorpyrifos enters the body this way, it passes quickly into the blood. It may also enter your body through the skin, but the chances of being exposed to harmful levels of chlorpyrifos this way are not as great as with inhalation and oral exposure, because the amount that gets through the skin is relatively small (less than 3% of what was put on the skin). Dermal exposure of infants represents a greater health risk than with adults because of the texture of infant skin and because infants laying or crawling on an area sprayed with chlorpyrifos may have a greater amount of their skin exposed to chlorpyrifos. Infants crawling on areas recently sprayed with chlorpyrifos may also be exposed to greater amounts of chlorpyrifos through inhalation of its vapors.

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1.5 HOW CAN CHLORPYRIFOS 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 can harm 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.

In people, short-term oral exposure (one day) to low (milligrams) levels of chlorpyrifos can cause dizziness, fatigue, runny nose or eyes, salivation, nausea, intestinal discomfort, sweating, and changes in heart rate. Short-term oral exposure to much higher (grams) levels of chlorpyrifos may cause paralysis, seizures, loss of consciousness, and death. Reports in people also show that short-term exposure to chlorpyrifos may cause muscle weakness weeks after the original symptoms have disappeared. Other effects of exposure to chlorpyrifos include changes in behavior or sleeping pattern, mood changes, and effects on the nerves and/or muscles in the limbs (which may appear as odd sensations such as numbness or tingling, or as muscle weakness). The EPA has not classified chlorpyrifos for carcinogenicity (Class D).

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

There is a general test that can be performed to determine if you have been exposed to carbamate or organophosphate insecticides. Those types of pesticides inhibit the activity of acetylcholinesterase, the enzyme responsible for inactivating acetylcholine, the compound ultimately responsible for most of the toxic symptoms seen with chlorpyrifos. The test measures the activity of the enzyme acetylcholinesterase in the blood or a similar enzyme, pseudocholinesterase, in the plasma, or both. If enzyme activity is inhibited, then exposure to an organophosphate or carbamate pesticide is suspected. There is also a biochemical test that can determine if you have been specifically exposed to chlorpyrifos. After chlorpyrifos enters the body, it is changed by the liver into other forms of the compound that may or may not be less toxic than the original material. The major nontoxic chlorpyrifos metabolic product formed by the liver is 3,5,6-trichloro-2-pyridinol, or TCP. TCP is primarily eliminated from the body in the urine and can be detected in the urine using readily available laboratory equipment. The extent of the exposure, length of time after exposure, and the amount of water in the body will affect the level of TCP in the urine. Typically, TCP can be found in the urine for several days after exposure to chlorpyrifos. In addition to chlorpyrifos, TCP is a metabolite of methyl chlorpyrifos and triclopyr. TCP may also be found in the environment, but it is unlikely that urinary levels of TCP result from environmental-TCP exposure. Direct exposure to chlorpyrifos or chlorpyrifos-like compounds is the most likely cause.

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1.7 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, on the other hand, 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 the levels 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 chlorpyrifos include the following:

Chlorpyrifos is one of a list of chemicals regulated under "The Emergency Planning and Community

Right-to-Know Act of 1986" (EPCRA). This requires owners and operators of certain facilities that manufacture, import, process, or otherwise use the chemicals on this list to report their release of those chemicals to any environmental media annually.

Chlorpyrifos is designated a hazardous substance and subject to regulations in the Federal Water Pollution Act and the Clean Water Act. EPA has established tolerances for chlorpyrifos in raw agricultural commodities, foods, and animal feeds.

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 F-32
Atlanta, GA 30333

Information line and technical assistance:

Phone: 888-422-8737
FAX: (770)-488-4178

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.

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To order toxicological profiles, contact:

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

Reference

Agency for Toxic Substances and Disease Registry (ATSDR). 1998. Toxicological profile for chlorpyrifos. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

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