

Cornell University Program on Breast Cancer and Environmental Risk Factors in New York State (BCERF)

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Pesticides and Breast Cancer Risk, An Evaluation of Chlorpyrifos

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This fact sheet reviews the information currently available on whether or not chlorpyrifos affects the risk of breast cancer. It also includes information on how chlorpyrifos is used, different ways by which people can come in contact with it, and how you can minimize your exposure to this chemical.

What is chlorpyrifos?

Chlorpyrifos is a synthetic chemical used to kill insects (insecticide). It belongs to the group of chemicals called "organophosphate pesticides." Dursban® and Lorsban® are two common trade names of insecticides that contain chlorpyrifos.

Why was chlorpyrifos chosen for an evaluation?

Chlorpyrifos was chosen to be evaluated because it is widely used in both agricultural and home settings. It has been found to be present in the air and dust of treated homes. While chlorpyrifos is known to be toxic to the nervous system, whether or not it causes cancer has not been well studied.

Does chlorpyrifos cause breast cancer?

There have been no studies of the incidence of breast cancer in women with past exposure to chlorpyrifos. Chlorpyrifos fed to experimental animals over a long time did not cause an increase in the incidence of mammary (breast) tumors. There are gaps in our knowledge, but the evidence available so far does not suggest an increase in breast cancer risk from exposure to chlorpyrifos.

Are there other ways by which chlorpyrifos may affect breast cancer risk?

Chlorpyrifos was not found to act like the female hormone estrogen in animals or in cells growing in a laboratory. Some studies have observed that it causes harmful changes, called mutations, in cells growing in a laboratory, but others have not observed such an effect. One study found

disturbances in the immune system of eight people who had been exposed to different amounts of chlorpyrifos. Our immune system helps us fight infections as well as cancer and we recommend that the effects of chlorpyrifos on the immune system be studied in more detail.

Does chlorpyrifos cause any other types of cancer?

While studies have shown that chlorpyrifos may affect the nervous system of people exposed to this insecticide through their work, there have been no studies of cancer risk in these people. Experimental animals fed chlorpyrifos over a long time were not found to have an increased number of tumors than untreated animals. However, flaws in these studies do not allow a definite answer about whether chlorpyrifos does or does not cause cancer. Considering its toxicity, unnecessary exposure should be avoided and people who were exposed to chlorpyrifos in the past should be followed for cases of cancer.

How is chlorpyrifos used in farming?

Chlorpyrifos is used to kill insects that would otherwise damage crops and seeds. It can kill insects upon contact, or when it enters the insect's body. The major use of chlorpyrifos in farming is to protect corn. It is also used to protect cotton crops and fruit trees against insects. Chlorpyrifos protects crops against a wide variety of insect pests such as aphids, corn borers and cutworms. It is also used to treat soils and seeds to protect seeds and young plants against insect damage.

The farm use of chlorpyrifos in the 1990s doubled compared to the 1980s. In the years 1990 to 1993, it was estimated that



over 14 million pounds of chlorpyrifos was used for agriculture each year in the US, ranking it as the tenth most highly used insecticide in the country. In the same time period, 218 thousand pounds of chlorpyrifos was used for agriculture each year in New York State (NYS). It is the eighth most highly used insecticide for agriculture in NYS.

How is chlorpyrifos used in non-farm settings?

The amount of chlorpyrifos used for non-agricultural purposes is even higher than its use for agriculture. Commercial manufacture of chlorpyrifos started in 1969. Since then, chlorpyrifos has been used in many different indoor areas such as homes, offices, schools, hotels, hospitals and restaurants. Its use in homes and workplaces has increased in the 1990s.

Chlorpyrifos is used in spot-treatments of cracks and crevices in homes against cockroaches, and in ant traps. Until recently, it was common to spray chlorpyrifos over a carpeted area, or use chlorpyrifos-containing flea bombs to get rid of fleas and ants in homes. There was a concern that chlorpyrifos sprayed indoors could settle on floors, carpets, toys, clothes, drapes and furniture and lead to children coming in contact with this insecticide. Toddlers frequently put their hands into their mouths and chew on toys and may thus take in more of the chlorpyrifos that settles in a room after treatment, than an adult.

In response to this concern, since 1998 chlorpyrifos is no longer available for use in sprays and foggers inside homes and on pets. It is still available for spot treatments of cracks and crevices in homes and in flea collars for pets. Chlorpyrifos is also used in the treatment of foundations of homes and in pressure-treated wood to protect homes against fire ants and termites. In outdoor areas, chlorpyrifos is sprayed on turfgrass and ornamental plants to control insect pests.

How do federal agencies regulate chlorpyrifos to protect the consumer?

EPA has set the maximum amount of chlorpyrifos and its breakdown product that is permitted to remain in or on raw food at the time of harvest, called "tolerances." Foods that contain residues above these limits can be seized and destroyed by federal or local officials.

EPA has set health advisories based on estimates of chlorpyrifos levels in drinking water that are not expected to cause any harmful health effects in people.

EPA requires facilities that make, import, process or use this chemical to report the amount of chlorpyrifos that is released into the environment each year. EPA requires that spills or accidental releases into the environment of one pound or more of chlorpyrifos be reported.

The American Conference of Governmental Industrial Hygienists has recommended limits on exposure to chlorpyrifos in the workplace. These limits vary depending on the number of hours spent in the workplace.

Who might be exposed to chlorpyrifos?

People most likely to be exposed to this insecticide are:

- Workers involved in the manufacture of chlorpyrifos

- Pest-control applicators who use chlorpyrifos to treat foundations of buildings, turfgrass, ornamental plants, and indoor areas in commercial facilities and homes

- Workers involved in the manufacture of chlorpyrifos-treated wood products

- Farmers, agricultural, orchard and greenhouse workers who mix or apply chlorpyrifos, or work in areas that have been sprayed with this chemical

- Veterinarians, pet groomers and pet owners who use chlorpyrifos-containing sprays against ticks or fleas, or handle flea collars containing chlorpyrifos

- Home owners who use chlorpyrifos to control insect pests on lawns and ornamental plants and in sprays for spot treatments of cracks and crevices, or use flea collars for pets that contain chlorpyrifos

- People who live in homes that have been treated with chlorpyrifos against termites. Chlorpyrifos has been used for treatments of houses against termites since 1980.

Small amounts of chlorpyrifos can pass through the skin, but the levels of exposure are highest when it is breathed in through the air, or eaten through food and water.

Is chlorpyrifos found in food and water?

The very small amounts of chlorpyrifos found in food and water are not considered to be a cause for concern.



Chlorpyrifos does not last long in water, and its levels fall to half within a day. It has been found in groundwater around cornfields and orchards where it is most used, but at levels that are much lower than the health advisories set by EPA.

Where is more research needed?

The animal cancer studies that have been done so far have flaws. Animals that have been treated with chlorpyrifos or have worn flea collars should be followed for incidences of cancer.

Populations exposed to this insecticide should be followed for cancer incidence and effects on the immune system.

Pest-control applicators who apply this insecticide are frequently exposed to higher levels than the general population. Since higher levels of exposure are usually associated with a greater risk of health effects, we urge that these people be followed for cancer incidences. Studies are also needed to find better ways to protect workers and prevent such exposure.

Is more research being done?

A large group of female and male agricultural workers are being surveyed for pesticide exposure and cancer in an ongoing study at the National Cancer Institute. A study at the University of Wisconsin, Madison seeks to understand how organophosphate pesticides can alter the immune system. A study at the University of California, Davis, will investigate if there is an association between exposure to organophosphate pesticides and frequency of injuries among 500 Hispanic migrant farmworkers. Another study, at the University of California, Riverside, will compare different clothing materials for the protection that they offer to applicators.

Conclusions:

Currently, there is no evidence to indicate that chlorpyrifos causes an increase in breast cancer risk. However, this conclusion is based on a very limited amount of information. There are no studies available on whether or not chlorpyrifos exposure causes breast cancer in humans. Chlorpyrifos did not cause an increase in the frequency of mammary tumors in a small number of experimental animals that were evaluated in one study.

Chlorpyrifos does not remain in the environment for long periods of time. However, it is a very popular insecticide and its increasing use may cause people to come in contact with this chemical more frequently.

- While evidence available so far is not enough to conclude whether or not it causes cancer, there is clear evidence that it is toxic to the nervous system. Hence, unnecessary exposure to this chemical and exposure to children, especially toddlers, should be minimized.

How can I minimize exposure to chlorpyrifos?

If you still have old chlorpyrifos sprays or foggers, do not use them to treat large areas of your home.

If you are getting your house treated with pesticides, ask for the labels of the pesticide products that will be applied. The labels carry manufacturer's guidelines on the proper use of the pesticide product and when to re-enter the house after treatment. Cover or remove all items such as food, cooking utensils, toys and clothing in the rooms before treatment.

If you use a chlorpyrifos-containing product such as a pet flea collar, wash hands thoroughly if you have touched the collar, and after you pet your animal.

Prevent children from playing with the soil around foundations of homes that have been treated with chlorpyrifos against termites.

Follow all directions posted on buildings that have been recently treated with pesticides, and follow guidelines for when to re-enter.




An extensive bibliography on *Chlorpyrifos* and *Breast Cancer Risk* is available on the BCERF web site: <http://www.cfe.cornell.edu/bcerf/>

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