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NPTN fact sheets are designed to answer questions that are commonly asked by the general public about pesticides that are regulated by the U.S. Environmental Protection Agency (US EPA). This document is intended to be educational in nature and helpful to consumers for making decisions about pesticide use.

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**N**ational  
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# Chlorpyrifos

## (General Fact Sheet)

For more technical information please refer to the Technical Fact Sheet

**The Pesticide Label:** Labels provide directions for the proper use of a pesticide product. *Be sure to read the entire label before using any product.* A signal word on each product label indicates the product's short-term toxicity.

**CAUTION-** low toxicity

**WARNING-** moderate toxicity

**DANGER-** high toxicity

## What is chlorpyrifos?

- Chlorpyrifos is an insecticide (kills or controls insects), that was first registered in the United States in 1965. Currently, over 850 registered chlorpyrifos products are on the market.
- Chlorpyrifos belongs to a class of insecticides known as organophosphates.
- Chlorpyrifos is one of the most commonly used insecticides.

## How does chlorpyrifos work?

- Chlorpyrifos can kill insects by direct contact or ingestion. Chlorpyrifos kills insects by disrupting their normal nervous system functions.
- Chlorpyrifos disrupts the nervous system by interfering with the acetylcholinesterase enzyme. This enzyme is necessary for normal nerve transmission.

## What types of products contain chlorpyrifos?

- Liquid termite barriers (soil injection)
- Lawn/garden granules, dusts, and sprays
- Household aerosols, baits, dusts, and sprays
- Agricultural sprays and granules
- Animal flea collars, dips, and sprays

## What are some products that contain chlorpyrifos?

- Dursban™
- Empire 20™
- Equity™
- Lorsban™

**Laboratory Testing:** Before pesticides are registered by the U.S. EPA, they must undergo laboratory testing for short-term and long-term health effects. In these tests, laboratory animals are purposely fed a pesticide at high doses to cause toxic effects. These tests help scientists judge how these chemicals might affect humans, domestic animals, and wildlife in cases of overexposure. When pesticide products are used according to label directions, toxic effects are not likely to occur because the amount of pesticide that people and animals may be exposed to is low compared to the doses fed to laboratory animals.

## How toxic is chlorpyrifos?

### Animals

- Scientists fed chlorpyrifos to animals to test its toxicity. See box on **Laboratory Testing**. It is moderately toxic to both male and female rats, highly toxic to chickens, and only slightly toxic to rabbits (1). See boxes on **LD50** and **Toxicity Category**.
- Skin-applied chlorpyrifos has low toxicity to rabbits and rats (2).
- Chlorpyrifos is more toxic to cats than dogs.
- The signs of chlorpyrifos poisoning include behavioral changes, muscle tremors, twitching, diarrhea, salivation, breathing difficulties, and in more severe cases, paralysis and death (3).

**LD50/LC50:** A common measure of toxicity is the lethal dose (LD50) or lethal concentration (LC50) which causes death (resulting from a single or limited exposure) in 50 percent of the treated animals. LD50 is generally expressed as the dose in milligrams (mg) of chemical per kilogram (kg) of body weight. LC50 is often expressed as mg of chemical per volume (e.g., liter (l)) of medium (i.e., air or water) the organism is exposed to. Chemicals are considered highly toxic when the LD50/LC50 is small and practically non-toxic when the value is large. However, the LD50/LC50 does not reflect any effects from long-term exposure (i.e., cancer, birth defects or reproductive toxicity) which may occur at doses below those used in short-term studies.

### Humans

- Depending on the formulation, chlorpyrifos-containing products are slightly to highly toxic to humans.
- The symptoms associated with chlorpyrifos poisoning include headache, nervousness, blurred vision, weakness, nausea, cramps, diarrhea, difficulty breathing, and chest pain (4).
- The signs associated with chlorpyrifos poisoning include sweating, pin-point pupils, tearing, salivation, clear nasal discharge and sputum, vomiting, muscle twitching, muscle weakness, and in severe poisonings convulsions, coma, and death (4).
- The red blood cell cholinesterase test can document an acute chlorpyrifos poisoning. Also, urine can be analyzed for a breakdown product of chlorpyrifos to assess the level of exposure.
- Severe, acute organophosphate poisoning may rarely be associated with chronic neurological effects (5).

**Toxicity Category (Signal Word) (6)**

	<b>High Toxicity (Danger)</b>	<b>Moderate Toxicity (Warning)</b>	<b>Low Toxicity (Caution)</b>	<b>Very Low Toxicity (Caution)</b>
<b>Oral LD50</b>	Less than 50 mg/kg	50 - 500 mg/kg	500 - 5000 mg/kg	Greater than 5000 mg/kg
<b>Inhalation LC50</b>	Less than 0.2 mg/l	0.2 - 2 mg/l	2 - 20 mg/l	Greater than 20 mg/l
<b>Dermal LD50</b>	Less than 200 mg/kg	200 - 2000 mg/kg	2000 - 5000 mg/kg	Greater than 5000 mg/kg
<b>Eye Effects</b>	Corrosive	Irritation persisting for 7 days	Irritation reversible within 7 days	No irritation
<b>Skin Effects</b>	Corrosive	Severe irritation at 72 hours	Moderate irritation at 72 hours	Mild or slight irritation at 72 hours

**Exposure:** Effects of chlorpyrifos on human health and the environment depend on how much chlorpyrifos is present and the length and frequency of exposure. Effects also depend on the health of a person and/or certain environmental factors.

## Does chlorpyrifos break down and leave the body?

### Animals

- Chlorpyrifos is detoxified quickly in rats, dogs, and other animals (2).
- Scientists gave a single dose of chlorpyrifos to a rat to determine how it leaves the body. The chlorpyrifos was rapidly absorbed and excreted in the urine (90%) and feces (10%) (1).

### Humans

- Chlorpyrifos is eliminated rapidly in blood with a half-life of about 1 day. However, a small portion of chlorpyrifos is stored in the fat, but it is eliminated with a half-life of about 62 hours (1). See **Half-life** box.

**Half-life** is the time required for half of the compound to degrade or be eliminated from the body.

<b>1 half-life</b>	=	<b>50% remaining</b>
<b>2 half-lives</b>	=	<b>25% remaining</b>
<b>3 half-lives</b>	=	<b>12% remaining</b>
<b>4 half-lives</b>	=	<b>6% remaining</b>
<b>5 half-lives</b>	=	<b>3% remaining</b>

Remember that the amount of chemical remaining after a half-life will always depend on the amount of the chemical originally applied.

## Does chlorpyrifos cause cancer?

### Animals

- There was no evidence of cancer in rats or mice fed large amounts of chlorpyrifos over their life time (6). See **Cancer** box.

### Humans

- Chlorpyrifos does not increase the risk of cancer in humans (6).

**Cancer:** The U.S. EPA has strict guidelines that require testing of pesticides for their potential to cause cancer. These studies involve feeding laboratory animals large daily doses of the pesticide over most of the lifetime of the animal. Based on these tests, and any other available information, EPA gives the pesticide a rating for its potential to cause cancer in humans. For example, if a pesticide does not cause cancer in animal tests, then the EPA considers it unlikely the pesticide will cause cancer in humans. Testing for cancer has not been done on human subjects.

## Does chlorpyrifos cause developmental or birth defects?

### Animals

- When scientists gave pregnant animals high doses of chlorpyrifos, the offspring did not have birth defects (7).
- In some cases, high doses acutely toxic to the pregnant mother resulted in fetal death or lower birth weight of the offspring (7).

### Humans

- There is no evidence that human exposure to chlorpyrifos interferes with pregnancy or causes birth defects (8).

## What happens to chlorpyrifos in the environment?

- Chlorpyrifos has an average soil half-life of 30 days and a foliage half-life of 3.3 days (9).
- Chlorpyrifos has a very low potential for movement through the soil to groundwater (10).
- Chlorpyrifos will persist indoors for weeks to months (11).

## What effect does chlorpyrifos have on wildlife?

- Chlorpyrifos is extremely toxic to birds and other wildlife (8).
- Fish and marine organisms are very sensitive to chlorpyrifos, so pesticide applicators should be careful when using chlorpyrifos near water ways.
- General agricultural uses of chlorpyrifos pose a serious hazard to honeybees (2).

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