

# DELTAMETHRIN

## Overview

---

Deltamethrin is a [synthetic pyrethroid pesticide](#) that kills insects through dermal contact and digestion. It is applied for a range of commercial crops and recreational uses, and by extension controls a variety of pests. It was first synthesized in 1974, and since has been used primarily on cotton, coffee, maize, cereals, fruits, and stored products; however, deltamethrin is also applied in animal health and public health capacities ([#INCHEM](#)). Deltamethrin is considered the most powerful and therefore the most toxic of the pyrethroids, up to three orders of magnitude more so than some ([#EXTOXNET](#)). In studies done on workers in agricultural settings, deltamethrin can produce a variety of acute health conditions, but these can be prevented with necessary precautions. The chemical also carries several ecological risks, particularly by causing algal blooms and reducing bee populations and their associated pollination service.

### Just the facts

---

#### Physical Information

Name: Deltamethrin

Use: [pesticide](#)

Source: synthetic chemistry

Recommended daily intake: none

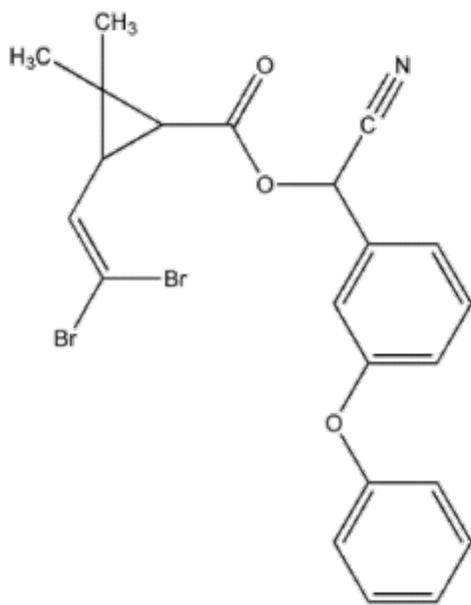
Absorption: rapidly following oral ingestion, slowly when absorbed through skin

Sensitive individuals: agricultural workers and those who use the pesticide

Regulatory facts: some forms are [General Use Pesticides \(GUP\)](#) and others are [Restricted Use Pesticides](#)

#### Chemical Structure

---



Structure retrieved from [PAN](#)

## Chemical Description

---

Deltamethrin belongs to the chemical class of pyrethroids, naturally occurring insecticidal compounds that are synthesized from chrysanthemum flowers ([ATSDR](#)). Its most common appearance is either as a colorless or slightly beige powder, both of which are odorless. As a lipophilic compound, deltamethrin is not soluble in water and therefore is highly stable in the physical environment. Unlike many pyrethroids, deltamethrin is also stable in air and sunlight: when exposed to either, it does not degrade, even after two years' time at 40 degrees Celsius ([#EXTOXNET](#)).

## Uses

---

As noted above, deltamethrin is a pyrethroid, an insecticide used in various agricultural, home, and landscaping settings. Unlike the related pyrethrins, however, pyrethroids contain higher levels of toxicity, making them much more effective against insects. At the same time, pyrethroids can pose risks to mammals and the ecosystem as a whole, as they remain longer in the air, soil, and water. Deltamethrin has historically been used for a variety of purposes, including vector-control for insects such as the mosquito and the tsetse fly and the associated public health threats they pose ([#INCHEM](#)).

The chemical's primary function, however, remains to be its use in agriculture and landscaping. For the latter, these applications include areas such as golf courses, park fields, home gardens

and lawns, and even at times, indoors. Its applications are equally diverse in agriculture. Deltamethrin is the active compound in a number of commercial insecticides such as Butoflin, Cislin, Crackdown, and K-Otek. It is mostly used for growing cotton, which in 1987 accounted for 45% of the chemical's total usage. It is also applied to commercial crops such as corn, coffee, hops, artichokes, and various fruits. For the latter category, the application of deltamethrin controls the populations of insects such as apple and pear suckers, plum fruit moths, various caterpillars, and aphids. For vegetables, the chemical's primary targets are aphids, mealy bugs, and whiteflies ([#EXTOXNET](#)).

The application of this product usually takes the form of sprays, wettable powders, or granules. As of 1996, deltamethrin has not been found to be incompatible with other insecticides and fungicides, making its use widespread and popular, especially in conjunction with other chemical products ([#EXTOXNET](#)).

### Pharmacology and Metabolism

---

As a pyrethroid, deltamethrin paralyzes the nervous system of its insect target, leading to eventual death ([#EXTOXNET](#)). Insects absorb, quickly metabolize, and are poisoned by the compound, through both oral and dermal means ([#INCHEM](#)). The susceptibility of various insects to deltamethrin depends on not only their own physiological structure, but also the surrounding environmental conditions. For example, flies are more vulnerable to the compound at dawn ([#EXTOXNET](#)).

### Health Effects

---

Human exposure to deltamethrin can occur through inhalation, ingestion, and the dermal routes of eye and skin contact. Each of these pathways can possibly lead to acute health effects. Both the World Health Organization and the United States Environmental Protection Agency list deltamethrin as moderately hazardous, with the WHO labeling the compound as a Type II Acute Hazard ([PAN](#)). Laboratory studies on mammals confirm this characteristic: acute doses of deltamethrin have caused writhing syndromes, convulsions, and salivation in rodents ([#EXTOXNET](#)).

The acute effects of deltamethrin exposure on humans include convulsions, ataxia, dermatitis, diarrhea, tremors, and vomiting. Allergic reactions to the compound through skin exposure are also common among agricultural workers. Oral poisoning occurs in humans at dosages of 2-250 mg/kg, while the ingestion of 100-250 mg/kg induces coma ([#EXTOXNET](#)). It is also listed as an endocrine disruptor by the EPA ([PAN](#)).

From [#EXTOXNET](#) on Deltamethrin's acute health effects:

*"Acute exposure effects in humans include the following: ataxia, convulsions leading to muscle fibrillation and paralysis, dermatitis, edema, diarrhea, dyspnea, headache, hepatic microsomal enzyme induction, irritability, peripheral vascular collapse, rhinorrhea, serum alkaline phosphatase elevation, tinnitus, tremors, vomiting and death due to respiratory failure. Allergic reactions have included the following effects: anaphylaxis, bronchospasm, eosinophilia, fever, hypersensitivity pneumonia, pallor, pollinosis, sweating, sudden swelling of the face, eyelids, lips and mucous membranes, and tachycardia,"*

No information is currently available on deltamethrin's [carcinogenicity](#). Little chronic health risks from the chemical occur in humans, but agricultural laborers exposed to deltamethrin over long periods of time (7-8 years) have been found to develop various forms of skin irritation ([#EXTOXNET](#)).

## Precautions

---

Deltamethrin only presents risks to those living or working in regions where the chemical is applied ([#INCHEM](#)). Protecting the various routes of exposure can prevent the acute health problems noted above. The use of rubber gloves and face masks during the application of deltamethrin can block these various routes.

## Environmental Effects

---

Deltamethrin is not mobile in the environment because of its strong adsorption on particles, its insolubility in water, and very low rates of application; however, it still presents risks to the ecosystem in which it is applied. Under laboratory conditions, deltamethrin has been found to be highly toxic to a range of aquatic organisms such as amphibians, crustaceans, mollusks, and various forms of plankton. Although these laboratory investigations demonstrate that the chemical is harmful to fish, field studies have not confirmed this finding. Additionally, because deltamethrin reduces local insect populations, its use can indirectly cause the proliferation of algal blooms. With fewer insect-consumers to control algae population growth, these blooms can in turn harm fish and other aquatic life through clogging gills and decreasing the water's level of oxygen. Other ecological risks of deltamethrin use are seen in decreased pollination, as the chemical is toxic to bees