

Thank you for visiting the National Pesticide Information Center's fact sheets.

Some of the information in the following fact sheet (scroll down) is out-of-date. All remaining uses of the insecticide bendiocarb were cancelled in 1999. For details about that decision and the phase-out process, please visit the US EPA's [R.E.D. Fact Sheet](#).

The National Pesticide Information Center (NPIC) is not currently planning to update this fact sheet. However, it remains available for historical purposes.

Please call NPIC with any questions you have about pesticides at **1-800-858-PEST (7378)**.

Pesticide Questions?
We've Got Answers!

Are you pregnant and wondering about using a pesticide inside your home?

Do you have questions about the safe use of insect repellents on your children?

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from real people in real time!
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The advertisement features a blue header with the title 'Pesticide Questions? We've Got Answers!'. Below this, there are two cartoon illustrations. The first shows a pregnant woman talking on a mobile phone, with a question mark above her head and a child nearby. The second shows a man in a green cap and orange vest talking to a woman, with several flies around them. The NPIC logo is centered between the two illustrations. At the bottom, a green box contains the slogan 'Real answers to real questions from real people in real time!' and the toll-free number '1.800.858.7378'.

NPIC General 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 pesticides.

National Pesticide Information Center

Bendiocarb

(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.* Signal words, listed below, are found on the front of each product label and indicate the product's potential hazard.

CAUTION - low toxicity

WARNING - moderate toxicity

DANGER - high toxicity

What is bendiocarb?

- Bendiocarb belongs to a class of insecticides (chemicals that kill or control insects) known as carbamates (1).
- Bendiocarb was first registered in the United States in 1980. Its registration was voluntarily canceled in September 1999, and all products containing bendiocarb lost registration in December 2001. Products with canceled registrations can not be purchased after that date, but existing stocks can still be used according to label directions (1).

How is bendiocarb used?

- Products containing bendiocarb may be labeled for such outdoor uses as applications on turf, soil, shrubs, trees and ornamental plants. They are also used against various types of pests, such as beetles, aphids, mites, and caterpillars.
- Labels may indicate that a product is designed to be used in various indoor applications such as houses, hotels, restaurants, warehouses, hospitals, railroad boxcars, and aircraft, where it may be used to control spiders, wasps, ants, flies, and stored- product pests.
- Products with bendiocarb as an active ingredient are formulated as granules, dusts, or sprays.

What are some products that contain bendiocarb?

- Ficam™
- Turcam™
- Tattoo™
- Multamat™

How does bendiocarb work?

On Pests

- Bendiocarb disrupts the normal functioning of an insect's nervous system and may kill by either contact or ingestion (2).
- Bendiocarb disrupts the nervous system by interfering with an enzyme necessary for normal nerve transmission (3).
- The inhibition caused by bendiocarb is temporary because the enzyme it affects can regenerate (4).

Laboratory Testing: Before pesticides are registered by the U.S. EPA, they must undergo laboratory testing for short-term (acute) and long-term (chronic) health effects. Laboratory animals are purposely fed high enough 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 the label directions, toxic effects are not likely to occur because the amount of pesticide that people and pets may be exposed to is low compared to the doses fed to laboratory animals.

How toxic is bendiocarb?

- Bendiocarb-containing products are low to moderate in toxicity. The pure chemical is highly toxic. The formulated products are typically lower in toxicity because of the reduced concentration of bendiocarb. See **Toxicity Category** and **Laboratory Testing** boxes.
- Bendiocarb is moderately to highly toxic to both male and female rats. Bendiocarb is highly toxic to guinea pigs and rabbits (2). See the **LD50/LC50** box.
- When researchers applied bendiocarb to the skin of rats, they found it to be moderately toxic (2).

Signs of Toxicity - Animals

- The signs of bendiocarb poisoning may include behavioral changes, excessive tearing and salivation, muscle tremors, twitching, vomiting, and diarrhea. Severe intoxications can result in paralysis (3).
- Dogs given very high doses of bendiocarb recovered completely within 24-25 hours (2).
- Cats are typically more sensitive to the effects of bendiocarb than dogs (3).

Signs of Toxicity - Humans

- Early symptoms associated with bendiocarb exposure may include headache, malaise, muscle weakness, nausea, gastrointestinal cramps, sweating, and restlessness (4). See **Exposure** box.
- Greater exposures to bendiocarb may lead to pin-point pupils, tearing, excessive salivation, nasal discharge, vomiting, diarrhea, muscle twitching, and problems with coordination. Severe poisonings can result in convulsions, coma, and death (4).
- The red blood cell cholinesterase test may be able to document an acute bendiocarb poisoning if administered immediately after exposure, but it may be misleading due to the rapid regeneration of the affected enzyme. Also, urine can be analyzed for unique breakdown products of bendiocarb to assess exposure (4).

Is bendiocarb likely to cause cancer?

Animals

- Rats and mice fed large amounts of bendiocarb over their life time did not show any significant increases in tumors from the group that was not treated (2). See **Cancer** box.

Humans

- Scientists do not believe bendiocarb increases the risk of cancer in humans. The EPA considers bendiocarb a "Group E" chemical, meaning there is no evidence linking it with cancer in animals or humans (1).

Toxicity Category (<i>Signal Word</i>)				
	High Toxicity (<i>Danger</i>)	Moderate Toxicity (<i>Warning</i>)	Low Toxicity (<i>Caution</i>)	Very Low Toxicity (<i>Caution</i>)
Oral LD50	Less than 50 mg/kg	50 - 500 mg/kg	500 - 5000 mg/kg	Greater than 5000 mg/kg
Dermal LD50	Less than 200 mg/kg	200 - 2000 mg/kg	2000 - 5000 mg/kg	Greater than 5000 mg/kg
Inhalation LC50 - 4hr	Less than 0.05 mg/l	0.05 - 0.5 mg/l	0.5 - 2 mg/l	Greater than 2 mg/l
Eye Effects	Corrosive	Irritation persisting for 7 days	Irritation reversible within 7 days	Minimal effects, gone within 24 hrs
Skin Effects	Corrosive	Severe irritation at 72 hours	Moderate irritation at 72 hours	Mild or slight irritation

U.S. Environmental Protection Agency, Office of Pesticide Programs, Label Review Manual, Chapter 7: Precautionary Labeling
<http://www.epa.gov/oppfod01/labeling/lm/chap-07.htm>

LD50/LC50: A common measure of acute toxicity is the lethal dose (LD50) or lethal concentration (LC50) that 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) that may occur at levels below those that cause death.

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

Could bendiocarb cause reproductive problems or birth defects?

Animals

- When scientists fed pregnant animals increasing quantities of bendiocarb, most offspring did not have any birth defects. However, some animals that were given the highest dose levels had offspring with increased eye abnormalities and underdeveloped pubic bones (2).
- In some cases, rats given daily various doses during pregnancy had reduced offspring survival rates or lowered birth weights in their offspring. This occurred only with rats fed the highest amounts of bendiocarb (2).

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 is not done on human subjects.

Humans

- No human data was found on the ability of bendiocarb to cause reproductive problems or birth defects.

Does bendiocarb break down and leave the body?

Animals

- Mice, rats, rabbits, and dogs quickly detoxify bendiocarb (2).
- Scientists fed a single dose of bendiocarb to rats to determine how it leaves the body. The chemical was rapidly absorbed and excreted in the urine in 1 day, with small amounts leaving through expired air and feces (5).
- Researchers fed male and female rats bendiocarb to determine if it would build up in their bodies. It did not move into any one tissue to a greater extent than another, and all residues in tissues were very low (5).

Humans

- A volunteer who ate a small amount of bendiocarb eliminated 99% of it within 22 hours (5).

What happens to bendiocarb outdoors?

Soil

- Depending upon local conditions, bendiocarb has a half-life in soil ranging from 3-21 days, with an average of 5 days (6).
See **Half-life** box.

Plants

- Bendiocarb residues on plant surfaces usually have a half-life of 3 to 18.3 days (7, 8).

Water

- Bendiocarb does not dissolve well in water and binds to soil, so it is unlikely to move through the soil to groundwater (9).

Half-life: the time required for half of the compound to degrade.

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

The amount of chemical remaining after a half-life will always depend on the amount of the chemical present initially.

What happens to bendiocarb indoors?

- Indoor applications of bendiocarb do not last long. Residues are greatly reduced after only a couple of days (10, 11).
See the **bendiocarb technical fact sheet** for more information.

Does bendiocarb affect wildlife?

Birds

- Pure bendiocarb is highly toxic to birds such as ducks and quail (12).

Bees

- Bendiocarb is highly toxic to honey bees (12). It is also extremely toxic to earthworms, reducing a population over 90% in one study in which bendiocarb was applied at a standard rate (13).

Other

- Bendiocarb is also moderately to highly toxic to several species of fish and aquatic invertebrates such as shrimp, crabs, and insects (12).
- Before you apply pesticides, consider the potential harmful effects on birds, aquatic organisms, and beneficial insects.

Date Reviewed: September, 2002

For more information contact: NPIC

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NPIC at <http://npic.orst.edu> EXTTOXNET at <http://ace.orst.edu/info/exttoxnet/>

References

1. U.S. Environmental Protection Agency *EPA R.E.D. Facts: Bendiocarb*. From <http://www.epa.gov/oppsrrd1/REDs/factsheets/0409fact.pdf> (accessed Oct. 2001).
2. *FAO/WHO Pesticide Data Sheet- Bendiocarb*. Data Sheets on Pesticides No. 52. Food and Agriculture Organization of the United Nations. From http://www.inchem.org/documents/pds/pds/pest52_e.htm (accessed Oct. 2001)
3. Osweiler, Gary D. *Toxicology*. National Veterinary Medical Series. Williams and Wilkins: Media, PA, 1996; pp 231-236.
4. Riegart, J. R.; Roberts, J. R. *Recognition and Management of Pesticide Poisonings*, 5th Edition; U.S. Environmental Protection Agency, Office of Pesticide Programs, U.S. Government Printing Office: Washington, DC, 1999; pp 48-54.
5. Challis, I. R.; Adcock, J. W. The Metabolism of the Carbamate Insecticide Bendiocarb in the Rat and in Man. *Pestic. Sci.* **1981**, *12*, 638-44.
6. Hornsby, A. G; Wauchope, R. D; and A. E. Herner. *Pesticide Properties in the Environment*; Springer-Verlag: New York, 1996; pp 52.
7. *Groundwater Loading Effects of Agricultural Management Systems (GLEAMS)*; W.G. Knisel, Ed. Version 2.10; USDA-ARS: Tifton, GA, 1993.
8. Nigg, H. N.; Brady, S. S.; Kelly, I. D. Dissipation of Foliar Dislodgeable Residues of Bendiocarb Following Application to Azaleas. *Bull. Environ. Contam. Toxicol.* **1992**, *48*, 416-20.
9. Vogue, P.; Kerle, E.; Jenkins, J. *Oregon State University Extension Pesticide Properties Database*; Oregon State University Extension Service: Corvallis, OR, 1994.
10. Currie, K. L.; McDonald, E. C.; Chung, L.; Higgs, A. R. Concentrations of Diazinon, Chlorpyrifos, and Bendiocarb after Application in Offices. *Am. Ind. Hyg. Assoc. J.* **1990**, *51*(1), 23-7.
12. Wright, C. G.; Leidy, R. B.; Dupree, H. E. Jr. Insecticides in the ambient air of rooms following their application for control of pests. *Bull. Environ. Contam. Toxicol.*, **1981**, *26*, 548-53.
13. *A World Compendium: The Pesticide Manual*, 12th ed.; Tomlin, C. D. S., Ed.; British Crop Protection Council: Farnham, Surrey, UK, 2000; pp 67-68.
14. Kunkel, B. A.; Held, D. W.; Potter, D. A. Impact of Halofenozide, Imidacloprid, and Bendiocarb on Beneficial Invertebrates and Predatory Activity in Turfgrass. *J. Econ. Entom.* **1999**, *92*, 922-30.