

Pesticide Toxicity Profile: Carbamate Pesticides¹

Frederick M. Fishel²

This document provides a general overview of human toxicity, provides a listing of laboratory animal and wildlife toxicities and a cross-reference of chemical, common and trade names of many carbamate pesticides registered for use in Florida.

General

Carbamate pesticides are derived from carbamic acid and kill insects in a similar fashion as organophosphate insecticides. They are widely used in homes, gardens and agriculture. Like the organophosphates, their mode of action is inhibition of cholinesterase enzymes, affecting nerve impulse transmission. The first carbamate, carbaryl, was introduced in 1956 and more of it has been used throughout the world than all other carbamates combined. Because of carbaryl's relatively low mammalian oral and dermal toxicity and broad control spectrum, it has had wide use in lawn and garden settings. Most of the carbamates are extremely toxic to Hymenoptera, and precautions must be taken to avoid exposure to foraging bees or parasitic wasps. Some of the carbamates are translocated within plants, making them an effective systemic treatment.

Toxicity

The signs and symptoms of carbamate poisonings are similar to those caused by the organophosphate pesticides. The carbamate's principal route of entry is either by inhalation or ingestion or secondarily by the dermal route. Dermal exposure tends to be the less toxic route than inhalation or ingestion. For example, carbofuran has a rat oral LD₅₀ of 8 mg/kg, compared to a rat dermal LD₅₀ of greater than 3,000 mg/kg, making it much more toxic when ingested. The carbamates are hydrolyzed enzymatically by the liver; degradation products are excreted by the kidneys and the liver. Respiratory depression combined with pulmonary edema is the usual cause of death from poisoning by carbamate compounds. As with organophosphates, the signs and symptoms are based on excessive cholinergic stimulation. Unlike organophosphate poisoning, carbamate poisonings tend to be of shorter duration because the inhibition of nervous tissue acetylcholinesterase is reversible, and carbamates are more rapidly metabolized. Muscle weakness, dizziness, sweating and slight body discomfort are commonly reported early symptoms. Headache,

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 2. Frederick M. Fishel, Associate Professor, Agronomy Department, and Director, Pesticide Information Office; Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida, Gainesville, FL 32611.

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salivation, nausea, vomiting, abdominal pain and diarrhea are often prominent at higher levels of exposure. Contraction of the pupils with blurred vision, incoordination, muscle twitching and slurred speech have been reported. Mammalian toxicities for carbamate pesticides are shown in Table 1. Table 2 lists the toxicities to wildlife by the common name of the carbamate pesticide. Table 3 provides a cross listing of many of the trade names that these products are registered and sold by in Florida.

Additional Information

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Table 1. Carbamate pesticide mammalian toxicities (mg/kg of body weight).

Common name	Rat oral LD ₅₀	Rabbit dermal LD ₅₀
Aldicarb	1	20
Carbaryl	500 – 850	>2,000
Carbofuran	8	>3,000
Fenoxycarb	16,800	>2,000
Methiocarb	60 – 1,000 depending on product	>2,000 (rat)
Methomyl	30 – 34	>2,000
Oxamyl	5.4	2,960
Thiodicarb	66	>2,000

Table 2. Carbamate pesticide wildlife toxicity ranges.

Common name	Bird acute oral LD ₅₀ (mg/kg)*	Fish LC ₅₀ (ppm)**	Bee [†]
Aldicarb	MT	HT	PNT
Carbaryl	PNT	HT	HT
Carbofuran	HT	HT	Not available
Fenoxycarb	PNT	HT	PNT
Methiocarb	HT	HT	Not available
Methomyl	HT	MT	HT
Oxamyl	VHT	MT	HT
Thiodicarb	HT	HT	MT

*Bird LD₅₀ : PNT = >2,000; ST = 501 – 2,000; MT = 51 – 500; HT = 10 – 50; VHT = <10.
**Fish LC₅₀ : PNT = >100; ST = 10 – 100; MT = 1 – 10; HT = 0.1 – 1; VHT = <0.1.
[†]Bee: HT = highly toxic (kills upon contact as well as residues); MT = moderately toxic (kills if applied over bees); PNT = relatively nontoxic (relatively few precautions necessary).

Table 3. Cross-reference list of common, trade and chemical names of carbamate pesticides.

Common name	Trade names*	Chemical name
Aldicarb	Temik®	2-methyl-2-(methylthio)propionaldehyde O-(methylcarbamoyl)oxime
Carbaryl	Carbaryl®, Prokoz® and Sevin®	1-naphthyl methylcarbamate
Carbofuran	Furadan®	2,3-dihydro-2,2-dimethyl-7-benzofuranyl methylcarbamate
Fenoxycarb	Award® and Logic®	Ethyl [2-(4-phenoxyphenoxy)ethyl] carbamate
Methiocarb	Mesuro®	3,5-dimethyl-4-(methylthio)phenyl methylcarbamate
Methomyl	Lannate®	S-methyl N-[(methylcarbamoyl)oxy]thioacetimidate
Oxamyl	Vydate®	S-methyl N,N-dimethyl-N-(methylcarbamoyloxy)-1-thio-oxamimidate
Thiodicarb	Larvin®	Dimethyl N,N-(thiobis(methylimino)carbonyloxy)bis(ethanimidothioate)
*Does not include manufacturers' prepackaged mixtures.		