PI-78

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Pesticide Toxicity Profile: Miscellaneous Rodenticides[1]

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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 miscellaneous rodenticides registered for use in Florida.

General

Rodenticides pose a risk of accidental poisonings for several reasons. They are agents specifically designed to kill mammals; often their toxicity is very similar for the target rodents and for humans. Since rodents usually share environments with humans and other mammals, the risk of accidental exposure is an integral part of the placement of baits for the rodents. As rodents have developed resistance to existing rodenticides, there is a continuous need to develop new and potentially more toxic rodenticides. Currently, the inorganic rodenticide, zinc phosphide, the convulsant, strychnine, and the non-classed rodenticide, cholecalciferol, are registered for use in Florida.

Zinc phosphide was first registered as a pesticide in the U.S. in 1947. It is labeled for controlling rats, moles, gophers, and mice in a wide variety of sites. It is classified as a federally restricted use pesticide due to its hazard to nontarget species, and its acute oral and inhalation toxicity. Available formulations include pellets, baits, and tracking powder, most containing 2% active ingredient.

Strychnine, a poisonous alkaloid that is obtained from seeds of the nux vomica tree (*S. nux-vomica*) and related plants of the genus, *Strychnos*, was also first registered for use in the U.S. in 1947. The primary commercial source of strychnine is from nux vomica trees grown in India. In Florida, the only vertebrate labeled for control on its products is the pocket gopher in nonfood areas. Its products carry the signal word “DANGER” due to acute oral toxicity hazard to nontarget avian species and its accident history. The products available in Florida are formulated as granular baits.

Also known as vitamin D3, cholecalciferol targets rats and mice. Products available in Florida are granules and all carry the signal word, “CAUTION.”

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Toxicity

Zinc phosphide

Zinc phosphide is a Toxicity Category I (the highest of four categories) for acute effects via oral or inhalation exposures, Toxicity Category III (the second lowest of four categories) for the dermal route, and Toxicity Category IV (the lowest of four categories) for eye irritation. Following ingestion of zinc phosphide, digestive acids within the gastrointestinal tract react with it forming phosphine which enters the bloodstream. Nausea, vomiting, excitement, chills, chest tightness, and cough may progress to fluid buildup in the lungs. There is no conclusive evidence available regarding zinc phosphide's chronic effects, nor reproductive, teratogenic, carcinogenic, or mutagenic effects. More information on phosphine gas exposure may be found in UF/IFAS EDIS Document PI-73 *Pesticide Toxicity Profile – Phosphorous and Sulfur Fumigants* (http://edis.ifas.ufl.edu/PI110). Ecologically, zinc phosphide is considered to be highly toxic to both birds and fish.

Strychnine

Strychnine has been placed in Toxicity Category I, indicating a high degree of acute toxicity, for oral and ocular effects. Inhalation toxicity is also presumed to be high. A substantial number of accidental exposures to strychnine pesticides are reported annually to Poison Control Centers. Symptoms of strychnine poisoning begin within 15 to 20 minutes following ingestion. The substance blocks inhibitory nerve impulses which lead to violent convulsions. There may be from one to ten such attacks prior to it causing suffocation. Acute toxicity of strychnine to birds is very high. Mammalian studies indicate that strychnine is very highly toxic to small mammals on both an acute oral basis and dietary basis. The signs of toxicity, including death, occur within one hour.

Cholecalciferol

Cholecalciferol is the activated form of vitamin D3. Its toxic effect is probably a combination of actions on liver, and kidney, and possibly the walls of the heart, the last two toxicities being the result of excessive calcium in the bloodstream caused by elevated levels of vitamin D. Early symptoms and signs of vitamin D intoxification in humans are fatigue, weakness, headache, and nausea. Human poisonings from its use as a rodenticide have not been reported, but vitamin D overdose has occurred under clinical circumstances. Cholecalciferol is considered practically nontoxic to birds, but testing for its toxic effects on fish is not required because technical-grade cholecalciferol is virtually insoluble in water. Mammalian toxicities for these rodenticides are shown in Table 1. Table 2 lists the toxicities to wildlife, if known, by the common name of the pesticide. Table 3 provides a cross listing of some of the trade names that these products are registered and sold by in Florida.

Additional Information

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Table 1. Miscellaneous rodenticide mammalian toxicities (mg/kg of body weight).

Common name	Rat oral LD_{50}	Dermal LD_{50}
Cholecalciferol	43.6	2,000
Strychnine	2.2 – 14	>2,000
Zinc phosphide	45.7	2,000 – 5,000

Table 2. Miscellaneous rodenticide wildlife toxicity ranges.

Common name	Bird acute oral LD_{50} (mg/kg)*	Fish (ppm)**	Bee†
Cholecalciferol	PNT	---	---
Strychnine	VHT	MT - HT	---
Zinc phosphide	HT	HT	---

*Bird LD_{50}: Practically nontoxic (PNT) = >2,000; slightly toxic (ST) = 501 – 2,000; moderately toxic (MT) = 51 – 500; highly toxic (HT) = 10 – 50; very highly toxic (VHT) = <10.

**Fish LC_{50}: 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 miscellaneous rodenticides.

Common name	Trade names*	Chemical name
Cholecalciferol	Quintox®, Rampage®	Cholecalciferol
Strychnine	Martins Gopher Bait®	Strychnine
Zinc phosphide	Prozap®, ZP®	Zinc phosphide

*Does not include manufacturers' prepackaged mixtures.