



Chemical Watch Factsheet

A Beyond Pesticides/ NCAMP Factsheet

Fenvalerate

A synthetic pyrethroid, fenvalerate is registered for a wide array of crop uses, as well as a termiticide and insect repellent. First developed in 1974 by Sumitomo Chemical Co. of Japan (Sumicidin™), fenvalerate is also distributed in the U.S. by E.I. du Pont de Nemours and Company (Pydrin™), Velsicol (Tribute™), and Shell International (Belmark™), among others. Crop uses include cotton, soybeans, corn, vegetables, apples, peaches, pears, and nuts.

On August 5, 1987 EPA registered termiticide uses for fenvalerate, the newest chemical alternative to the voluntarily cancelled cyclodiene termiticides, including chlordane. Evercide™, manufactured by MGK, Inc., of Minneapolis, is restricted to use by pest control operators; no homeowner formulations will be available. Tribute™ is also available as a soil termiticide.

Fenvalerate has been in the news lately due to over 200 reports of dog and cat poisonings, including 26 deaths following use of Blockade™, a Hartz Mountain tick and flea repellent formulation combining fenvalerate with DEET, an ingredient in most

mosquito and blackfly repellent sprays.

The synthetic pyrethroids act as excitatory nerve poisons, thought to poison by interfering with the ionic permeability of nerve cell membranes. Synthetic pyrethroids as a class have now captured an estimated 30% of the commercial insecticide market, due to their generally lower acute toxicity and field persistence compared to classical organochlorine and organophosphate-type insecticides.

In common with most synthetic pyrethroids, fenvalerate is of low acute toxicity to mammals, especially when dissolved in water, where the oral LD50 in rats is greater than 3200 mg/kg. It is more toxic when dissolved in OMSO. Dermal toxicity is also low, with an LD50 greater than 2500 mg/kg in rabbits.

Fenvalerate is quickly metabolized and excreted in urine. It also has a very

low vapor pressure, 1.1×10^{-8} mm Hg at 25°C, indicating that it has essentially no predisposition to evaporate into the air. According to EPA, the database is essentially complete, and the Agency has no chronic toxicity concerns.

However, there have been a number of reports of workers exposed to fenvalerate residues developing itchy, burning skin, typically without a rash, respiratory symptoms (sneezing, runny nose, cough, difficulty breathing), and eye irritation. Others developed a peculiar tingling and burning sensation of the hands and face, which generally abated after 24 hours. Sweden discontinued the use of fenvalerate in forestry because of such reports.

In general, the alpha-cyano pyrethroids, such as fenvalerate, interfere with the ability of nerve cells to recharge, causing nerve cells to fire for abnormally long periods. This can lead to unusual and painful sensations, 'called dysesthesia and paresthesia. Flannagan, et al. conducted a double blind study, published in 1985, of the sensory nerve effects that can fol-

UPDATE: *September 2007* 2003 VOLUNTARY CANCELLATION

Researchers have reported that fenvalerate may cause developmental effects in aquatic organisms. Work by Reynaldi et al., (2006) found that exposure to fenvalerate reduced feeding activity, resulting in growth retardation and delayed maturity in *Daphnia magna* (water fleas). Occupational exposure to fenvalerate may lead to reproductive effects as seen in research conducted by Lifeng et al (2006). Their work reported that the semen quality of male factory workers exposed to fenvalerate was significantly affected.

In December 2003, the EPA issued a Cancellation Order for fenvalerate after the registrants requested its cancellation. Products may still be sold, distributed, and used until existing stocks have been exhausted.

low fenvalerate or permethrin (a non-cyano pyrethroid) exposure. The effects, sensory dysesthesia, following fenvalerate exposure were four-fold more intense than those following permethrin exposure. Interestingly, the researchers found that immediate applica-

tion of Vitamin E to exposed areas could completely block these effects. They also noted that the myelinated (insulated) nerves of vertebrates can sequester pyrethroid residues for a period of time.

Fenvalerate is extremely toxic to bees and fish. The Pydrin™ label prohibits planting root crops other than those on

the label within 12 months of application, implying some persistence in soil, and also generally prohibits feeding waste greens and forage to livestock.

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Fenvalerate chemicalWATCH Factsheet Bibliography

Farm Chemicals Handbook. 1989. Eds. C. Sine, et al. Meister Publishing Co., Willoughby, OH.

Flannigan, S.A., et al. 1985. "Synthetic pyrethroid insecticides: A dermatological evaluation." *Brit. I. Indust. Med.* 42:363-372.

Knox, M., et al. 1984. "Paresthesia from cutaneous exposure to a synthetic pyrethroid insecticide." *Arch. Dermatol.* 120:744-746.

Kolmodin-Hedman, B., et al. 1982. "Occupational exposure to some synthetic pyrethroids (permethrin and fenvalerate)." *Arch. Toxicol.* 50:27-33.

Linfeng, T., et al. 2006. "Effects of fenvalerate exposure on semen quality among occupational workers." *Contraception.* 73:92-96.

The Merck Index. 1983. 10th ed. Merck & Co., Inc., Rahway, NJ.

"Pet spray controversy: EPA studying effects of 'Hartz Blockade™,'" *The Washington Post*, September 11, 1987.

Reynaldi, S., et al. 2006. "Linking feeding activity and maturation of *Daphnia magna* following short-term exposure to fenvalerate." *Environmental Toxicology and Chemistry.* 25:1826-30.

Thomson, W.T. 1984. *Agricultural Chemicals: Insecticides.* Thomson Publications, Fresno, CA.

Tucker, S.B. & S.A. Flannigan. 1983. "Cutaneous effects from occupational exposure to fen valerate." *Arch. Toxicol.* 54:195-202.

U.S.-EPA. 1987. "Chemical alternatives to the cydodienes for termite control (registered as of 8/87)." Office of Pesticide Programs, Washington, DC.

U.S.-EPA. 1985. Letter from John Moore to Congressman John Paul Hammerschmidt concerning report of cattle ear-tag toxicity to fish. Office of Pesticides & Toxic Substances, Washington, DC.

Wouters, W. & J. Van den Berken. 1978. "Review: Action of pyrethroids." *Gen. Pharmacol.* 9:387-398.