

chemicalWATCH Factsheet

FIPRONIL

Fipronil is a phenylpyrazole insecticide, first introduced to the U.S. in 1996 for commercial turf and animal health indoor pest control. It is a disruptor of the insect central nervous system via the GABA channel, acting with contact and stomach action. It blocks the GABA-gated chloride channels of neurons in the central nervous system, resulting in neural excitation and death of the insect (NPTN, Fipronil, 1997). It is used against cockroaches, ants, fleas, ticks, and mites (PAN, 2000). Common pesticides containing fipronil are Frontline®, Frontline® Topspot™, Combat®, and MaxForce® (NPTN, Fipronil, 1997). Concerns about human exposure to Frontline spray treatment were raised in 1996, leading to a denial of registration for the spray product (PAN, 2000).

Acute Toxicity

The technical form of fipronil has the signal word "Warning," implying moderate toxicity, while all formulated or end-use products in the U.S. carry the signal word "Caution," indicating low toxicity. Signs of toxicity in rats include anuria (no urination), increased excitability, seizures, and reduced feed consumption. It may cause mild irritation of the eyes and slight skin irritation, but is not a skin sensitizer (NPTN, Fipronil, 1997). It has a rat acute LD50 of 97 mg/kg,

and has moderate acute toxicity by oral and inhalation routes in rats. It is of moderate dermal toxicity to rabbits, and is less toxic to mammals than to fish, some birds, and invertebrates. The photodegrade of fipronil, MB46513, is about 10 times more acutely toxic to mammals than fipronil itself (PAN, 2000).

Chronic Toxicity

Fipronil is neurotoxic in both rats and dogs. Severe skin reactions to Frontline Topspot for Cats and Topspot for Dogs have occurred, with skin irritation and hair loss at the site of application. Fipronil is carcinogenic to rats at doses of 300 ppm, causing thyroid cancer related to disruption in the thyroid-pituitary status, and is classified as a Group C (Possible Human) Carcinogen based on the rat carcinogenicity study (PAN, 2000). Organs affected by chronic exposure may include the liver, thyroid and kidney. Reproductive toxicity occurred at the higher doses tested, with clinical signs including reduced fertility, decreased litter size, decreased body weights in litters, and fetus mortality. There is no evidence of fipronil causing birth defects, but it may cause a delay in development at high doses (NPTN, Fipronil, 1997).

Effects on Wildlife

Fipronil is highly toxic to fish and

aquatic invertebrates, highly toxic to bees, and highly toxic to upland game birds, but is almost non-toxic to waterfowl and other bird species. The metabolite MB 461 is more highly toxic to birds, and the metabolites MB 46136 and MB 45950 are more highly toxic to freshwater invertebrates than fipronil itself (PAN, 2000). Fipronil is excreted in rats via the feces (45-75%) and urine (5-25%) (NPTN, Fipronil, 1997).

Environmental Fate

The half-life of fipronil was found to range from 122-128 days in oxygenated sandy loam soil, 0.7 to 1.7 months on soil surfaces, and 3 to 7.3 months when incorporated in soil. It has low soil mobility and little potential for groundwater contamination. In water and sediment that lack oxygen, fipronil degrades more slowly, with a half-life of 116-130 days. Its half-life in basic solutions is 28 days, and it remains stable to breakdown by water at a mildly acidic to neutral pH. When exposed to sunlight, fipronil has a half-life of 3.6 hours in water and 34 days in loamy soil (NPTN, Fipronil, 1997). The half-life on vegetation is 3-7 months. Studies showed that there is potential for bioaccumulation of the photodegrade MB 46513 in fatty tissues (PAN, 2000).

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Fipronil *chemicalWATCH* Factsheet Bibliography

National Pesticide Telecommunication Network. 1997. *Fipronil Technical Fact Sheet*. December. Oregon State University, Corvallis, OR.

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