

Type	Insecticide
Controls	Cockroaches, ants, termites, fleas, and ticks.
Mode of Action	Neurotoxic by blocking GABA-regulated chloride channels of neurons resulting in excessive neuronal activity leading to paralysis and death.

Thurston County Review Summary:

Pesticides containing the active ingredient fipronil fail Thurston County's review criteria because fipronil is listed in the USEPA's Group C cancer classification as a possible human carcinogen, and fipronil's degradation product (fipronil desulfinyl) has a single dose toxicity that is considered too high in hazard. The chemical properties of fipronil indicate that it is high in hazard for persistence and bioaccumulation potential.

MOBILITY

Property	Value	Reference	Rating
Solubility (mg/L)	2.4	4	Low
Soil Sorption (Kd=mL/g)	Not found		
Organic Sorption (Koc=mL/g)	803	1	Moderate

Mobility Summary:

Fipronil is not soluble in water, adheres moderately to organic soil, and is considered moderate in hazard for moving off the site of application.

PERSISTENCE

Property	Value	Reference	Rating
Vapor Pressure (mm Hg)	0.000000003	4	High
Biotic or Aerobic Half-life (days)	122	1	High
Abiotic Half-life (days)	Not found		
Terrestrial Field Test Half-life (days)	Up to 75	1	High
Hydrolysis Half-life (days)	> 1,100	1	High
Anaerobic Half-life (days)	123 (soil)	1	High
Aquatic Field Test Half-life (days)	14.5	1	Moderate

Persistence Summary:

It is likely to take more than 100 days for fipronil to breakdown to half of the applied concentration. Chemicals that take more than 60 days to degrade to half of the original concentration have the potential to accumulate in soil when the chemical is reapplied yearly, therefore, fipronil is rated high in hazard for persistence.

BIOACCUMULATION

Property	Value	Reference	Rating
Bioaccumulation Factor	Not found		
Bioconcentration Factor	321	6	Moderate
Octanol/Water Partition Coefficient	log Kow = 4	1	Moderate

Bioaccumulation Summary:

The bioconcentration factor for fipronil indicates that the hazard for bioaccumulation is moderate. The chemical properties of fipronil show that it has a fairly strong affinity to organic solvents which indicates that there is a potential for accumulation in fish and animal tissue. Studies have shown that about 45 - 75% of administered fipronil is excreted and 5 - 25% leaves the body in urine (Reference 5), this could result in as much as 50% of the chemical left in the body. Because fipronil is not rapidly eliminated from the body, the bioaccumulation hazard is rated as high.

ACUTE TOXICITY

Test Subject	Value	Reference	Rating
Mammalian (LD50)	97 mg/kg	1	Moderate
Avian (LD50)	11.3 mg/kg	1	High
Honey bee or insect (LD50)	0.0059 ug/bee	4	High
Annelida -worms (LC50)	"non-toxic"	5	Low
Fish (LC50)	0.085 ppm	1	High
Crustacean (LC50)	0.00014 ppm	1	High
Mollusk (LC50)	Not found		
Amphibian (LD50 or LC50)	Not found		

Acute Toxicity Summary:

Single-dose toxicity testing indicates that fipronil is very highly toxic to aquatic organisms and insects, it is also highly toxic to birds and moderately toxic to mammals. Sunlight will break down fipronil to the chemical fipronil-desulfinyl which has a lethal-dose concentration to mammals (LD50 = 15 mg/kg) that is considered high in hazard and fails the County's review criteria.

ACUTE TOXICITY - Risk Assessment

Subject and Scenario	Dose of Concern	Exposure	Margin of Safety	Route	Reference	Rating
Applicator of 0.29% RTU product onto pet	0.05 mg/kg/day	0.0001 mg/kg/day	500	Skin (dermal)	2	Low
Child 1- 6 drinking treated surface water	0.005 mg/kg/day	0.000025 mg/kg/day	200	Ingesting water	2	Low
Child touching treated pet	0.05 mg/kg/day	0.005 mg/kg/day	10	Skin (dermal)	2	Low
Combined routes of exposure were not evaluated						

Acute Toxicity Risk Assessment Summary

The risk for toxicity from short-term exposures to fipronil from insecticide use in and around the home was evaluated by the EPA. The worst-case exposure to a residential applicator was from Ready-To-Use products containing 0.29% fipronil for use on dogs or cats. These applicator exposures are considered low in hazard. The worst-case exposure after a fipronil application is to a child touching a treated pet. The exposure is 10% of the dose of concern and is rated as low in hazard.

The worst-case scenario for a fipronil application getting into surface water and contaminating a drinking water supply resulted in a short-term exposure that is 200 times less than the dose of concern. These potential exposures are rated as low in hazard.

CHRONIC TOXICITY

Property	Value	Adverse Effect	Reference	Rating
Carcinogenicity	C	Possible human carcinogen	2	Fail
Mutagenicity	Negative		2	Low
Neurotoxicity - (NOAEL)	0.5 mg/kg/day	Positive	2	Check risk
Endocrine Disruption	- -	*Requires testing	2	Conditional
Developmental Toxicity (NOAEL)	20 mg/kg/day	Negative	2	Check risk
Reproductive Toxicity (NOAEL)	2.54 mg/kg/day	Negative	2	Check risk
Chronic Toxicity (NOAEL)	0.5 mg/kg/day	Death	2	Check risk

Chronic Toxicity Summary:

Fipronil has an EPA Group C cancer classification as a possible human carcinogen. Being listed as a possible carcinogen is too high in hazard by Thurston County's criteria.

CHRONIC TOXICITY - Risk Assessment

Subject and Scenario	Dose of Concern	Exposure	Margin of Safety	Route	Reference	Rating
Long-term skin exposures were not evaluated						
Combined exposures were not evaluated						
Exposures to treated food was not evaluated						
Child drinking contaminated water	0.0002 mg/kg/day	0.000005 mg/kg/day	40	Ingestion of water	2	Low

Chronic Toxicity Risk Assessment Summary:

The EPA concluded that the only long-term exposures to fipronil from insect control products are from treated crops (dietary exposures) and from contaminated drinking water. Thurston County does not evaluate dietary exposures because there are no County uses that would include spraying crops. If an insecticide application resulted in fipronil getting into surface water, the worst case exposure would be to a child using it for a long-term drinking water supply. These potential exposures are 40 times less than the calculated dose of concern and are rated as low in hazard for toxicity.

Degradation Products:

Degradation chemicals of fipronil include: fipronil-desulfinyl (photodegradation product), fipronil amide (hydrolysis product and can account for up to 38% by soil degradation), fipronil sulfide (up to 17% by soil reduction), and fipronil sulfone (up to 34% by soil oxidation) References 4 and 6.

Fipronil-desulfinyl has a single-dose toxicity to mammals that is rated as high in hazard (LD50 = 15 mg/kg in rat testing) and fails Thurston County's review criteria.

Comments:

None

References

1. Pete Connelly. Environmental Monitoring Branch, Department of Pesticide Regulation, California Environmental Protection Agency. "Environmental Fate of Fipronil". December 2001.
2. USEPA. [Federal Register: November 26, 1997 (Volume 62, Number 228)] [Rules and Regulations] [Page 62970-62979]. 40 CFR Part 180. [OPP - 300587; FRL-5757-4]. RIN 2070 - AB78. "Fipronil; Pesticide Tolerances".
3. World Health Organization. Food and Agriculture Organization of the United Nations, Rome. "Pesticide Residues in Food - 1997. Report. (FAO Plant Production and Protection Paper - 145)". Section 4.15 Fipronil (T).
4. Russell Stanley Harris, III B.S., Louisiana State University. "The Fate of Bifenthrin and Fipronil in Pine Bark Nursery Media", A Thesis. August 2004.
5. Oregon State University. "Fipronil". National Pesticide Telecommunications Network. December 1997.
6. International Union of Pure & Applied Chemistry (IUPAC). Pesticide Properties Database, fipronil (Ref: BAS 350). [Http://sitem.herts.ac.uk/aeru/iupac/](http://sitem.herts.ac.uk/aeru/iupac/)