chemicalWATCH Factsheet

FLUVALINATE

Fluvalinate is a synthetic pyrethroid insecticide/acaricide which is highly corrosive to the eye and induces severe skin lesions.[1] Fluvalinate is mutagenic, fetotoxic, and causes skeletal abnormalities, ovarian atrophy and moderate to severe systemic effects. The pesticide is highly toxic to fish.

Registered since 1983, it is marketed as Mavrik™ and Spur™ by Zoecon Corp. Fluvalinate is used against a large number of pests on food crops, turf and crops for seed. Classified by EPA as a 'restricted use pesticide,' it may only be applied under the supervision of a licensed applicator.

Like other synthetic pyrethroids, fluvalinate kills insects by damaging their nervous systems. Specifically, synthetic pyrethroids cause repetitive discharge and strong excitatory action of the central nervous system, peripheral nerves and skeletal muscle fibers by interfering with axonal sodium and potassium channels, thus disabling the nerve's ability to recharge after transmitting a signal.[2,3,4] Typical of synthetic pyrethroids, fluvalinate also causes neurological symptoms in humans.[2,3,4] It also causes nerve cell degeneration in peripheral nerves of rodents.[2]

Skin *paresthesia*—a tingling or burning sensation of the skin—results from exposure to fluvalinate.[5] Responses in humans range from mild symptoms to fissuring, bleeding, and ulceration of the skin that lasted for months.[6] In the rat, dog and mouse, skin lesions consisting of scabbing and plantar ulcers (ulcers on the animals' paws) were associated with systemic infection.[6] These changes were present in mice given the lowest dose of 1 mg/kg. In fact, a two year chronic oral rat study had to be terminated at the end of 64 weeks because of the severity of the skin lesions. According to EPA, the rat study was repeated with the pesticide administered by gavage (oral intubation) and plantar ulcers were till present.[6]

However, EPA concluded that observed "skin lesions in rats is a result of a topical dermal phenomena and not the result of a systemically induced effect and that the experimental data developed for rats, though not directly applicable to dogs and mice because of species differences, is supportive in drawing the same conclusion for dogs and mice, as was concluded for rats," even though the chemical was administered in capsules to dogs.[6]

Having thus discounted the evidence of skin lesions from low oral doses, EPA calculated an acceptable daily intake (ADI) of 0.01 mg/kg/day.[7] Tolerances for residues of fluvalinate in fat, meat, eggs and milk are 0.01 ppm, and 0.1 ppm for cottonseed.[1]

The median lethal dose, LD_{50}, has been reported as 282 mg/kg for male rats and 261 mg/kg for female rats.[1] The inhalation acute LC_{50} for racemic technical is > 5 mg/L. Female mice appear to be more sensitive than males. Half-resolved technical is more toxic than the racemic technical.[6] *[Note: fluvalinate is actually a mixture of molecules which are mirror images of each other, called enantiomers. Racemic refers to an equal mixture of enantiomers, while half-resolved means that there is more of one enantiomer. It is quite common among pyrethroids for one enantiomer to be more toxic than the other.]*

In a fourteen day acute oral toxicity study in adult rats given the lowest dose, 1.5 mg/kg of Mavrik Aquaflow Insecticide 2-F™ (half-resolved) the animals developed signs of toxicity which increased in severity at the high dose levels.[8] Rats were dosed once and then observed. Clinical signs that subsided by days three and four were: salivation, labored breathing, bloody nasal and occular discharge, diarrhea, and weakness. Loss of hair and anal sores did not subside. Animals in the higher dose groups hemorrhaged into their stomachs and intestines. Females were much more susceptible to the toxic effects of the formulation than males.

While EPA claims that data submitted for chronic toxicity and carcinogenicity studies indicate that there were no adverse effects under the conditions of the test,[7] NCAMP's review found that the mice ingested doses well below the tolerated doses for such studies and therefore the study is of questionable validity. Fluvalinate is mutagenic in mouse lymphoma cells and bacteria, and induces sister chromatid exchanges.[1,6] EPA referred to problems in dog spleens without further details.[6]

In teratology studies, rats and rabbits developed skeletal abnormalities such as delayed ossification, decreased weight and length of fetuses and curved leg bones (tibia and fibula).[6] In a rat reproduction study, there were significantly decreased pup weight and growth, and decreased survival to weaning. In a subchronic study, female mice displayed ovarian atrophy and ovarian cysts.[6]

The pesticide is extremely toxic to fish, with an LC_{50} for bluegill sun fish of 0.09 µg/L (90 parts per trillion) and

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for rainbow trout 2.9 µg/L (2.9 parts per billion).[1] The level for mysid shrimp is 2.9 µg/L. EPA states the pesticide has low avian toxicity.[1]

Fluvalinate degrades in soil under aerobic conditions with half lives of four to eight days and anaerobically with a half life of fifteen days. While fluvalinate is said to have little potential to leach, major soil metabolites may leach in some soils.[1] The pesticide photodegrades in aqueous solutions with a half life of 0.6 to 1 day breaking down to the haloaniline, anilino acid and 3-phenoxybenzoic acid.[9] Additional data are needed to fully assess the environmental effects of the pesticide.

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Fluvalinate references

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