

# chemicalWATCH Factsheet

## PERMETHRIN

In 1982, EPA began to allow an expansion of permethrin (Pounce™, Torpedo™, Dragnet™) registrations to include use on livestock and poultry, eggs, vegetables like potatoes, and fruit. Before 1978, permethrin had been registered for use on cotton crops only. This action alone is estimated to have expanded the market for permethrin 500%. Between the years 1981 and 1982, permethrin products were the subject of 195 "Special Local Need" registrations. A termiticide formulation has been available since 1985.

The major manufacturers of permethrin are FMC Corp. and ICI-Americas of Great Britain. This synthetic pyrethroid resembles natural pyrethrins chemically, but is chlorinated to increase its stability. There are four isomeric forms, two cis- and two trans-, of technical permethrin. Although the acute toxicity of the mixture (oral rat LD<sub>50</sub>>5000 mg/kg, oral mouse LD<sub>50</sub>=500) is less than that of natural pyrethrins, the cis-isomer is considerably more toxic (oral mouse LD<sub>50</sub>=100), and in rats, the metabolites of the cis-isomer are more persistent biologically. (The cis and trans isomers differ in spatial arrangement of the atoms.) Formulations of permethrin can vary greatly in isomeric content.

Despite the fact that permethrin is not very acutely toxic, there are

numerous reports of transient skin, eye and respiratory irritation in humans. Workers and researchers report tingling in face and hands, and some people have reported allergic reactions. Permethrin is a central nervous system poison which acts on the sodium channels in cell membranes.

EPA now ranks permethrin as a class C, or possible human carcinogen, but this rating was the subject of contention for nearly 10 years. Five of seven available studies were considered in EPA's first assessment of the oncogenic potential of permethrin, conducted in the early 1980's. Statistically significant results were seen in two. Dose-responsive increases in benign lung tumors were found in female mice, and in a second study, alveolar (lung) cell proliferation, lung adenomas and carcinomas, and benign liver tumors were seen in female mice. The time to tumor development was significantly shortened in the latter study. Mutagenicity tests were negative. Much controversy concerning the significance of these results ensued, but EPA's official stance at the time was that permethrin was not a carcinogen. However, EPA scientist Dr. Adrian Gross, dissenter on EPA's evaluation, stated to the media at the time that if "one calculates the risk using

the legal maximum [dietary] exposure set by EPA in October, 1982, the 'allowable daily intake' of 0.05 mg/kg/day, the maximum risk increases to about one cancer per 1000, a very large risk."

Permethrin is stable to hydrolysis, with a half-life of more than 50 days at elevated temperatures and pH =9. Unlike most other pyrethroids, permethrin is relatively stable to ultra-violet light, although it is less stable to highly alkaline conditions. The vapor pressure of permethrin at 50°C is 1x10<sup>-6</sup> mm Hg, probably less at room temperature (values not available). Permethrin is strongly absorbed to soil and sediments containing adequate amounts of organic matter. Review of an activated sludge metabolism study indicated that permethrin was not biodegradable, that 80% of what was submitted for digestion appeared in the solid material, while 10% passed on in the supernatant undegraded. The termiticide formulation is effective against termites for 1-5 years.

Permethrin is known to be very toxic to fish and bees. In addition, permethrin is toxic to most insects, but is reported to be especially effective against butterfly and moth species. Insect resistance has begun to be reported.

*Bibliography on reverse*

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## Pesticides and You

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