Bendiocarb Summary

Bendiocarb is a nonselective carbamate insecticide. Like organophosphates, carbamates are cholinesterase inhibitors but are generally less toxic. Unlike organophosphates, the nerve damage can be reversible.

Acute toxicity

The acute toxicity of bendiocarb to mammalian species varies. Cats are the most sensitive of the species tested, with doses of 8 mg/kg (approx 160 ppm) killing half the individuals tested. In similar studies with rats, the lethal doses ranged from 34-48 mg/kg for the technical grade to 12,000 mg of the 1% dust formulation per kg.

The toxicity of bendiocarb to other species tested varies from very highly toxic to toxic. Sensitive species include: bluegill sunfish, trout, bees, aquatic invertebrates, and birds. EPA states it may also impair the reproduction of birds.

Chronic toxicity

In lab studies, bendiocarb has caused chromosomal aberrations in human lymphocyte cells. However, gene mutation and DNA damage/repair tests have been largely negative. Bendiocarb has not caused carcinogenic effects in rat or mice studies.

In developmental studies, 2 of 3 rat studies showed adverse effects (increased resorptions and late intrauterine death). In rabbits, teratogenic effects occurred only with severe maternal toxicity. One rabbit study found fetotoxic effects (delayed skeletal formation) at 2.5 mg/kg.

Reproductive effects occurred in at least four studies. Effects included decreased pup survival, reduced postnatal weight gain, and slight delay in mating.

Environmental Fate

Column leaching studies found bendiocarb to be mobile. One study specifically mentioned the degradation product, and found it was mobile as well. No data was available from actual use.

Most of the available data indicate short half-lives in soil (2-6 days). However, longer half-lives of 28-68 days have also been reported. Little field data was available.

In lab studies, half-lives in water appear to vary widely with pH, from 1 day to over 37 days.

Little applicable information was found about persistence on interior surfaces. One study found residues up to 0.56 ppm on food containers in contact with shelf paper containing bendiocarb did not decline over the 8 week exposure period. Another found approximately 25% residual on ceramic tile and 30% on vinyl tiles after 7 days.

Nontarget effects

Several examples in EPA reviews were found of studies or models which indicated adverse effects could be anticipated at typical application rates and practices.

For example, a study using a 10% formulated product found 100% mortality of red-winged blackbirds when the bird ingested 10 granules. A typical application could result in 1417 granules/ft2.

Another example: In a normal rainfall year (location not stated), the concentration in runoff was estimated to be 46% of the toxicity of fish and 739% of the toxicity to aquatic invertebrates.

The expected environmental concentration on short grasses was calculated to be 960 ppm.

Other

The technical grade may potentially contain chlorinated dibenzodioxin or dibenzofuran impurities. A hydrolysis product can cause skin sensitization. Lenticular opacity was seen in a rat feeding study at 20 and 200 ppm. In 1987, major data gaps existed for environmental fate studies.

Conclusions

Bendiocarb does not pass the review criteria. Chronic studies have been positive, but the most overwhelming concern is acute effects to nontarget species.

This was not a particularly thorough review. Much of the data was from older EPA information. But there didn't seem to be any point in further investigation, given the wide range and severity of effects noted.