ChemicalWatch Factsheet

A Beyond Pesticides/ NCAMP Factsheet

Benomyl

Is enrollment in EPA's Special Review program the kiss of death for a pesticide product? If the history of the widely-used fungicide benomyl (Benlate™, Tersan™, Arbotrine™) is any indication, definitely not. Even though extensive testing has shown that benomyl is a carcinogen, a teratogen (causes birth defects), a spermatotoxin, and a mutagen, EPA ended a lengthy Special Review process without even requiring a birth defect warning on the label, much less curtailing usage.

Registered since 1968 by sole producer E.I. duPont de Nemours & Co., benomyl is used extensively on field crops, in orchards, as a seed treatment, as a post-harvest dip for fruit, on turf and on ornamentals. The systemic (cannot be washed off) fungicide is thought to act by inhibiting DNA synthesis. Benomyl accounts for 55% of the $320 million worldwide fungicide market. A 1986 National Academy of Sciences report notes that 69 of 70 species of fungi known to be resistant to fungicides are resistant to benomyl in particular.

In December, 1977 EPA initiated a Special Review of benomyl because risk criteria exceeded at that time included: mutagenicity, teratogenicity, sperm activity reduction, and acute toxicity to aquatic organisms. In 1979, EPA's Scientific Advisory Panel, charged with reviewing both the data and EPA's proposed actions, recommended against imposition of label warnings of the teratogenicity of benomyl, citing data indicating low dermal absorption. Thus, the upshot of a five-year EPA Special Review was the continuation of all traditional uses of benomyl, according to the 1982 conclusion of the Special Review. The only new requirements imposed were a label change directing workers engaged in mixing/loading operations for aerial spraying to wear cloth dust masks, and the initiation of aquatic monitoring studies to determine residue levels in aquatic sites adjacent to rice fields.

Industry studies show that both benomyl and its major metabolite, methyl-2-benzimidazole carbamate (S-MBC), are teratogenic in at least nine studies in both rats and mice, causing decreased size of the testes and depressed spermatogenesis.

DuPont studies also show that both benomyl and MBC are liver carcinogens in mice, and that benomyl, in addition, causes lung tumors in male mice.

Benomyl residues do not bioaccumulate, rather they are quickly metabolized and cleared as the glucuronide and/ or sulfate of the major metabolite. Clearance is complete and rapid; in experiments, 99% of the radiolabelled test compound was recovered from urine/feces in 72 hours.

EPA's 1979 Position Document 2/3 (notice of preliminary determination) states that concentrations of benomyl in natural bodies of water after application to rice fields were as high as 50 ppb, greater than one half the acute LC_{50} (lethal concentration) for channel catfish (8-12 ppb), bluegill sunfish (0.4-1.2 ppb) and *Daphnia magna,* also known as the "water-flea," (0.64 ppb). As of a September, 1986 progress report, further studies had been received in 1984 and are still "under review." Benomyl is known to be toxic to fish and earthworms. Half-lives of benomyl on turf range 3-6 months and 6-12 months on bare soil.

DuPont studies show that residues concentrate in orange juice, dried apricots, plums and grape

chemicalWATCH Stats:

Chemical Class: Fungicide
Use: Phased Out
Toxicity Rating: Toxic
Signal Word: Caution
Health Effects: Possible carcinogen, probable endocrine disruptor, linked to reproductive effects, neurotoxicity, kidney/liver damage, and birth/developmental defects.
Environmental Effects: Detected in groundwater, toxic to fish/aquatic organisms.

juice. The significance of this fact is that the Delaney Clause of the Food, Drug and Cosmetic Act does not allow residues of carcinogenic pesticides to be used on raw foods when residues of the carcinogen are shown to appear at higher levels in the processed form of the food. Since 1988, both EPA and Congress have been moving towards a policy of accepting what they call "negligible" levels of carcinogens in food.

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Update, *April 2007*:

In April 2001, DuPont requested voluntary cancellation of all its benomyl registrations. The DuPont cancellations became effective August 8, 2001. All other companies holding benomyl product registrations have also since requested and obtained voluntary cancellation of their benomyl products, effective January 15, 2002. Also in August 2001, a jury ruled that DuPont had to pay two Costa Rican growers $29.5 million for plant damage caused by the fungicide Benlate, a formulation of benomyl.

Benomyl *chemicalWATCH* Factsheet Bibliography

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