UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

DATE: April 21, 1977

SUBJECT: Response to Campt memo of March 30, 1977

FROM: Environmental Chemistry Section
Efficacy & Ecological Effects Branch

TO: Acting Director
Registration Division

THRU: Pesticide Science Officer
Registration Division

In response to your memo:

1. Incremental risk assessment for terrestrial crop use of thiabendazole (TBZ).

   a. TBZ for application to the growing crop sugar beets has registered status. The approximate sugar beet acreage grown anually is about 1,000,000 acres of which it is estimated 25,000 could be treated with TBZ. Most of this acreage is in California, East of the Rockies and the Northern Plains.

   b. The proposed new use of TBZ is on the growing crop soybeans. The approximate soybean acreage being 50,000,000 acres of which it is estimated 6,000,000 acres, may be treated. Most of these acreages in lower Mississippi Valley.

   c. All other accepted uses were of a character that did not require environmental chemistry assessment. These uses were not considered in the incremental increase. The incremental increase is from an estimated 25,000 acres to an estimated additional 6,000,000 acres, a 240 fold increase in acreage. This represents an additional undefined burden on the environment.

2. The following scientific facts are noted on TBZ.

   a. Laboratory experiments of 14C-ring labeled TBZ was found to be stable in soil under aerobic and anaerobic conditions without LIGHT. The only extractable compound was TBZ and the rest of the 14C compound(s) unextractable. The T 1/2 TBZ was over a year.

   b. Photolysis in deionized water solution yielded 21 photo production in 60 min. The major products were TBZ 14.9%, Benzimidazole 28.6%, Benzimidazole-2-carboxamide 15.3% and unknows 14.97%. Photodegradation occured at pH 3, 6 and 9 but no identity work was done.

c. Photolysis on sugar beet leaves was slow. Only small amounts of benzimidazole and benzimidazole-2-carboxamide found when plants are grown in a Phytotron. Plants grown outside showed additional degradation. Plants grown in a phytotron contained 95% of total applied 14C-TBZ, 97 to 98% of this was TBZ. Plants exposed to sunlight contained 76% of total applied 14C-TBZ, 78% of this total was TBZ and 22% altered unidentified products and there was a 24% loss of total 14C TBZ. The crop surface may have an inhibiting effect on photodegradation of TBZ. This is not indicated in the photodegradation study in water. If, TBZ photodegrades on soil the products formed may be benzimidazole and benzimidazole-2-carboxamide of which one is a suspected teratogen. These maybe taken up by rotational crops or by accumulated in fish. These studies, rotational crops and fish accumulated are done in a way that photodegrates would not be present. Photodegradation appear to be the primary mode of degradation in the environment.

d. Stable at pH's of 3,6 and 9 at 25 to 45°C, yet acid is used as partition method in clean up procedure. If one can acid partition TBZ, then TBZ should not be stable at acidic pH's tested.

e. Field experiments using 14C-TBZ showed residues bound in soil. The only extractable residue is TBZ. Parent compound is not found in soil when foliar applied. This may be indicative of photodegradation prior to hitting of soil or on soil surface. Another indication that photodegradation on soil surface is needed for further assessment.

f. Rotational crops did not pickup 14C-TBZ from treated soil. This experiment, as set up, may prevent photodegradation, thus uptake of photoproducts would not be considered. Photodegradation appears to be a major route of degradation and is needed to assess if additional crop uptake studies are needed.

g. Fish exposed to soil treated with 14C-TBZ and aged 30 days prior to exposure. This experiment as set up would prevent photodegradation, thus accumulation of photo products would not be considered. Photodegradation appears to be a major route of degradation and is needed to assess potential for accumulation in fish.

h. The results of studies show TBZ to be stable at pH's 5,7 and 9. Residue methods for crops extract TBZ with Ethyl Acetate and then clean this extract with NaOH, and then partition with HCl.

The TBZ is in the HCl layer. This being the case than a recation must have occured in the hydrolysis study at pH 5 but none was reported. An explanation is needed. TBZ in the HCl solution is reacted with NaOH then the method proceeded onward. These results indicate that if TBZ is converted in acid soil, the reaction product would not be extracted with the solvent (ethyl acetate). If the solvent contained NaOH then maybe extractable identifiable residues may be determined. The same would apply to crops and animals (fish) if such reaction occured in living bodies. This reaction with acids is probable in animals. This may or may be the case in plants. In any case, extracting with solvents containing NaOH should be tried, the reacted product via acid has not been identified in soil, water and living organism, if one occured. We do not know if work has been done to identify such products, but if a reaction occurs the methods submitted will not extract said products. Recovery data will not determine reacted products or losses which only time (aged) studies would. The above (h) is speculative but is indicative of problems with TBZ.

3. The data gaps once fullfilled will fill a void which will enable us to assess uptake in rotational crops and in fish. If photodegradation occurs and one of the products is benzimidazole-2-carboxamide a possible a teratogen which could be taken up; we defer to Toxicology Branch for additional hazard assessment. Photodegradation in water is the only mode of degradation thus far identified and dissipation is via binding.

4. The incremental risk assessment for additional terrestrial use is that the risk is unacceptable as indicated in 1, 2 and 3 above. Further review to determine incremental risk will be made after data requested is submitted and review and data in OPP files is validated.

Ronald E. Ney, Jr.

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cc:

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