UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

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MEMORANDUM

SUBJECT: Environmental Fate and Transport of Azinphos-methyl (GUTHION[R]) for Inclusion in Briefing Document

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Attached is the environmental fate and transport assessment for AZINPHOS-METHYL to be included in the planned briefing document, as discussed in the EEB/EFGWB/SACS meeting held on 5/19/92.

AZINPHOS-METHYL- Environmental Fate

I. SUMMARY

Hydrolysis and photodegradation in water are the fastest degradation routes for azinphos-methyl (half-lives less than one week). Although azinphos-methyl is not rapidly photodegraded or biodegraded in soils (half-lives greater than one month) and not considered to be extremely mobile in soils, azinphos-methyl residues could potentially enter surface water(s) with eroded soil particulates rather than by dissolved run-off, especially if very heavy rainfall events occur immediately after application.

II. DETAILED INFORMATION

a. Hydrolytic stability:
The hydrolysis half-lives of azinphos-methyl at pH 4, 7, and 9 are 39, 23, and 2.2 hours, respectively; hydrolytic stability decreases with increasing pH of the aqueous media. Major degradates are Mercapto-methyl benzazimide and bis-(benzazimide-N-methyl) sulfide.

b. Effect of exposure to sunlight:
In buffered pH 4.4 water azinphos-methyl degraded with a half-life of 76.7 hours; the main degradates were benzazimide (maximum 40% after 87 hours) and anthranilic acid (7.2% at 56 hours). On sandy loam soil the half-life of degradation was 99 days.

c. Biodegradation:
Only data on the aerobic and anaerobic biodegradation of azinphos-methyl on soils are available. Under aerobic conditions, the half-life of azinphos-methyl in sandy loam soils was 44 days; under anaerobic conditions, the half-life was 68 days. The metabolites detected were the "azinphos-methyl oxygen analog", mercaptomethyl benzazimide, benzazimide, hydroxymethyl benzazimide, and bis-methyl benzazimide sulfide. Of these metabolites, the "oxygen analog" reached a maximum of 5% after 190 days under aerobic conditions and 0.6% after 90 days under anaerobic conditions; the benzazimide metabolite reached a maximum of 12% after 120 days under aerobic conditions and 9% under anaerobic conditions (no specific amounts of each metabolites were reported in the study). Most of the residues were found as soil-bound residues. Although the biodegradation of azinphos-methyl is not considered a fast degradation pathway, the results indicate that azinphos-methyl is prone to biodegradation. No data on the aerobic or anaerobic aquatic biodegradation are available in the files.

d. Mobility in Soil:
The results of batch-equilibrium adsorption/desorption studies indicate that parent azinphos-methyl is not expected to be extremely mobile in soils. Aged residues of azinphos-methyl do not appear to be very mobile. However, no data are available for mobility of individual degradates/metabolites of azinphos-methyl.

Parent Azinphos-Methyl

	K_{ads}
Silt loam soil (5% OM; pH 7.9)	16.75
Sandy loam soil (2.8% OM; pH 6.6)	7.60
Silty clay soil (0.5% OM; pH 6.0)	9.85

e. Terrestrial Field Dissipation:
Data indicate that the field dissipation of azinphos-methyl is variable and likely to depend on the type of soil. Half-lives of dissipation vary from 30 days to 181 days. In has been noted in the studies that residues do not move below the 6-inch depth.

f. Bioaccumulation in Fish:
Catfish continuously exposed to azinphos-methyl bioaccumulated total ^{14}C residues at 139x on day 4 of exposure, but averaged 60x during days 7 to 28 of exposure. About 90% of the total residues present on the last day of exposure were released during the 2-week depuration period. However, no data are available on the distribution and nature of the residues in the different parts of the fish. The results indicate that bioaccumulation occurs in the earlier stages of exposure, but it is not known from the available data if fish were exposed to parent azinphos-methyl alone or to any of its degradates.