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DATA EVALUATION RECORD

STUDY 5

CHEM 059101 Chlorpyrifos §161-4

FORMULATION--00--ACTIVE INGREDIENT

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Fontaine, D. and D. Tester. 1987. Chlorpyrifos: Photodegradation of chlorpyrifos in the vapor phase. Laboratory Project ID: GH-C 1911. Unpublished study prepared by ABC Laboratories in cooperation with Dow Chemical U.S.A. 30 p.

TOTAL REVIEW TIME = 3

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CONCLUSIONS:

Degradation - Photodegradation in Air

This study is scientifically sound and provides supplemental information towards the registration of chlorpyrifos. This study does not fulfill EPA Data Requirements for Registering Pesticides because the intensity of the artificial light source was not reported, the description of the photoreactor chamber was inadequate, not all degradates comprising ≥10% of the applied were identified, and degradate data were reported as percent of the recovered rather than percent of applied and the appropriate raw data were not provided to determine the recovery.

SUMMARY OF DATA BY REVIEWER:

Pyridine-labeled [$^{14}$C]chlorpyrifos (radiochemical purity >98%), applied at 22.9 μg to each 72-L borosilicate glass flask, degraded with a half-life of 1-2 days ([$^{14}$C]residues in the vapor phase plus [$^{14}$C]residues

adsorbed to the flask walls) when irradiated with artificial light (total intensity unspecified). The registrant-calculated half-life was 2.6 days. After 7 days of irradiation, chlorpyrifos and its degradate . . .

pyridinol (3,5,6-trichloro-2-pyridinol)

comprised 14 and 49% of the recovered radioactivity (from TLC plates), and two unknowns comprised 8 and 16% of the recovered. Chlorpyrifos comprised 56% of the recovered after 7 days in the dark control, and the only degradate detected was pyridinol comprising 43% of the recovered.

DISCUSSION:

1. The intensity of the artificial light source was not reported.

2. The description of the photoreactor chamber was inadequate. It was reported that irradiated flasks were placed behind a shield having an 11-cm diameter opening. It is unclear how much of the flask was actually exposed; no diagram was provided.

3. One degradate, comprising up to 16% of the applied, was not identified.

4. Degradate data were presented as percent of the recovered rather than percent of the applied. Total recoveries of [$^{14}$C]residues from the TLC plates are necessary to interpret the data.

5. Reference compounds of the degradates of chlorpyrifos were not co-chromatographed with the samples.

6. Degradation of the test substance is affected by the surface of the container (wall affects). This study was conducted using only one type of container (72-L borosilicate flasks). Research conducted by Crosby and Moilanen [Archives of Environmental Contamination and Toxicology, 2(1):-62-74] demonstrated that the use of a 72-L borosilicate flask minimized the wall affects for the pesticides aldrin, dieldrin, photoaldrin, and photodieldrin. Since only four pesticides were studied by Crosby and Moilanen, it cannot be determined if wall affects would also be minimized for other pesticides under these conditions. Experiments to determine the extent of wall effects for chlorpyrifos under the experimental conditions should have been conducted.

7. The degradation rate of a volatilized test substance is affected by the concentration of the test substance in the air. This study was conducted using only one concentration (22.9 μg/flask) of chlorpyrifos; the degradation rate may differ for other concentrations of chlorpyrifos.

# MATERIALS AND METHODS

MATERIALS AND METHODS:

A 229-ppm solution of pyridine-labeled [$^{14}$C]chlorpyrifos (radiochemical purity >98%, specific activity 15.78 mCi/mmol, Dow Chemical USA) in hexane was added (procedure not described) to 72-L borosilicate glass flasks at 22.9 µg chlorpyrifos per flask. The flasks were sealed and incubated at 25 ± 2°C in a photolysis chamber equipped with a xenon lamp (total intensity not reported). The spectral energy distribution of the xenon lamp as compared to natural sunlight is presented in Figure 3 and Appendix I. In the photolysis chamber, the flasks were placed 83 cm from the xenon lamp behind a shield which had an 11-cm diameter opening. For controls, similarly prepared flasks were treated with [$^{14}$C]chlorpyrifos, enclosed in a box, and placed in the photolysis chamber. Irradiated and dark control flasks were sampled at 0, 1, 2, 3, 5, and 7 days posttreatment.

Samples were taken by placing the flasks in a freezer for 1-2 hours to produce condensation which was rinsed from the flasks with methanol. The samples were analyzed for radioactivity by LSC and for chlorpyrifos and its degradates by TLC on silica gel plates developed in methanol:water (85:15). Reference [$^{14}$C]chlorpyrifos was cochromatographed with the samples. Radioactive areas were detected and quantified with a TLC radioscanner.

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