Bull. Environm. Contam. Toxicol. 27, 122-125 (1981)

Insecticide Concentrations in Air after Application of Pest Control Strips

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Contamination of air in homes due to spraying of pesticides is of concern to the public. A pest control strip which kills creeping and crawling insects by contact is one method of reducing the amount of insecticide in the air. Several different insecticides are now available in this form. The manufacturers believe that there is little if any vaporization of these insecticides into the air. This study was designed to determine how much if any insecticide gets into the air of a room with properly applied pest control strips.

EXPERIMENTAL

Pest control strips containing a 10% concentration of either propoxur, diazinon, or chlorpyrifos (Hercon Insectape,* Health-Chem Corp., New York, NY) were applied in a room according to the manufacturer's directions. The room was 3 m x 3.6 m with 2.8 m ceiling. Air exchanges (8-10 per hour) were made through a single inlet and single outlet in the ceiling. The temperature and humidity in the room were maintained at 21 ± 1°C and 50 ± 20%, respectively.

Thirty-six insecticide strips (2.5 x 1.0 cm) were placed in the room, eighteen at floor level and at 1 m up on the wall. They were placed at ca 0.75 m intervals.

An ERCO (Environmental Research Corp., St. Paul, MN) portable high volume air sample was placed in the center of the room on the floor, which placed the air intake 28 cm off the floor. One side of ERCO's dual intake was blocked providing a single sample for each period. The sampler was operated at 11.2 m^3/hr for 2 hr.

The trapping media was a 15 cm circular filter pad of a 3:1 mixture of Porapak R and glass fibers between two glass filters (LISSICK and BOSIN 1975; LEWIS 1976). This trap had been used previously for trapping of organophosphorus insecticides (LISSICK and BOSIN 1975; LEWIS 1976; JACKSON and LEWIS 1979). Pretreatment samples were taken in the room prior to the start of any study.

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*Mention of trade names is for identification only and does not constitute endorsement by the U.S. Environmental Protection Agency.

0007-4861/81/0027-0122 $01.00

After application of the strips, air samples were taken at 0.25, 1, 2, 3, 4, 7, 15, and 30 days for all insecticides and also at 5 days for chlorpyrifos. The diazinon study was carried out in duplicate, whereas only single tests were made with the propoxur and chlorpyrifos strips.

The filter pads were stored in a freezer after sampling until time of analyses (never exceeded 15 days). The pads were Soxhlet extracted for 4 hr (5 cycles/hr) using benzene for propoxur or ethyl acetate for diazinon and chlorpyrifos. The extracting solvent was reduced to ca 1-10 ml with a rotatory evaporator.

The diazinon and chlorpyrifos samples were subjected to GC analysis without further cleanup. The propoxur samples were derivatized by the method of JACKSON et al. (1981), followed by the deactivated alumina cleanup procedure of COBURN et al. (1976). The propoxur derivative eluted in all three fractions, therefore, all fractions were analyzed and the results totaled. A standard of propoxur was carried through the derivatization and cleanup procedures with each batch of samples. The propoxur was analyzed by GC-EC (Ni-63) on a 183 x 0.64 cm glass column of 3% OV-1 on Gas Chrom Q (80/100 mesh). Carrier gas was nitrogen at 60 cc/min. Temperatures were inlet: 200°C; column, 160°C; and detector, 320°C.

Diazinon and chlorpyrifos were analyzed by GC-FPD (Phosphorus mode) with a 183 x 0.64 cm glass column of 4% SE-30/6% OV-210 on Gas Chrom Q (80/100 mesh). Carrier gas was nitrogen (100 cc/min). Detector gases were: air (80 cc/min) and hydrogen (60 cc/min). Temperatures were inlet: 220°C; column, 200°C; detector, 180°C.

Extraction efficiencies were determined by spiking a filter pad with the compound of interest, allowing the solvent to evaporate and then extracting. Collection efficiencies were established by spiking a 15-cm circular glass fiber filter with the compound of interest. The ERCO sampler was modified to allow the placement of this filter 1 cm upstream from the collection pad. The sampler was operated for 2 hr at 11.2 m^3/hr. Both the glass fiber filter and the pad were analyzed separately and the collection efficiencies calculated.

RESULTS

The extraction and collection efficiencies are shown in Table 1. Propoxur and chlorpyrifos results were corrected for the respective collection efficiencies. The diazinon results were not corrected.

The air concentration results are shown in Table 2. It is evident that all three pest control strips did emit vapors into the atmosphere. The highest air concentrations found were less than 0.8, 1.4, and 0.25 $\mu g/m^3$ for propoxur, diazinon, and chlorpyrifos, respectively. The sharp drop on day 4 for propoxur is

TABLE 1
Extraction and Collection Efficiencies

	Propoxur	Diazinon	Chlorpyrifos
Extraction			
n	3	2	2
Range	100 µg	2-40 µg	2-4 µg
% Recovery	99	95	93
Collection			
n	2	4	6
Range	100 µg	2-40 µg	2-4 µg
% Recovery ± SD	54 ± 0.5	93 ± 6	77 ± 5
Detection Limit	0.005 µg/m³	0.01 µg/m³	0.02 µg/m³

TABLE 2
Air Concentrations of the Insecticides

Time after Treatment (Days)	Propoxur (µg/m³)	Diazinon (µg/m³)	Chlorpyrifos (µg/m³)
Pretreatment	<0.005[a]	0.01[b]	0.03[c]
0.25	0.40	0.32	0.10
1	0.39	0.56	0.12
2	0.79	0.76	0.14
3	0.58	0.60	0.14
4	0.11	0.84	0.14
5	-	-	0.18
7	0.33	0.90	0.23
15	0.74	1.34	0.18
30	0.70	1.21	0.16

[a]Corrected for a 54% recovery.
[b]Average of two experiments.
[c]Corrected for a 77% recovery.

unexplained, but is probably an analytical or sampling error. Maximum room levels were reached in 7 to 15 days. There was no characteristic odor of insecticide in the room, an advantage to persons whom odors offend.

ACKNOWLEDGMENT

The authors thank Donald K. Hinkle for providing the pest control strips, the room facilities, and assisting in the sampling.

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Accepted May 7, 1981