Bull. Environ. Contam. Toxicol. (1989) 43:713–716

Bulletin of Environmental Contamination and Toxicology

Acephate Present in Food–Serving Areas of Buildings after Baseboard Spraying

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Insecticide labels for residual insecticides usually specify a spot (max 0.19 m^2), general surface, and/or crack and crevice application when used in food-service dining facilities for German cockroach control. Acephate and other insecticides have been detected in the ambient air of structures following their application using spot and/or crack and crevice application techniques (Wright et al 1981). Acephate, diazinon and chlorpyrifos have been found on nearby surfaces following their application as a pinstream spray into cracks and crevices or directed at the cracks and crevices (Leidy et al 1987, Wright et al 1984). The label on the acephate (Orthene PCO Formula II™) formulation states that it can be applied along and behind baseboards as a low pressure spot spray. German cockroach control recommendations usually list the ideal insecticide application sites as areas where they shelter, for example, cracks and crevices, and not on exposed surfaces such as baseboards. In practice, quantities of the insecticide are often applied to baseboards which are easily and quickly treated. In this site they do not give maximum control and are placed where persons, especially young children, and pets can easily contact the surfaces, thus, increasing the possibility of dermal exposure. Additionally, baseboards are a broad surface from which the insecticide vapor can move to non-target surfaces and into the ambient air. Because of these factors we were interested in determining insecticide levels on baseboards following their direct application and the quantities which moved to non-target sites. The study discussed hereafter determined these levels.

MATERIALS AND METHODS

Vinyl baseboards in the dining rooms and food-serving areas of five buildings were used in the test. Prior to acephate application the ambient air in the dining rooms was sampled to determine baseline levels of acephate using a Byron Model 90 Sample Collectors™ (Byron Instruments, Raleigh NC 27601). These samplers were equipped with polyurethane foam (PUF) (2 cm od. by 3 cm) trapping devices and had a flow rate of 2 L/min (Wright et al 1988). Samplers were placed in the same site near one wall in the

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dining rooms with the absorbent about 76 cm from floor level. In each building three surfaces, a wall immediately above and touching the baseboard in the dining room, a vertical surface on the front of a stainless steel serving counter in the food-serving area, and the side of a stainless steel hood in the kitchen, were sampled for acephate prior to treatment following the method of Leidy et al (1987). Upon completion of daily activity in the dining facilities, and with all exposed food removed as per label directions to avoid possible insecticide contamination, the baseboards in the dining rooms and food-serving areas were sprayed with a 1% acephate solution. A 3.8 l compressed air sprayer with fan spray (Multeejet Nozzle, No. 1/8" T-5700, manufactured by Spraying Systems Company, Bellwood, IL 60104) was used to apply the acephate. The quantity of acephate applied, actual application time, and size of the treated areas were recorded. Kitchens were not treated. Immediately upon completion of the application, air and surface samples were taken to detect any changes in acephate levels. The second and subsequent surface samples were each taken 5 cm to the right of the sample taken previously. Air and surface samples were taken 1 and 2 wk after application. Residue data were analyzed by an analysis of variance (ANOVA).

RESULTS AND DISCUSSION

During baseboard treatment quantities of acephate were inadvertently applied to or splashed on the wall above the target baseboards. The amount of acephate applied ranged from 454 to 1189 ml, with a mean of 667 ml. Mean application time was 12 min, with a range of 6 to 20 min. The average surface area of baseboards treated was 153 m^2, with a range of 88 to 288. There was no correlation between area size, quantity of pesticide applied, or application time.

No airborne concentrations of acephate were detected in the dining rooms prior to baseboard spraying. Immediately after acephate application the mean residue levels were 0.46 $\mu g/m^3 \pm 0.19$. Only two dining rooms contained detectable airborne levels of acephate ($0.11 \mu g/m^3 \pm 0.02$) 1 wk after application. The two wk sample contained only 4 of the original replications because one dining facility had been sprayed with acephate between wk 1 and 2 due to the presence of cockroaches. However, air levels increased in 2 of the 4 replicates (mean - 0.14 to 0.89 and < 0.10 to 0.65 $\mu g/m^3$) while the other 2 were below detectable levels. The reason for this increase is not known. There was a significant ($P<.01$) decrease in the airborne concentrations between Day 0 and 1 wk after application. However, at 2 wk there was no difference from the Day 0 samples due to increased levels at 2 sites at 2 wk.

Quantities present on surfaces varied by time after application and location of sampled surface as related to the treated baseboard (Table 1). Small quantities were detected on 5 of the 15 surfaces sampled prior to acephate application, probably due to earlier applications by the technician. Significantly ($P<.01$) greater acephate was detected on the wall surfaces than the other

Table 1. Acephate (μg/100cm^2) on non-target surfaces after baseboard spraying in dining room and serving areas

Pre spray	Post spray (wk)[a] 0	1	2[b]
	Wall immediately above the treated baseboard		
0.18 ± 0.27	194.13 ± 200.50	32.87 ± 58.27	54.73 ± 91.14
	Vertical surface of stainless steel serving counter		
0.08 ± 0.09	0.36 ± 0.55	<0.01	<0.01
	Stainless steel hood in kitchen		
0.06 ± 0.01	0.03 ± 0.04	<0.01	<0.01

[a]Mean with the standard deviation. Lowest detection level was >0.01. Five replications
[b]Based on four replications, one dining facility had been retreated between weeks 1 and 2

non-target surfaces (stainless steel serving counter and hood) at all post-application sampling times. Stainless steel surfaces had non-detectable amounts at 1 and 2 wk after applications. Sampled areas above the baseboards had significantly ($P<.01$) greater amounts of acephate immediately after application than at 1 and 2 wk post application. There was a large variation in amounts detected on the walls above the baseboards of the 5 dining rooms at individual sampled intervals. This could have been due to an uneven splashing of walls above the baseboards during application. Less ($P<.01$) acephate was detected on the stainless steel surfaces, probably due primarily to two factors: acephate was not sprayed on the stainless steel but had to move through the air to the sites and a rapid volatilization from the non-porous steel surfaces as was seen in earlier studies (Roper and Wright 1985). These data showed that little acephate, when sprayed towards baseboards, moved into the air and to non-target surfaces other than to the wall immediately above the baseboard. It is suspected that little acephate moved into areas, such as cracks and crevices, where cockroaches normally harbor. Most remained on or near the baseboards, a site which did not provide harborage for cockroaches. Thus, the acephate probably did not provide cockroach control equal to that provided when insecticide is applied into their harborages.

Acknowledgments. Paper No. 11958 of the Journal Series of the N. C. Agric. Res. Ser., Raleigh, NC 27695-7643. Use of trade names in this publication does not imply endorsement of the products named or criticism of similar ones not mentioned.

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Received January 17, 1989; accepted May 20, 1989.