LONGEVITY OF TWO NEW PYRETHROIDS AND A PYRETHROID-ORGANOPHOSPHATE COMBINATION AGAINST TWO SPECIES OF MOSQUITOES AND AGAINST HOUSE FLIES[1]

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Haskins et al. (1974 and 1976) published evaluations of the residual toxicity to mosquitoes of new organophosphates and synthetic pyrethroids. Evaluations of 2 additional pyrethroids [FMC 33297[4]=*m*-phenoxybenzyl *cis,trans*-(±)-3-(2,2-dichlorovinyl)-2,2-dimethylcylopropanecarboxylate; and NRDC-167[5]=*m*-phenoxybenzyl *cis*-(+)-3-(2,2-dichlorovinyl)-2,2-dimethylcylopropanecarboxylate] and one pyrethroid-organophosphate mixture [1% FMC 33297+1% San 1976[6]=*O*-(6-ethoxy-2-ethyl-4-pyrimidinyl)-*O,O*-dimethyl phosphorothioate] are reported here.

The test used to determine the residual qualities of the insecticides was modified from that described by Haskins et al. (1974). Square panels of tent fabric, 30.5 x 30.5 cm, were treated with 100 mg of active ingredient per panel by spraying with 2% concentrations formulated in propellants 11 and 12 (1:1) aerosols. Each panel was then cut to form 15.2 x 15.2 cm square panels. Two replications were completed for each test compound and untreated control. Tests were continued until the insecticides degraded below the 95% knockdown (dead and moribund) level. Three to 14-day-old female mosquitoes, *Aedes triseriatus* (Say) and *Anopheles quadrimaculatus* Say, as well as 7 to 10-day-old females of the house fly, *Musca domestica* L., were used in the study. All were DDT-susceptible from colonies maintained at the Naval Medical Field Research Laboratory, Camp Lejeune, N.C. The exposure room was held at 73±5% relative humidity and 22±1°C.

Each week approximately 20 mosquitoes or 10 flies were introduced to each treated fabric panel by placing them under a petri dish lid containing a 1.3 cm hole and rubber stopper. After 1 hr. of contact with the fabric, knockdown (dead and moribund insects) was determined and the panels were removed and stored in the dark at 30±1°C and 84±4% relative humidity. Insects were removed from the panels by placing a clean square piece of galvanized steel under the panel to allow the petri dish-panel unit to be picked up and turned upside down. Tapping the metal square while the unit was inverted dislodged most of the insects from the panel onto the lid, and a paper card was then inserted between the petri dish and the panel to retain the insects. Another clean metal square was then slid between the paper and panel to allow the petri dish and paper retainer to be removed from the panel and replaced on the shelf. The insects were then supplied with 50% sucrose solution via saturated cotton wicks inserted in place of the rubber stoppers. Knockdown was again determined at 24 hr. This method considerably reduced knockdown among controls as compared with inserting the paper between lid and panel while the panel was on the shelf.

The relative effectiveness of the 4 insecticides is shown in Table 1. On the basis of 95% or greater knockdown at 24 hr., NRDC-167 was effective 6 times longer than resmethrin[7] [(5-benzyl-3-fury 1)methyl *cis - trans* - (±) - 2,2 - dimethyl - 3 - (2 - methylpropenyl) cyclopropane - carboxylate] against *Ae. triseriatus* and *M. domestica*. It lasted 3.6 times longer against *Ae. quadrimaculatus*. FMC 33297 plus San 197 was 5 times as effective as resmethrin against *Ae. triseriatus*, twice as effective against *An. quadrimaculatus*, and equaled resmethrin in house fly control. Although FMC 33297 was the least active of tht new insecticides, it was effective twice as long as resmethrin against *Ae. triseriatus* and *M. domestica,* and lasted only 1.6 times as long against *An. quadrimaculatus*.

Knockdown time for all insecticides was less than 1 hr. Flies were more resistant than mosquitoes to aged insecticides. However, there was considerable fly mortality at 1 hr., which did not occur with either species of mosquito. After the 1st week, there were no dead mosquitoes at the 1-hr. counts for any of the insecticides. The

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[6] Sandoz Co.

[7] S. B. Penick Corp.

Table 1. Weekly knockdown determinations of four insecticides against female house flies and mosquitoes exposed for one hour to treated tent fabric.[a]

Test insect	Aged of treated fabric (weeks)	Percent dead or moribund, 24 hours after exposure					
		Control	Resmethrin	FMC 33297	NRDC-167[b]		FMC 33297 +San 197
Aedes triseriatus	1	0	98	100	100	(5)[b]	100
	2	2	27	100	100	(6)	100
	3	0	0	76	93	(7)	100
	4	3	21	85	67	(8)	100
	5	0	3	16	53	(9)	100
	6	0	5	32	80	(10)	90
	7	0	..	3	37	(11)	74
	8	0	..	15	54	(12)	48
	9	0	..	12	49	(13)	21
Anopheles quadrimaculatus	1	0	100	100	100	(5)	100
	2	2	100	100	100	(6)	100
	3	2	100	100	100	(7)	100
	4	0	71	100	100	(8)	100
	5	5	77	100	100	(9)	86
	6	0	58	94	98	(10)	100
	7	23[c]	..	84	95	(11)	88
	8	3	..	88	90	(12)	75
	9	0	..	88	93	(13)	58
					100	(14)	
Musca domestica	1	0	100	100	100	(5)	100
	2	5	55	100	100	(6)	85
	3	0	10	63	85	(7)	53
	4	0	0	75	75	(8)	48
	5	5	0	28	50	(9)	10
	6	0	0	24	67	(10)	5

[a] Treated at 100 mg/930 sq cm (sq ft).

[b] Parenthetic numbers refer to post-treatment age of fabric treated with NRDC-167. It was treated and aged for 4 weeks prior to concurrent testing with the other panels.

[c] Cotton wick was allowed to dry on control.

moribund mosquitoes at the 1-hr. counts closely approximated the total of dead and moribund at 24 hr in all except FMC 33297 plus San 197, indicating irreversible toxic responses following 1 hr exposure. The 1-hr mosquito knockdown counts for FMC 33297 plus San 197 decreased more rapidly each week than did the corresponding 24-hr counts and were very similar to the 1-hr knockdown pattern for FMC 33297 alone. The rapid knockdown was apparently dependent on the pyrethroid, and no obvious synergistic benefit was gained by formulating the pyrethroid with the organophosphate.

All the insecticides tested were effective longer than the resmethrin standard. NRDC-167 was the most effective of the 3 test insecticides and was the only one which functioned well against flies.

References

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