

the blood would come into contact with the membrane. The rack was then placed into the cage containing the mosquitoes. Figure 2 illustrates *C. pipiens* feeding on the membrane-covered tubes.

It has been estimated that feeding success using this method was greater than 90 percent using either human or animal blood. Although we have only fed *C. pipiens*, we feel that this method can possibly be used with equal success for other species.

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### NEW INSECTICIDES THAT SHOW RESIDUAL TOXICITY TO *ANOPHELES QUADRIMACULATUS* SAY<sup>1</sup>

H. G. WILSON, G. C. LABRECQUE AND J. A. THOMAS

Insects Affecting Man Research Laboratory, Agr. Res. Serv., USDA, Gainesville, Florida 32604

The development of resistance to insecticides in many strains of *Anopheles* has focused attention on the need for new insecticides that can be used as residual sprays in malaria control and eradication programs.

In the screening tests reported here, 146 compounds were tested in duplicate against susceptible (Gainesville regular) and DDT-resistant (Hartwell Dam) strains of *Anopheles quadrimaculatus* Say. The susceptible strain was obtained in 1936 and has been reared in the laboratory since that time without exposure to insecticides. The DDT-resistant strain, received in 1965 from the Public Health Service in Savannah, was then moderately resistant to DDT and has been maintained for the last 3 years in cages coated inside with DDT.

Acetone solutions of each insecticide were sprayed on plywood panels at the rate of 1 g/m<sup>2</sup>.

Then 20 female mosquitoes were exposed under half sections of petri dishes on the treated panels for 60 minutes, transferred to cylindrical cages, provided a sugar-water solution in pads of absorbent cotton, and held for 24 hours. At this time, mortality counts were made. The panels were tested 1 week after treatment, again at 4 weeks, and every 4 weeks thereafter until they became ineffective. Panels were considered ineffective when they failed to produce at least 70 percent mortality. A sufficient number of panels was sprayed with each insecticide to avoid using any surface twice.

Fifteen compounds (Table 1) and the DDT and malathion (standards) remained effective throughout the 24 weeks of the test against susceptible mosquitoes. The 3 compounds in this group that were not equally effective against the resistant strain were BAY 88941, which failed at 20 weeks; Hoffman-La Roche RO 3-5571, which failed after 1 week; and American Hoechst Corporation HOE 2960. Also, DDT was ineffective against this strain. The 15 compounds with the chemical or common names are shown in Table 1.

<sup>1</sup>This paper reflects the results of research only. Mention of a pesticide or a commercial or proprietary product in this paper does not constitute a recommendation or an endorsement of this product by the USDA.

TABLE I.—Chemicals which showed effectiveness as residual treatments against *A. quadrimaculatus*.

Code- A13—No.	Company designation	Chemical or common name
27764	American Hoechst Corp. HOE 2960 Chevron Chemical Co.	<i>O,O</i> -Diethyl <i>O</i> -(1-phenyl-1 <i>H</i> -1,2,4-triazole-3-yl) phosphorothioate
27704-X	Ortho RE-11775	<i>m</i> - <i>sec</i> -Butylphenyl methyl(phenylthio)carbamate (approximately 58%), mixture with <i>p</i> - and <i>o</i> -isomers (29% and 5%, respectively)
27705-X	Ortho RE-11776	<i>m</i> - <i>sec</i> -Butylphenyl [( <i>p</i> -chlorophenyl)thio] methylcarbamate (approximately 58%), mixture with <i>p</i> - and <i>o</i> -isomers (29% and 5%, respectively)
27701	CIBA Agrochemical Co. C-17018	<i>o</i> -[Methyl(2-propynyl)amino]phenyl methylcarbamate
27735	Eli Lilly EL-411	<i>O,O</i> -Diethyl phosphorodithioate <i>S</i> -ester with 1-(mercapto-methyl)-4-methyl-3-(trifluoromethyl)- $\Delta^2$ -1,2,4-triazoline-5-thione
27958	Hoffman-La Roche RO 3-5571	4-Phenoxy-2-butynyl 2,2,3,3-tetramethylcyclopropanecarboxylate
27743	Mobil Chemical Company MC 3815	2-Chloro-1-pyrazol-1-ylvinyl diethyl phosphate
27723	Pennwalt Corp. TD-8550	Methyl (mercaptoacetyl)methylcarbamate <i>S</i> -ester with <i>O</i> -methyl methylphosphonodithioate
27394-X	Sandoz-Wander S-6538 (other designations— Sandoz 6706)	<i>O,O</i> -Diethyl <i>O</i> -2-quinoxalinyll phosphorothioate, 50% in xylene
27720	Stauffer Chemical Company R-15396	<i>O,O</i> -Diethyl phosphorothioate <i>O</i> -ester with <i>p</i> -hydroxybenzaldehyde <i>O</i> -(hexylcarbamoyl)oxime
27841	Vero Beach Laboratories BAY 88941	<i>O,O</i> -Diethyl phosphorothioate <i>O</i> -ester with <i>o</i> -tolylglyoxylonitrile oxime
27748	BAY 92114	Isopropyl salicylate <i>O</i> -ester with <i>O</i> -ethyl isopropylphosphoromidothioate
27826	BAY HOX 1980	<i>O</i> -(3-Bromo-7-methylpyrazolo [1,5- <i>a</i> ] pyrimidin-2-yl) <i>O,O</i> -diethyl phosphorothioate
27981	BAY KUE 2302	<i>o</i> -Isopropoxyphenyl [(dichlorofluoromethyl)thio]methylcarbamate
27982 1506	BAY KUE 2327	<i>o</i> -Isopropoxyphenyl methyl[(trichloromethyl)thio]carbamate DDT
17034		Malathion