

THE LARVICIDAL ACTIVITY OF SEVERAL LIQUID DETERGENTS AND QUATERNARY AMMONIUM COMPOUNDS¹

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INTRODUCTION. One *Aedes aegypti* breeding site that may require specific treatment is the birdbath. In an effort to select compounds suitable for such treatment, several liquid detergents and quaternary ammonium compounds were evaluated under laboratory conditions against *Ae. aegypti*. Also included in the tests were three other species—*Anopheles quadrimaculatus*, *Culex quinquefasciatus* and *Aedes triseriatus*.

MATERIALS AND METHODS. The liquid detergents evaluated were (1) Lux,^{2,3} (2) Joy, and (3) Ivory. The quaternary ammonium compounds included (1) Hyamine 3500 [50 percent n-Alkyl (50 percent C₁₄, 40 percent C₁₂, 10 percent C₁₆) dimethyl benzyl ammonium chloride and 50 percent water and ethanol]; (2) Hyamine 2389 [50 percent methyl dodecyl benzyl trimethyl ammonium chloride and methyl dodecyl xylene bis (trimethyl ammonium chloride) and 50 percent water]; and (3) Multisept [50 percent methyl dodecyl benzyl tri-methyl ammonium chloride and methyl dodecyl xylene bis trimethyl ammonium chloride and 50 percent water].

Test mosquito larvae were 3rd instar

A. quadrimaculatus, *C. quinquefasciatus*, *Ae. aegypti* (DDT-dieldrin resistant and susceptible) and *Ae. triseriatus*.

A syringe was used to deliver 1, 5, 10, 20, 40 or 80 mg. of the tested material to 225 ml. of water in a 600-ml. beaker. One and five mg. were secured by touching a #30 needle to the side of the beaker. A size #22 needle was used for the other dosages (one drop being equal to approximately 10 mg.). This treatment procedure would deliver maximum possible dosages of 4, 20, 40, 80, 160 and 320 parts per million. Three replications were prepared for each dosage and material and each species or strain of larva. Water checks also were used with each test series.

Twenty-five larvae of each species or strain were counted out into 150 ml. beakers containing 25 ml. of water, a sufficient number of beakers being prepared for all dosages, materials, and replicates. The larvae were then poured into the 600 ml. test beakers and remained there for 24 hours, when mortality observations were made. In tests with Lux, Joy and Ivory, the larvae were removed from the beakers after the 24-hour mortality count was made. The treatments were then aged and their potency evaluated at 2-week intervals by repeating the above procedure. Only *Ae. aegypti* and *Ae. triseriatus* were used in the residual tests. The water level in the beakers was brought up to the initial level before each test. Tests were run until the mortality fell below 90 percent.

RESULTS. Table 1 presents summary data on the effectiveness of the test materials. Ivory and Hyamine 3500 were the more effective compounds against *Ae. aegypti*, most of the other materials requiring at least 320 ppm to effect good kills. Of the other three species tested,

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² Use of trade names is for identification purposes only and does not constitute endorsement by the Public Health Service or the U. S. Department of Health, Education, and Welfare.

³ Lux, Joy and Ivory were purchased locally; Hyamine 3500 and 2389 were obtained through the courtesy of Rohm and Haas Company, Philadelphia, Pa. and Multisept through the courtesy of the F. M. Speckman Company, San Francisco, Calif.

TABLE 1.—Lethal concentration in ppm required for 90 percent kill of 3rd instar larvae of four species.

Compound	<i>Anopheles quad.</i>	<i>Culex quin.</i>	<i>Aedes aegypti</i>		<i>Aedes tris.</i>
			Resistant	Susceptible	
Hyamine 3500	80	320	80	80	40
Hyamine 2389	160	>320	320	320	320
Multisept	160	>320	320	320	320
Ivory	80	320	80	80	40
Joy	40	>320	320	160	40
Lux	80	160	320	320	80

C. quinquefasciatus appeared to be the hardest to kill while *Ae. triseriatus* appeared to be the most susceptible.

Of the three liquid detergents tested for residual life at 320 ppm, only Lux continued to give effective kills beyond 2 weeks (Table 2).

DISCUSSION. Greater than 320 ppm of several of the test compounds were required for satisfactory kills of *C. quinquefasciatus*; kill of *Ae. aegypti*, however,

was satisfactory at as low as 80 ppm. This larvicidal activity together with the low toxic hazard to birds and mammals would make them very useful for birdbath treatments.

SUMMARY. Several liquid detergents and quaternary ammonium compounds were evaluated as larvicides against five strains of mosquitoes. Liquid Ivory and Hyamine 3500 were the most toxic to resistant and susceptible *Ae. aegypti* with LC-90s of 80 ppm.

TABLE 2.—Weeks of 90 percent kill of 3rd instar larvae with liquid Lux detergent.

Mosquito	Concentration in ppm		
	80	160	320
<i>Aedes aegypti</i> (DDT-dieldrin-resistant)	<2	<2	6
<i>Aedes aegypti</i> (susceptible)	<2	<2	22
<i>Aedes triseriatus</i>	2	8	22

Of the three liquid detergents tested for residual life at 320 ppm only Lux showed residual activity; it was effective for 22 weeks.

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CORRECTION

In Volume 27, No. 3 (September, 1967), article by D. J. Sutherland, F. D. Beam and A. P. Gupta, entitled "The effects on mosquitoes of sublethal exposure to insecticides. . . .": Page 320, column 1, "All numerical figures 0.0075 ppm should read 0.00075."—D. J. S.