

weeks in a plywood hut versus 16 weeks for an equivalent dosage of 20 percent dichlorvos-resin strand ($\frac{1}{8}$ " diameter). Parallel tests of two strand formulations of 20 percent dichlorvos-resin, three 20 percent dichlorvos-resin strip ($10'' \times 2.5'' \times 0.22''$) formulations and a 25 percent dichlorvos-wax dispenser ($1.5''$ diameter $\times 6''$) indicated that one strand and one strip formulation produced results superior to those by the dichlorvos-wax dispenser. The results were obtained with a lower total amount of dichlorvos present in both the strip and strand dispensers (20 and 30 g., respectively) than in the wax dispenser (50 g.). Both strip and strand formulations contained a greater surface area than that of the wax dispenser. Vapor emission rates for the superior strand and strip formulations were higher than those of other strand or strip formulations tested.

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RESULTS OF INSECTICIDE RESISTANCE TESTS AGAINST *Aedes aegypti* ADULTS AND LARVAE IN BRITISH GUIANA

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In Georgetown, British Guiana, during February-March 1963, the W.H.O. insecticide resistance testing kits were used in checking possible resistance of *A. aegypti* larvae and adults to various insecticides.

LARVAE. Third and early 4th instar larvae were used in the tests, which were carried out 3 times. Larvae used in test 1 were taken from pit latrines in Georgetown, the East Coast of Demerara County, and from houses along the East Bank of the Demerara River. In tests 2 and 3,

the larvae came from Georgetown pit latrines only.

Dieldrin, DDT, and BHC were diluted according to directions, so that 5 concentrations of each resulted: 0.004 p.p.m., 0.02 p.p.m., 0.10 p.p.m., 0.50 p.p.m., and 2.50 p.p.m. Twenty larvae were used in each test. Mortality readings were taken after 3 hours, 7 hours, 20 hours, and 24 hours. A control bowl of 20 larvae in diluted ethanol accompanied each test. The results are shown in Table I.

At 0.004 p.p.m. all three were equally ineffective. At 0.02 p.p.m. dieldrin was the most effective, with complete resistance to DDT. At 0.50 p.p.m., dieldrin and

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TABLE I.—Results of resistance tests on 3rd and early 4th instar *A. aegypti* larvae from Georgetown and other coastal areas, British Guiana. (Average of 3 tests at each concentration, 20 larvae per test and per control)

Insecticide and Concentration	Total dead and moribund				% Mortality
	After 3 hrs	After 7 hrs	After 20 hrs	After 24 hrs	After 24 hrs
DIELDRIN					
0.004 ppm	0	0	0	0	0
0.02 "	1	1	7	12	60
0.10 "	6	13	19	20	100
0.50 "	15	19	20	..	100
2.50 "	18	20	100
Control	0	0	0	0	0
DDT					
0.004 ppm	0	0	0	0	0
0.02 "	0	0	0	0	0
0.10 "	1	5	11	12	60
0.50 "	9	12	16	16	80
2.50 "	11	16	18	20	100
Control	0	0	0	0	0
BHC					
0.004 ppm	0	0	0	0	0
0.02 "	1	1	1	4	20
0.10 "	5	11	13	16	80
0.50 "	14	19	20	..	100
2.50 "	17	20	100
Control	0	0	0	0	0

BHC were equally effective, and DDT fairly effective. At 2.50 p.p.m., dieldrin and BHC were equally very effective, and DDT almost as effective. In economical dosages, therefore, dieldrin would be the larvicide of choice against *A. aegypti* larvae, and BHC almost as good. DDT could be used if necessary, but some resistance should be expected.

ADULTS. The standard W.H.O. testing procedure was followed, but only 10 adults were used in each test and in controls. All were 5 days old and lab-hatched from larvae which had been collected in Georgetown and other places in Demerara County. The mosquitoes were exposed to impregnated paper in test cylinders for one hour, then kept in holding cages.

1. *Dieldrin.* One test each was conducted with 4.0%, 1.6%, and 0.8% dieldrin-impregnated paper. With the 4.0%, 8 (5 dead, 3 moribund) were knocked down at the end of the first holding hour. With the 1.6%, 7 (4 dead, 3 moribund) were down after one hour, and with the 0.8%

there were 9 down (3 dead, 6 moribund) after one hour. None survived longer than 5 hours in any of the tests.

2. *Malathion.* Since the W.H.O. kit did not include malathion-impregnated paper, test papers were prepared by spraying mimeograph paper tacked to a wall. The concentrations sprayed were 2.0%, 1.0%, 0.5%, 0.25%, 0.125%, and 0.0625% malathion emulsion. Two tests each were made with the three highest percentages, and one test each with the three lowest. Ten control mosquitoes accompanied each test.

Within 20 minutes after holding began, in all concentrations except 0.0625%, all 10 mosquitoes were on their backs kicking, and some were already dead. Complete mortality occurred between 2 and 4 hours after holding began. All control mosquitoes remained alive. Even at a very low concentration of 0.0625% (in which 7 were down in one hour, and all were dead in 3½ hours) malathion is very effective against *A. aegypti* adults.

DISCUSSION. In British Guiana there has recently occurred a reinfestation of the coastlands with *A. aegypti* (Burton 1963). Following an intensive residual house spraying campaign in 1947-1948 (Giglioli 1948) this vector was eradicated from British Guiana. The effective insecticide of choice at the time was 5 percent DDT in commercial kerosene. Simultaneously *Anopheles darlingi*, the vector of malaria on the coast, was eradicated also. Since *A. aegypti* was one of the three house-frequenting mosquitoes in largest numbers, after *A. darlingi* and *C. fatigans*, eradication was possible (Giglioli 1948a). In any future spraying campaign, dieldrin would be the insecticide of choice. The presence of jungle yellow fever in the interior of British Guiana at present (Burton 1963) points to the necessity for action against this vector.

SUMMARY. Resistance tests against *A. aegypti* larvae and adults were carried out in Georgetown, British Guiana, using W.H.O. resistance testing kits. The larvae were found to be highly susceptible to dieldrin and BHC at 0.1 and 0.5 p.p.m. At 0.5 p.p.m. DDT was only about 80 percent effective. Adults were very suscepti-

ble to paper-impregnated malathion emulsion in concentrations of 2.0%, 1.0%, 0.5%, 0.25%, 0.125%, and 0.0625%. In all cases except the last, 100% knockdown occurred in 20 minutes, with complete mortality by 3½ hours. Using 4.0%, 1.6%, and 0.8% dieldrin, most were knocked down after one hour in the holding cage, and all were dead by 5 hours after holding began. Dieldrin is recommended as the insecticide of choice in any anti-*A. aegypti* campaign in British Guiana in the future.

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SUSCEPTIBILITY OF TWO DDT-RESISTANT *Aedes aegypti* STRAINS TO DDT AND DEUTERO-DDT AS LARVICIDES IN LABORATORY TESTS¹

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Samples of deutero-DDT³ furnished this laboratory were used to make ethanolic solutions for testing against two strains of chlorinated hydrocarbon-resistant *Aedes*

aegypti (L.). Previous tests had indicated these two *aegypti* strains maintained at the Pan American Sanitary Bureau's Kingston, Jamaica, laboratory to possess high tolerances for DDT and also cyclodiene (dieldrin, BHC) compounds using the standard WHO 24-hour exposure.

The Lionel Town, Jamaica, strain reported on herein had been collected in the field in October, 1962, from an area

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³ 2,2-bis(p-chlorophenyl)-1,1,1-trichloroethane-2d.