BOYD, MARK F. (Editor). 1949. Malariology. Vol. I and II, W. B. Saunders Co., Philadelphia, 1643 pp.

FRITZ, ROY F. and JOHNSON, DONALD R. 1960. United States participation in a global program for malaria eradication. Proceedings, 47th Annual Meeting, New Jersey Mosquito Extermination Association:51–58.

HARMER, GORDON R. and COSTALES, EUGENE N. 1961. Scott's Standard Postage Stamp Catalogue, Scott Publications, Inc., N. Y., N. Y. 966 pp.

HYDE, HENRY VAN ZILE. 1961. Pesticides—Vital to world health. National Agricultural Chemicals Association News, 19(3):4–6.

JOHNSON, DONALD R. 1956. News and Notes item, *Mosquito News* 16(1):38.

STUDIES OF RESISTANCE IN *AEDES TAENIORHYNCHUS*, CHATHAM COUNTY, GEORGIA

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In 1957, studies were initiated in Chatham County, Georgia, to obtain susceptibility levels of *Aedes taeniorhynchus* to DDT and dieldrin. Although Chatham County has an extensive acreage of salt marsh from which large broods of *A. taeniorhynchus* periodically emerge, control measures prior to 1957 were limited to occasional adulticiding at Savannah and Savannah Beach. Since 1957, fogging operations with DDT have been county-wide in extent, but the larvicidal use of chlorinated hydrocarbon pesticides is not practiced.

All tests were conducted by using a resistance kit which employs papers commercially impregnated with DDT- or dieldrin-Risella oil solution (Mathis *et al.*, 1959). The test and holding chambers consist of plastic tubes 1–¾" x 5" fitted with a screen top and a removable metal shutter as a bottom. The test chambers are lined with impregnated papers, and mosquitoes are introduced for the desired exposure period. After exposure, the test specimens are transferred to holding tubes which are lined with untreated papers, offered food, and held for 24-hour mortality counts.

Most test specimens were obtained by collecting 3rd or 4th instar larvae, or pupae, from natural breeding places and completing the rearing in the laboratory. From Cockspur Island, additional specimens were obtained by flooding soil samples in the laboratory and rearing the larvae. Limited tests were also made with field-collected females from Cockspur, Tybee # 2, and the grounds of the Technical Development Laboratories.

The first tests were made during the summer of 1957 by exposing adult females collected from the laboratory grounds to DDT-Risella oil impregnated papers. A 60-minute exposure gave 89 percent mortality and 120-minute exposure gave 98 percent. During the winter of 1957–58, adults reared from flooded soil samples from Cockspur Island and exposed to the same residues gave a much lower mortality. When exposed to dieldrin residues the mortality was even less than that obtained with DDT. It was later discovered that the Georgia Department of Agriculture and the Plant Pest Control Division of the U. S. Department of Agriculture had treated approximately 134 acres on Cockspur Island during August 1957 with 4 to 5 pounds of dieldrin per acre for the control of the white-fringed beetle.

During 1958, tests were made with adults from Cockspur Island and from four other locations 1 to 7 miles from this island. Two of the locations were southeast of this island (1 to 2 miles) and

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two were northwest (5 to 7 miles). Table 1 gives the results obtained following exposures of female *A. taeniorhynchus* to Cockspur Island. Since two methods were used in obtaining adults for testing, the results obtained with females reared from

TABLE 1.—Mortalities obtained with exposure of female *Aedes taeniorhynchus* from Chatham County, Georgia, to commercially-impregnated, dieldrin-treated papers

Exposure, minutes	Percent conc.	Cockspur Island	Tybee # 1	Tybee # 2	Whitmarsh Island	Causton Bluff
60	0.2	..	0	7	0	0
"	0.4	5	0	12	9	3
"	0.8	1	22	78	33	35
"	1.6	18	95	100	93	97
120	0.2	..	..	..	..	0
"	0.4	8	..	..	..	23
"	0.8	36	..	100	..	79
"	1.6	33	..	100	..	99
240	0.2	..	..	..	..	..
"	0.4	57	..	..	..	..
"	0.8	51	..	100	..	..
"	1.6	26	..	100	..	..

Distance from Cockspur Island:
Tybee # 1—1 mile.
Tybee # 2—1.5 miles.
Whitmarsh—5 miles.
Causton Bluff—7 miles.

dieldrin-treated papers. A 60-minute exposure of females from Cockspur Island to 1.6 percent dieldrin papers gave only 18 percent mortality while a 240-minute exposure gave only 26 percent. This same dosage and a 60-minute exposure gave from 93 to 100 percent mortality of females from the four other locations. Although Tybee # 1 is approximately 1 mile from the nearest point on Cockspur Island, the mortality was essentially the same as that obtained from Causton Bluff, which is approximately 7 miles from Cockspur Island.

Using the same procedure and test specimens from the same locations, tests were made in which female mosquitoes were exposed to DDT-Risella oil impregnated papers. The results are shown in table 2. Exposure of females from Cockspur Island to 4.0 percent DDT papers for 60, 120, and 240 minutes gave 58, 35, and 63 percent mortality, respectively. A 60-minute exposure of females from the four other locations gave from 91 to 96 percent mortality.

Considerable variation in mortalities was obtained in tests with specimens from larvae or pupae collected in the field were compared with results obtained with adults reared from larvae obtained from soil samples brought into the laboratory and flooded. Table 3 gives the results with females obtained by the two different methods when exposed to DDT and to dieldrin.

Females from larvae reared in the field on Cockspur Island gave some response to an increase in exposure time to the 4.0 percent DDT papers but the highest mortality was only 53 percent with 240-minute exposure. With adults from flooded soil samples, the response to an increase in exposure time was similar to that obtained from adults from other locations. These data would tend to indicate that dieldrin selection of larvae in the field influenced susceptibility levels of the resultant adults to DDT.

When the same comparison was made with exposure to dieldrin, very little mortality was obtained with 60-, 120-, or 240-minute exposures to the 1.6 percent papers. With test specimens reared from soil samples from Cockspur Island, a mortality of approximately 50 percent was reached with

TABLE 2.—Mortalities obtained with exposure of female *Aedes taeniorhynchus* from Chatham County, Georgia, to commercially-impregnated, DDT-treated papers

Exposure, minutes	Percent conc.	Cockspur Island	Tybee # 1	Tybee # 2	Whitmarsh Island	Causton Bluff
60	0.5	..	..	14	17	6
"	1.0	35	..	21	50	25
"	2.0	42	..	78	84	54
"	4.0	58	91	96	94	93
120	0.5	..	..	7	..	14
"	1.0	27	..	46	..	28
"	2.0	63	..	93	..	70
"	4.0	35	..	98	..	100
240	0.5	..	..	24	..	..
"	1.0	74	..	66	..	..
"	2.0	76	..	98	..	..
"	4.0	63	..	99	..	..

TABLE 3.—Mortalities obtained with exposure to DDT and dieldrin of female *Aedes taeniorhynchus* from field-collected larvae and pupae and from egg-infested soil samples, Cockspur Island

	Field-collected larvae and pupae			Larvae from soil samples		
DDT concentration, %	1.0	2.0	4.0	1.0	2.0	4.0
Exposure-minutes						
60	2	2	8	51	32	73
120	3	3	18	42	95	92
240	0	12	53	90	93	93
Dieldrin concentrations, %	0.4	0.8	1.6	0.4	0.8	1.6
Exposure-minutes						
60	0	0	2	7	4	24
120	0	0	3	12	52	46
240	33	39	10	62	54	96

the 0.8 percent paper and 120-minute exposure, and, with the exception of the single replicate with the 1.6 percent paper at 240-minute exposure, the mortality remained essentially the same.

In limited tests with female *A. taeniorhynchus* collected from Tybee # 2 and exposed to 1.6 percent dieldrin papers, a 60-minute exposure gave 100 percent mortality. A 60- and 120-minute exposure of females from Cockspur to the same dieldrin papers gave 42 and 58 percent mortality, respectively. Females from the same location exposed for 60 and 120 minutes to 4.0 percent DDT papers gave 96 and 100 percent mortality of those from Tybee #2 and 5 and 51 percent of those from Cockspur.

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References

MATHIS, WILLIS, SCHOOF, H. F., and FAY, R. W. Method for the field determination of susceptibility levels of adult mosquitoes. *Mosquito News* 19(4): 247–255. 1959.