

PRELIMINARY NOTE ON THE RESISTANCE
OF *ANOPHELES STEPHENSI* TO MALA-
THION IN BANDAR ABBAS,
SOUTHERN IRAN¹

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INTRODUCTION. In southern Iran *Anopheles stephensi* Liston developed resistance to DDT and dieldrin in 1957 and 1960 respectively (Mofidi et al. 1958, Mofidi 1960). Since 1964, the Bandar Abbas area has been treated with malathion 50 percent wettable powder at the rate of 2g/m², 2-3 rounds per year (Manouchehri et al. 1972), and up to the present time (June 1975), 22 to 23 rounds of spraying with this insecticide have already been completed.

In our laboratory an attempt was made to select resistant individuals from offspring of wild-caught *A. stephensi* at Mamasani, Kazeroun. After 5 generations, the tolerance of *A. stephensi*

increased about 5 fold more than that of the F₁ generation, (Manouchehri et al. 1975).

MATERIALS AND METHODS. The method of testing was developed by the World Health Organization (WHO 1971). Paper impregnated with malathion at concentrations of 0.5, 3.2 and 5.0 percent was provided by WHO. For the control, impregnated paper with olive oil alone was used. The exposure times were 1 and 2 hr. After a 24 hr recovery period, a mortality count was made. During the holding period, the mosquitoes were held in paper cups, and a pad of wet cotton wool was placed on the top of each cup. All observed mortalities were corrected by Abbott's formula (Abbott 1925) when necessary. The mosquitoes used were freshly fed *A. stephensi* which had been collected from Siahou, Rocnabad, and Zahouki villages, Bandar Abbas. Those villages had been under malathion spraying twice a year since 1964 (Manouchehri et al. 1972). A series of tests was performed in Rahgerd village, Jiroft area, which had been treated with malathion twice a year since 1967. Four replicates were made for each test, and the number of mosquitoes per replicate was 20-25.

RESULTS. The base-line data collected just prior to starting malathion spraying for the con-

Table 1. The results of malathion susceptibility tests of *Anopheles stephensi* in Bandar Abbas and Jiroft areas, southern Iran, April and May 1975

Locality	Spraying Cycle	Temp. Min-Max Degree, Celsius	*RH%	Exposure Time	Concentration			
					0.5%	3.2%	5.0%	Control
Siahou	18 Mal	20-27	71-74	1 hr	0	64	75	0
	22 DDT				(91)	(80)	(87)	(89)
Gohreh	18 Mal	22-28	68-72	1 hr	2	55	78	1
	22 DDT				(90)	(86)	(93)	(91)
Zahouki	23 Mal	23-29	70-74	1 hr	1	62	77	0
	11 DDT				(96)	(89)	(92)	(94)
Zahouki	23 Mal	23-29	70-74	2 hr	3.7	95	97.6	0
	11 DDT				(80)	(83)	(86)	(94)
Rocnabad	23 Mal	22-28	65-70	1 hr	0	58.8	80.2	0
	11 DDT				(86)	(90)	(91)	(89)
Rocnabad	23 Mal	22-28	65-70	2 hr	2.3	93.1	98.1	1.2
	11 DDT				(85)	(87)	(83)	(83)
Rahgerd	11 Mal	26-32	58-62	1 hr	1	91	100	0
	26 DDT				(84)	(87)	(85)	(89)

* = Relative humidity.

The figures in parentheses represent the number of mosquitoes tested.

¹ This study was supported in part by the funds of the School of Public Health and Institute of Public Health Research, University of Teheran, and partly by the Public Health Research Project of the Ministry of Health and Plan Organization.

trol of *A. stephensi* in Bandar Abbas showed that the discriminating concentration that killed 100 percent of mosquitoes tested was 3.2 percent malathion (Manouchehri et al. 1966). From October 1964, the area was treated with malathion, 2 to 3 rounds per year. After almost 10 yr *A.*

stephensi remained susceptible to this insecticide (Manouchehri et al. 1974). However, by April 1975, it was observed that *A. stephensi* could tolerate 3.2 percent malathion, and the mortality after 1 hr exposure was between 55 and 64 percent (Table 1). When the exposure time was increased to 2 hr, the mortality rate increased to 93-95 percent. When the mosquitoes were tested against 5.0 percent malathion, the mortality rate after 1 and 2 hr exposure, 24 hr recovery, was between 74-80 and 98-99 percent respectively.

At the time of testing (May 1975) the density of *A. stephensi* in Siahou, Zahouki, and Rocnabad was 31, 10.7 and 19.6 per shelter, and 2 weeks after the application of malathion the density of *A. stephensi* decreased to 0.8, 1.1, and 2.3 per shelter respectively, and remained about 1 female per shelter, except in Rocnabad where the density was 2.6 per shelter 40 days after malathion spraying.

In Rahgerd, Jiroft area, where malathion treatments were made twice a year since 1967, *A. stephensi* remains susceptible to this insecticide, and the mortality rate after 1 hr exposure, 24 hr recovery, to 3.2 and 5.0% malathion has been recorded to be 91 and 100 percent respectively (Table 1).

Our conclusion is that individuals resistant to malathion are present in the field population of *A. stephensi* in Bandar Abbas area and special attention should be paid to the development of resistance of this species in southern Iran.

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