2. Title: Insecticide Tolerance Level of Mosquitoes in Thailand

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OBJECTIVE

The development of resistance by mosquitoes to insecticides has posed a considerable threat to the success of public health efforts in combating mosquito–borne disease in many parts of the world. In Thailand, insecticides have been in use for several years against agricultural pests and, more widely, in the national malaria eradication program. This study is designed to determine the susceptibility of mosquitoes of medical importance in Thailand to insecticides and to assess the possible consequences of resistance, whether physiological, or behavioristic, on disease incidence.

PROGRESS

Genetics of DDT–resistance in Aedes albopictus. – Aedes albopictus has been implicated in the transmission of dengue hemorrhagic fever in Thailand. Larvae on Koh Samui, Surat Thani province, were found to be susceptible to DDT while intermediate resistance was observed in adults. The objective of this study was to determine the pattern and mode of inheritance of DDT–resistance in this species.

A laboratory colony of A. albopictus originating from Koh Samui was established at SMRL. DDT–resistant larval and adult populations were initially selected by rearing the offspring of those mosquitoes surviving exposure to DDT dosages lethal to 75% of the strain; the process is being repeated on the strains resulting from such selections until highly resistant mosquitoes are obtained. DDT–susceptible populations will be obtained by isolating individual males with individual females, allowing mating and oviposition to occur, testing a portion of each pair's progeny for its resistance level, and rearing the remaining offspring of those found to be susceptible.

The LC_{75} of the Koh Samui A. albopictus larval population was determined to be 0.030 ppm DDT for a standard exposure period of 24 hours. Selection of the initial strain at this concentration increased the LC_{75} to 0.064 ppm; the resulting strain was designated LR1 (larval resistant – one selection). Selection of the LR1 strain at 0.064 ppm DDT increased the LC_{75} to 0.15 ppm (LR2 strain). At present, the LR2 strain is being selected at 0.15 ppm.

The LT_{75} of the Koh Samui A. albopictus adult female population was determined to be 43 minutes when exposed to 4% DDT. Initial selection at this dosage failed to change the LT_{75}. Selection of the resulting AR1 (adult resistant – one selection) strain at its LT_{75}, 43 minutes at 4%, is in progress.

Susceptibility of Dengue Vectors to Organophosphates–Susceptibility tests following the 1968 insecticide studies on Koh Samui have indicated that Aedes aegypti and Aedes albopictus larvae are still highly susceptible to Abate. LC_{50} values between 0.002 ppm and 0.0008 ppm (Table 6) were obtained for two strains of A. aegypti when exposed for 24 hours; these figures are slightly higher than the pretreatment LC_{50} values of 0.00043 ppm and 0.00051 ppm reported by Gould et al (1968).* A. albopictus larvae were also susceptible to Abate, with LC_{50} values of 0.0023 ppm and 0.0021 ppm (Table 6); the pretreatment LC_{50} was 0.00035 ppm (Gould et al, 1968).

Adults of A. aegypti and A. albopictus were determined to be susceptible to malathion following the insecticide program. In testing A. aegypti adults from Huathanon and Maenam, LC_{50} values were found to be below 0.4% for the standard one hour exposure period (Table 7). LC_{50} values of A. albopictus adults from Huathanon and Maenam were 0.56% and 0.58% respectively (Table 7).

*Gould, D.J., Yuill, T.M., Moussa, M.A., Simasathien, P., and Rutledge, L.C., "An Insular Outbreak of Dengue Hemorrhagic Fever. III. Identification of Vectors and Observations on Vector Ecology," Amer. J. Trop. Med. & Hyg. 17 (4), 609–618, (1968).

Table 6

Toxicity of Abate to larvae of A. aegypti and A. albopictus from Koh Samui, 1969.

Locality	Percent mortality in 24 hours at indicated concentrations (ppm)					LC_{50} (ppm)	LC_{90} (ppm)
	0.004	0.003	0.002	0.0008	0.00016		
	Aedes aegypti						
Huathanon	100	100	84	18	0	0.0012	0.0023
Maenam	100	100	80	1	0	<0.002	<0.003
	Aedes albopictus						
Huathanon	100	92	20	0	0	0.0023	0.0029
Maenam	100	94	40	0	2	0.0021	0.0028

Table 7

Toxicity of malathion to adults of A. aegypti and A. albopictus from Ko Samui, 1969.

Locality	Percent mortality in one hour at indicated concentrations (%)			LC_{50} (%)	LC_{90} (ppm)
	1.6	0.8	0.4		
	Aedes aegypti				
Huathanon	100	99	70	<0.4	<0.8
Maenam	100	97	70	<0.4	<0.8
	Aedes albopictus				
Huathanon	100	92	10	0.56	0.78
Maenam	100	84	11	0.58	0.88