Effects of Physiological Conditioning on Behavioral Avoidance by Using a Single Age Group of *Aedes aegypti* Exposed to Deltamethrin and DDT

SUPPALUCK POLSOMBOON,[1] PISIT POOLPRASERT,[1] MICHAEL J. BANGS,[2] WANNAPA SUWONKERD,[3] JOHN P. GRIECO,[4] NICOLE L. ACHEE,[4] ATCHARIYA PARBARIPAI,[5] AND THEERAPHAP CHAREONVIRIYAPHAP[1,6]

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ABSTRACT The behavioral and physiological responses of 6-d-old *Aedes aegypti* (L.) adult females exposed to deltamethrin and DDT were characterized using a free-choice excito-repellency test system. Excluding varying pretest age and carbohydrate availability as possible confounders, insecticide contact (measuring irritancy) and noncontact (measuring repellency) behavioral assays were conducted on two nonbloodfed groups, either unmated or mated (nulliparous), and two blood-fed groups, either parous or newly full-engorged mosquitoes. The degree of escape response to deltamethrin and DDT varied according to the physiological conditioning. Escape rates from contact and noncontact chambers with deltamethrin were more conspicuous in nonbloodfed groups compared with mosquitoes previously bloodfed. There were no significant differences in escape responses between unmated and nulliparous test populations. With DDT, a more pronounced escape response was observed in unmated compared with other physiological conditions. More moderate escape response was seen in nulliparous mosquitoes, and the least was observed in full bloodfed test individuals, regardless of test compound. *Ae. aegypti*, regardless of pretest conditioning, was completely susceptible to deltamethrin, whereas showing high resistance to DDT. Despite profound differences in resistance, there was no significant difference in avoidance response between chemicals and mosquito conditioning. Moreover, pre- and postbloodmeals were found to influence assay outcome and thus to have relevance on the interpretation of susceptibility and excito-repellency assays.

KEY WORDS *Aedes aegypti*, behavioral responses, excito-repellency, deltamethrin, DDT

Aedes aegypti (L.), the primary vector mosquito typically resides very near or inside human dwellings preferentially feeding on humans (Christophers 1960, Polawat and Harrington 2005). Because no commercial vaccine or antiviral agents are yet available for the prevention and treatment of dengue infection, the control of this mosquito vector remains the most important method to prevent dengue virus transmission and averting dengue epidemics.

Mosquito behavior is of epidemiological importance whereby favoring or inhibiting a mosquito preferentially feeding on a human, potentially ingesting an infectious bloodmeal, or transmitting a pathogen to a susceptible host (Elliott 1972). Introduction of an exogenous element, such as residual insecticides, can disturb normal patterns of insect behavior. The avoidance of certain insecticide-treated surfaces seems to be a natural reaction of most mosquitoes; therefore, a better understanding of the impact of excito-repellency on vector control methods should enable better decisions on pesticide selection and application (Muirhead-Thomson 1960, Roberts et al. 2000).

In Thailand, deltamethrin has been regarded as an effective, relatively safe compound since introduction, and it has been widely used for controlling household nuisance mosquitoes and disease vectors, including *Ae. aegypti* (Chareonviriyaphap et al. 1999, Somboon et al. 2003). Deltamethrin, applied as a space spray, also has been used in attempts to interrupt mosquito virus transmission in dengue active areas (MOPH 2006). The effectiveness of pyrethroids requires regular monitoring and serves as a stimulus for continued studies on the mode of action and epidemiological significance of avoidance behavior (WHO 1995). DDT has long been shown to educe strong behavioral avoidance responses by many species of mosquitoes (Kennedy 1947, Roberts and Alecrim 1991), and it remains an excellent standard by which

[1] Department of Entomology, Faculty of Agriculture, Kasetsart University, Bangkok 10900 Thailand.
[2] Public Health & Malaria Control, Jl. Kertajasa, Kuala Kencana-Timika, Papua, 99920 Indonesia.
[3] Department of Disease Control, Ministry of Public Health, Nonthaburi 10000 Thailand.
[4] Department of Preventive Medicine and Biometrics, Uniformed Services University of Health Sciences, Bethesda, MD 20814.
[5] Division of Biostatistics, Faculty of Liberal Arts and Science, Kasetsart University, Nakhon Pathom 73140 Thailand.
[6] Corresponding author, e-mail: faasthc@ku.ac.th.

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