

Influence of nutritional and physiological status on behavioral responses of *Aedes aegypti* (Diptera: Culicidae) to deltamethrin and cypermethrin

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ABSTRACT: Excito-repellency responses of *Aedes aegypti* (L.) exposed to deltamethrin and cypermethrin were assessed using an excito-repellency test system. Contact irritancy and non-contact repellency assays compared non-bloodfed (unfed) parous (post-gravid), nulliparous, early blood-fed, late blood-fed, sugar-fed, and unmated female mosquitoes for behavioral responses based on nutritional and physiological conditions at the time of testing. Rates of escape during contact exposure with either compound were most pronounced in parous mosquitoes, followed by unmated mosquitoes, when compared to other conditional states. Significantly higher numbers of parous females also escaped from control chambers compared to other cohorts ($P < 0.05$). Irritability of blood- and sugar-fed mosquitoes was noticeably suppressed. We conclude that nutritional and physiological conditions (including age) of mosquitoes at the time of testing can significantly influence behavioral responses (excito-repellency) to insecticides. The findings indicate that whether due to chronological age, nutrition, physiological state, or innate (circadian) activity patterns, careful consideration must be given to the selection of appropriate conditioned mosquitoes for testing. *Journal of Vector Ecology* 31 (1): 89-101. 2006

Keyword Index: *Aedes aegypti*, excito-repellency, behavior, deltamethrin, cypermethrin.

INTRODUCTION

Dengue hemorrhagic fever is one of the most serious viral illnesses of humans, occurring worldwide in many tropical/subtropical regions and placing 50-100 million people at risk of serious infection each year (Gubler 1997). The primary vector is the day-biting mosquito, *Aedes (Stegomyia) aegypti* (L.), an eusynanthropic mosquito that typically breeds in and around human habitation and seeks blood primarily from humans. Prevention and control of dengue transmission still relies heavily on control of the vector's preferred larval habitats. Elimination or resource availability management ("source reduction") of larval habitats has been the most common approach to vector control but remains an expensive endeavor that is difficult to sustain without large budgets, commitment, and active community participation (Gubler 1997). Adult vector control using insecticides applied as transitory space sprays, usually in direct response to dengue outbreaks, has been commonly used in and around homes for decades and is believed to be an important contributor of insecticide resistance in house-haunting mosquitoes like *Ae. aegypti*.

Although some populations of *Ae. aegypti* in Thailand have been found to be physiologically resistant to several synthetic compounds (Chareonviriyaphap et al. 1999,

Somboon et al. 2003), the true impact of resistance on vector control and disease transmission has not been adequately clarified (WHO 1992, Kongmee et al. 2004). Apart from the toxicological action, many synthetic pyrethroids have been shown to have irritant or repellent properties to insects (Threlkeld 1985). Most reports have focused on the excito-repellency properties of DDT and synthetic pyrethroids against *Anopheles* species (Coosemans and Sales 1977, Pell et al. 1989, Roberts et al. 2000, Chareonviriyaphap et al. 1997, 2001). Relatively little interest has been paid to behavioral responses of *Ae. aegypti* exposed to insecticides (Kennedy 1947, Lal et al. 1965, Moore 1977) and only one study has described the two principal types of behavioral responses, irritancy and repellency (Kongmee et al. 2004) in this species using a standardized excito-repellency test chamber and analysis (Roberts et al. 1997, Chareonviriyaphap et al. 2002). The influence of nutritional and physiological conditions on behavioral responses of *Ae. aegypti* during exposure to insecticides has not been investigated (Sungvornyothin et al. 2001), thus forming the objective of this study. The excito-repellency response of *Ae. aegypti* to deltamethrin and cypermethrin was determined by directly comparing the numbers of female mosquitoes escaping from test chambers following exposure to synthetic pyrethroids under controlled