Frequency of pyrethroid resistance in *Aedes aegypti* and *Aedes albopictus* (Diptera: Culicidae) in Thailand

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ABSTRACT: Thirty-two *Aedes aegypti* populations collected throughout Thailand and five populations of *Aedes albopictus* from southern Thailand were subjected to standard WHO contact bioassays to assess susceptibility to three commonly used synthetic pyrethroids: permethrin, deltamethrin, and lambda-cyhalothrin. A wide degree of physiological response to permethrin was detected in *Ae. aegypti*, ranging from 56.5% survival (Lampang, northern Thailand) to only 4% (Kalasin in northeastern and Phuket in southern Thailand). All 32 populations of *Ae. aegypti* were found to have evidence of incipient resistance (62.5%) or levels of survival deemed resistant (37.5%) to permethrin. Four populations of *Ae. albopictus* were found with incipient resistance (97 – 80% mortality) and one with resistance (< 80%) to permethrin. The majority of *Ae. aegypti* populations (68.7%) was susceptible (> 98% mortality) to deltamethrin, with incipient resistance (observed 97-82% mortality) in other localities. In contrast, all populations of *Ae. aegypti* were completely susceptible (100% mortality) to the recommended operational dosage of lambda-cyhalothrin. All five populations of *Ae. albopictus* were found completely susceptible to both deltamethrin and lambda-cyhalothrin. Evidence of defined incipient or resistance to synthetic pyrethroids mandates appropriate response and countermeasures to mitigate further development and spread of resistance. In light of these findings, we conclude that routine and comprehensive susceptibility monitoring of dengue mosquito vectors to synthetic pyrethroids should be a required component of resistance management policies and disease control activities. ***Journal of Vector Ecology* 36 (1): 204-212. 2011.**

Keyword Index: *Aedes aegypti*, *Aedes albopictus*, synthetic pyrethroids, susceptibility, Thailand.

INTRODUCTION

Dengue/dengue hemorrhagic fever is one of the most serious and important resurgent tropical diseases worldwide (Gubler 1998). Dengue is the most common vector-borne viral disease globally, primarily affecting developing countries of tropical and subtropical regions, with an estimated 2.5 to 3 billion people at risk of infection and resulting in approximately 50 million dengue infections annually (Guzman et al. 2010). *Aedes aegypti* (L.) and *Aedes albopictus* (Skuse) are the primary vectors of dengue viruses in Southeast Asia, a region that historically represents the epicenter of transmission and disease occurrence (Gubler 1998). Both species are primarily day-biting mosquitoes that share many of the same behavioral attributes. *Ae. aegypti* is more prevalent near and inside human dwellings and is the principal vector in urban, more densely populated zones, whereas *Ae. albopictus* is more peridomestic and more closely associated with rural and less congested suburban areas. Historically, *Ae. aegypti* is often associated with the epidemic spread of dengue viruses; *Ae. albopictus* typically provides a secondary role in outbreak transmission and maintaining rural endemic cycles in humans. Both mosquito species also play a comparable dual role in the transmission of chikungunya virus, a disease that has recently emerged in a more frequent epidemic form in Asia, Indian Ocean countries, and southern Europe (Charrel et al. 2007).

Effective control of these two mosquito species has proven extremely difficult with both vector and virus remaining entrenched and expanding in many disease endemic areas. Lacking an effective vaccine, vector control methods attacking both larval habitats and adult mosquito populations remains the primary method for reducing risk of dengue infection (Kongmee et al. 2004, Polsomboon et al. 2008). Unfortunately, control strategies aimed at elimination of preferred vector larval habitats through source reduction or periodic application of insecticides to water sources has often met with failure to sufficiently control these two