Comparison of *Aedes aegypti* (Diptera: Culicidae) Resting Behavior on Two Fabric Types Under Consideration for Insecticide Treatment in a Push-Pull Strategy

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ABSTRACT *Aedes aegypti* (L.), the primary vector of dengue and dengue hemorrhagic fever, breeds and rests predominately inside human dwellings. With no current vaccine available, vector control remains the mainstay for dengue management and novel approaches continue to be needed to reduce virus transmission. This requires a full understanding of *Ae. aegypti* ecology to design effective strategies. One novel approach is the use of contact irritants at target resting sites inside homes to make the surface unacceptable and cause vectors to escape before biting. The objective of the current study was to observe indoor resting behavior patterns of female *Ae. aegypti* within experimental huts in response to two fabrics under consideration for insecticide treatment: cotton and polyester. Results indicate that fabric type, coverage ratio of dark to light fabric and placement configuration (vertical vs. horizontal) all influenced the resting pattern of mosquito cohorts. Findings from this study will guide evaluations of a push-pull strategy designed to exploit contact irritant behaviors and drive *Ae. aegypti* out of homes prefeeding.

KEY WORDS *Aedes aegypti*, contact irritancy, resting behavior, experimental hut, Thailand

Dengue occurs in developing countries of the tropics with an estimated 2.5 billion people residing in endemic areas (World Health Organization [WHO] 2007). Only two species of *Aedes* mosquitoes, *Aedes aegypti* (L.) and *Aedes albopictus* (Skuse), are considered as dengue vectors. *Aedes aegypti*, a day biting mosquito, is more prevalent around human dwellings and is a principal vector in urban zones (Gould et al. 1968) while *Ae. albopictus*, the Asian tiger mosquito, is considered a vector in more rural and suburban areas (Chan et al. 1971, Chareonviriyaphap et al. 1999). Controlling these two species is extremely difficult and presents a long-term problem for disease endemic areas. Control strategies aimed at the elimination of immature breeding sites through source reduction, requires full community participation, and often results in failure (Gubler et al. 1998, Kongmee et al. 2004). Arguably, the most effective method for arthropod-borne disease prevention has been through adult vector reduction using various chemical means (Roberts et al. 1997, Grieco et al. 2007, Jirakanjanakit et al. 2007, Thanispong et al. 2008). However, with the rates of dengue and dengue hemorrhagic fever increasing in many endemic areas it is evident that novel control strategies are needed (WHO 2010).

The direct toxic effect of chemicals on mosquitoes has been the focus of control efforts dating back to the WHO malaria eradication efforts of the 1950s (WHO 2009) while limited attention has been given to the benefits of sub-lethal chemical actions (Roberts et al. 1997, 2000; Achee et al. 2012). One of the best known documentations of sub-lethal actions was the behavioral studies of *Anopheles* mosquitoes to DDT (Kennedy 1947). Combined, this work led to the identification of two different types of sub-lethal actions: contact irritancy and noncontact repellency (Kennedy 1947, Muirhead–Thompson 1951, Dethier et al. 1960, Davidson 1953, Lockwood et al. 1984, Roberts and Andre 1994). Contact irritancy elicits an escape response after insects make physical contact with chemical treated surfaces while noncontact or spatial repellency is differentiated from the former because of its ability to prevent vectors from entering chemically treated areas in the vapor phase, that is, without making physical tarsal contact with the treated surface (Lockwood et al. 1984; Roberts et al. 1997, 2000).

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