# Influence of Time of Assay on Behavioral Responses of Laboratory and Field Populations *Aedes aegypti* and *Culex quinquefasciatus* (Diptera: Culicidae) to DEET

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**ABSTRACT** Knowledge on test conditions that may influence behavioral responses of mosquitoes is critical when excito-repellency tests are conducted. The objective of this study was to investigate the effect of test time differences on normal circadian activity and behavioral responses of field and colonized *Aedes aegypti* (L.) (=*Stegomyia aegypti*) and *Culex quinquefasciatus* Say to DEET, one of the most common synthetic repellent active ingredients available. Two field populations of *Ae. aegypti* and *Cx. quinquefasciatus* from Kanchanaburi and Nonthaburi provinces, respectively, and two long-standing laboratory populations, *Ae. aegypti* obtained from the U.S. Department of Agriculture, and *Cx. quinquefasciatus* from the Ministry of Public Health, Thailand, were used. Each population was exposed to DEET during two different periods of time (0900–1500 hours) and (2100–0300 hours). Both field and laboratory *Cx. quinquefasciatus* showed marked differences in spatial repellent escape responses between day and nighttime periods but none in direct contact tests. No significant differences between day and nighttime testing periods were observed with field or laboratory *Ae. aegypti*, except a higher daytime escape response from noncontact DEET treatment. This study indicates that test time may influence the behavioral avoidance responses and is a potential confounder of excito-repellency evaluations.

**KEY WORDS** DEET, excito-repellency, *Aedes aegypti*, *Culex quinquefasciatus*

Humans living or visiting many tropical and subtropical regions are at risk of contracting diseases transmitted by mosquitoes (WHO 2012). Effective vaccines against many of these diseases, for example, malaria and dengue, are not yet available and are likely years away from reality. Currently, most strategies for the prevention of vector-borne diseases rely on control of the vector and use of personal protection measures using chemicals that either kill or repel the offending insect (Roberts et al. 1997, Grieco et al. 2007, Chareonviriyaphap et al. 2013). In the past, the majority of studies on insecticides have mainly focused on the toxic properties of compounds, whereas behavioral avoidance responses elicited by these same chemicals has been generally neglected.

*Aedes aegypti* (L.) (=*Stegomyia aegypti*) is predominately an urban mosquito species and an important vector of dengue, yellow fever, and chikungunya viruses. *Culex quinquefasciatus* Say, a common cosmopolitan pest species is an efficient vector of urban lymphatic filariasis, *Wuchereria bancrofti* (Sasa 1976). Both species are difficult to control because of their intimate association with human environments. *Ae. aegypti* is commonly found in and around human dwellings using clean stored water as larval habitats and preferentially feeds on humans during daylight hours, whereas *Cx. quinquefasciatus* is a common urban and rural nuisance mosquito that can breed in a variety of clean and polluted water sources and bites primarily during the night. Vector control against either species is the most effective measure for disease prevention and continues to rely upon various synthetic insecticides applied to control either the larval or adult stage.

A better understanding of the physiological and behavioral responses of mosquitoes to insecticidal and repellent compounds is of operational importance to vector control and disease prevention programs. In general, two forms of behavioral actions have been described following exposure to certain compounds, leading to movement away from the source, contact irritancy (="excitation" in the nonanthropomorphic sense) and noncontact spatial repellency ("avoid-

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