Journal of Medical Entomology, 58(6), 2021, 2299–2307
doi: 10.1093/jme/tjab095
Advance Access Publication Date: 11 June 2021
Research

ENTOMOLOGICAL SOCIETY OF AMERICA
SHARING INSECT SCIENCE GLOBALLY

OXFORD

Vector Control, Pest Management, Resistance, Repellents

Effect of Different Wall Surface Coverage With Deltamethrin-Treated Netting on the Reduction of Indoor-Biting *Anopheles* Mosquitoes (Diptera: Culicidae)

Krajana Tainchum,[1,2] Michael J. Bangs,[3,4] Sunaiyana Sathantriphop,[5] and Theeraphap Chareonviriyaphap[1,3,6]

[1]Center for Advanced Studies for Agriculture and Food, KU Institute for Advanced Studies, Kasetsart University, Bangkok 10900, Thailand, [2]Agricultural Innovation and Management Division, Faculty of Natural Resources, Prince of Songkla University, Songkhla 90110, Thailand, [3]Department of Entomology, Faculty of Agriculture, Kasetsart University, Bangkok 10900, Thailand, [4]Public Health & Malaria Control Department, PT. Freeport Indonesia, International SOS, Kuala Kencana, Papua 99920, Indonesia, [5]National Institute of Health, Department of Medical Sciences, Ministry of Public Health, Nonthaburi 11000, Thailand, and [6]Corresponding author, e-mail: faasthc@ku.ac.th

Subject Editor: Douglas Norris

Received 24 November 2020; Editorial decision 29 April 2021

Abstract

Indoor residual spray with deltamethrin remains the most common tool for reducing malaria transmission in Thailand. Deltamethrin is commonly used to spray the entire inner surfaces of the walls to prevent mosquitoes from resting. This study compared the mosquito landing responses on humans inside three experimental huts treated with deltamethrin at three different extents of wall coverage (25%, 50%, and full coverage), with one clean/untreated hut serving as a control. There were no significant differences between the numbers of *Anopheles* mosquitoes landing in the 50% and full coverage huts, whereas, in comparison to both of these, there was a significantly greater number landing in the 25% coverage hut. This study demonstrates that varying the percent coverage of indoor surfaces with deltamethrin-treated netting influences the blood-feeding success of wild *Anopheles*, and our findings suggest that it may be possible to reduce the extent of insecticide surface treatment while maintaining equivalent mosquito avoidance action to that seen in fully treated structures.

Key words: *Anopheles minimus* s.l., *Anopheles dirus* s.l., experimental hut, deltamethrin-treated netting, Thailand

In Thailand, malaria is still a serious vector-borne disease in forested and hilly areas. This is particularly true along the undeveloped international borders with Myanmar in the west, Cambodia in the southeast, and Malaysia in the southern peninsula (Tananchai et al. 2019). In recent years, surveillance data from the Bureau of Vector-Borne Diseases, the Department of Disease Control, and the Ministry of Public Health have indicated decreasing trends for morbidity and mortality from malaria, with a 96% reduction in the number of recorded malaria cases, from 159,120 in 2000 to 5,832 in 2019 (BVBD 2019). A reduction in malaria deaths from 625 in 2000 to 15 in 2019 (98%) was also observed. This significant improvement is due to ongoing diagnostic activity (active and passive mechanisms) and an effective, well-organized vector control program focusing activity on indoor residual spraying (IRS) and insecticide-treated netting (BVBD 2019).

IRS is regularly performed for interruption of human–vector contact and malaria transmission (Chareonviriyaphap et al. 1999, 2013). After its ban on the use of DDT in the malaria control program in 2001, DDT was gradually replaced by two synthetic pyrethroid compounds, deltamethrin, and permethrin (Ismail et al.1974, 1975; Muenworn et al. 2006; Chareonviriyaphap et al. 2013). Both pyrethroids have been widely accepted for controlling many insects that cause public health problems, due to their relatively low mammalian toxicity and high efficacy in controlling indoor mosquito populations (Elliott et al. 1978, Najera and Zaim 2002, Malaithong et al. 2010, Chareonviriyaphap et al. 2013). Deltamethrin has been the core compound for IRS in the fight against malaria in Thailand (Potikasikorn et al. 2005). Like DDT, most pyrethroids exhibit strong behavioral action in many malaria mosquito species (Roberts et al. 2000, Chareonviriyaphap et al. 2004, Potikasikorn et al. 2005,