

## Diagnostic Doses of Two Pyrethroids Currently Used for Control of *Aedes aegypti* L. (Diptera: Culicidae), a Vector of Dengue

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### ABSTRACT

Determining the diagnostic dose is crucial in evaluating the susceptibility of a mosquito population to certain insecticides. Presently, the diagnostic doses of only two pyrethroids (permethrin and  $\lambda$ -cyhalothrin) have been published for monitoring insecticide susceptibility of *Aedes aegypti*. Therefore, the objective of this study was to establish the diagnostic doses for two synthetic pyrethroids—bifenthrin and  $\alpha$ -cypermethrin—currently used in dengue vector control, using the United State Department of Agriculture (USDA) standard strain of *Aedes aegypti*. These diagnostic doses were subsequently used to evaluate the susceptibility status in field collected specimens of *Ae. aegypti*. Based on the baseline susceptibility levels, all three field strains demonstrated varying levels of physiological resistance to each compound. Strong resistance to bifenthrin was seen in one strain from Nong Khai resulting in 14.14% mortality whereas complete mortality (100%) was observed in the USDA standard strain when exposed to the established diagnostic doses of these two synthetic pyrethroids. These diagnostic doses could be applied for monitoring the susceptibility status in mosquito populations across Thailand.

**Keywords:** insecticide, diagnostic dose, *Aedes aegypti*, pyrethroids, Thailand

### INTRODUCTION

Over 100 countries around the world are at risk from a wide variety of vector-borne diseases, including dengue fever (DF) and dengue hemorrhagic fever (DHF), with an estimated 2.5 billion people at risk of contracting dengue many of whom live in Southeast Asia (WHO, 2002). Approximately 50–100 million people are infected annually with dengue viruses worldwide, primarily in crowded, impoverished urban regions of the world (WHO, 2009). In Southeast Asia, DHF cases have been increasing from an annual rate of

below 10,000 in the 1960s to more than 200,000 in the 1990s (Gibbons and Vaughn, 2002; WHO, 2009). In Thailand, there were 115,434 dengue cases in 2010 with 141 reported deaths (Bureau of the Vector-borne Diseases, 2010)

The four viral serotypes (DEN-1, 2, 3, 4) are transmitted primarily by *Aedes aegypti* (L.), a highly efficient mosquito vector that is often found in and near human dwellings. In Thailand, this mosquito-borne disease causes tremendous morbidity and mortality each year. To date, no effective or commercial multivalent dengue vaccine is available. Prevention of this disease

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