Selection for pyrethroid resistance in a colony of *Anopheles minimus* species A, a malaria vector in Thailand

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ABSTRACT: This study tested susceptibilities of *Anopheles minimus* mosquitoes to deltamethrin during each of 19 generations (although technical problems excluded selective pressure experiments during generations 11-13). The ultimate goal was to establish a pyrethroid resistant colony of this important malaria vector in Thailand. Resistance was selected for by exposing, using the World Health Organization test protocol, sequential generations of *An. minimus* females to LD_{50} and LT_{50} values of deltamethrin. The LD_{50} and LD_{90} values were determined for populations from each subsequent generation by probit analysis and significant increases (chi-square test, $P>0.01$) occurred from one generation to the next. There was approximately a 22-fold increase in the LD_{50} and a 27-fold increase in LD_{90} when the F_{10} generation was compared to the parent colony (F_1). Similarly, the LT_{50} and LT_{90} values were also increased during selection experiments during generations 14-19. There was roughly a 3-fold increase in susceptibility of F_{19} females compared to F_{14} females. In addition, deltamethrin conferred a cross-resistance to DDT in the selected colony. Baseline information from these experiments will serve as a guide for future studies on susceptibilities of wild *An. minimus* populations in Thailand. ***Journal of Vector Ecology* 27(2): 222-229. 2002.**

Keyword Index: Deltamethrin, resistance, *Anopheles minimus*, cross-selection.

INTRODUCTION

Despite years of vector control and public health activities, malaria remains a major public health concern in Thailand. Thousands of malaria cases are reported annually (Annual Malaria Reports 1995-2000). The key to preventing malaria transmission is to reduce human-vector contact using chemical insecticides (Prasittisuk 1985, Chareonviriyaphap et al. 2000). Intradomicillary spraying with DDT was employed for control after Thailand accepted the WHO plan for malaria eradication in 1950 (Prasittisuk 1985). However, the use of DDT has been decreasing over time because of changing human response to spraying coupled with environmental concerns. Furthermore, the development of physiological resistance to DDT had been detected in all 3 primary malaria vectors, *Anopheles dirus*, *An. minimus* and *Anopheles maculatus* (Chareonviriyaphap et al. 1999). Synthetic pyrethroids are the current insecticides of choice for malaria control in Thailand. The pyrethroids have shown great promise for pest control due to their low mammalian toxicity and remarkable potency at low levels that quickly immobilizes, kills and repels insects (Prasittisuk 1994, Chareonviriyaphap et al. 1997). Pyrethroids have been used for impregnation of bed nets, viz. permethrin and lambdacyhalothrin, and for intradomicillary spraying, viz. deltamethrin. Due to their effectiveness and rapid excito-repellency actions, these insecticides have been used for malaria control in many parts of the country (Chareonviriyaphap et al. 2001).

Anopheles minimus Species A is the main malaria vector in the hill and forest fringe areas of Thailand (Baimai 1989). This species is considered sufficiently endophagous and anthropophilic and, as a consequence, is more likely to come into contact with residual insecticides used in impregnated bed-nets and intradomicilary spraying (Nutsathapana et al. 1986, Chareonviriyaphap et al. 2001).