Temephos resistance in field Aedes (Stegomyia) albopictus (Skuse) from Selangor, Malaysia

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Abstract. Larvae of Aedes albopictus obtained from dengue endemic areas in Selangor, Malaysia were evaluated for their susceptibility to operational dosage of temephos (1 mg/L). Larval bioassays were carried out in accordance to modified WHO standard methods. Biochemical microassay of enzymes in Ae. albopictus was conducted to detect the emergence of insecticide resistance and to define the mechanisms involved in temephos resistance. The 50% mortality lethal time (LT₅₀) for Ae. albopictus tested against temephos ranged between 58.65 to 112.50 minutes, with resistance ratio ranging from 0.75 - 1.45. This study addressed the fluctuation of time-related susceptibility status of Ae. albopictus towards insecticide. Significant difference on the weekly enzyme levels of non-specific esterases, mixed function oxidases and glutathione S-transferases was detected (p < 0.05). No significant correlation was found between temephos resistance and enzyme activity (p > 0.05). Only glutathione S-transferases displayed high level of activity, indicating that Ae. albopictus may be resistant to other groups of insecticide. The insensitive acetylcholinesterase was detected in some field collected Ae. albopictus populations, indicating the possibility of emergence of carbamate or other organophosphate resistance in the field populations. Continuous resistance monitoring should be conducted regularly to confirm the efficacy of insecticides for dengue control.

INTRODUCTION

Dengue has remained endemic in Malaysia since the first case was documented in 1901-1902 (Skae, 1902). The disease was notifiable since 1973 and the first major outbreak of dengue was reported in 1982 in Penang (Lam, 1983).

Dengue is a vector-borne disease, with increasing morbidity and mortality in Malaysia over the years. High human population growth in many areas has led to extensive deforestation, irrigation and urbanization. These high population densities and associated environmental modifications have created conditions that favour the proliferation of the dengue vectors.

Aedes (Stegomyia) albopictus (Skuse) is incriminated as one of the dengue vectors in Malaysia (Rebecca, 1987; Lam, 1993; Lee & Inder, 1993). Experimental results in studies on the possibility of transovarian transmission of dengue virus in Ae. albopictus has been reported by Lee et al. (1997). In the absence of an effective vaccine and specific treatment, dengue control relies only on controlling the mosquito vectors. One of the most commonly used control agents is chemical insecticides. Temephos, the only approved larvicide, is widely used to control container-breeding Aedes since 1973 in Malaysia (Seleena et al., 2001).

However, long term and intensive use of insecticides often lead to emergence of resistance. Insecticide resistance is one of the major obstacles in the control of medical and agricultural arthropod pests (Georgiou & Taylor, 1986).