ABSTRACT

Potential Impact of Increased Temperatures on Insecticide Resistance in Caribbean Strains of the Dengue Vector, *Aedes aegypti*

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The main objective of this study was to assess the effect of increased temperatures on the insecticide resistance status of nine Caribbean strains of *Aedes aegypti*. Bioassays and biochemical assays were conducted on *Ae. aegypti* larvae from eight sites in Trinidad, and one each from Tobago and Anguilla. Mosquito larvae were treated with three temperature regimes prior to the conduct of bioassays and biochemical assays. Insecticide resistance and enzyme activity levels were calculated in relation to the CAREC reference susceptible strain.

Baseline results showed that resistance to insecticides was prevalent in Caribbean strains of *Ae. aegypti* larvae, with all strains showing high levels of resistance to DDT while most were resistant to one or more of the other insecticides. Biochemical assays revealed that all *Ae. aegypti* strains had elevated levels of α-esterase and MFO enzymes, while some had increased levels of β-esterases and GST, signifying the involvement of these enzymes in the manifestation of resistance. PNPA esterase and iAChE did not appear to be important resistance mechanisms in resistance to organophosphates seen in this study.

Larvae which were reared at or exposed to higher temperatures showed changes in susceptibility to insecticides and activity levels of enzymes. However, increases or

decreases in enzyme activity levels did not always correspond with decreased or increased susceptibility, respectively. Although there were variations in the responses of larvae to insecticides, mosquito strains generally became more susceptible to insecticides, with increasing temperatures. This therefore means that any modifications in the levels of resistance due to the impact of temperature could provide useful insight into the role that temperature could play in the evolution of insecticide resistance. It is postulated that while global warming may cause an increase in dengue transmission, our results suggest that the insecticide weapon on which we rely for dengue prevention and control may yet be effective if temperatures increase as projected.

Keywords: *Aedes aegypti*, insecticide resistance, temperature, resistance enzymes