Journal of Parasitology and Vector Biology Vol. 1 (2) pp. 013-018, August, 2009
Available online at http://www.academicjournals.org/jpvb
Academic Journals

Full Length Research Paper

Fluorescence can be used to trace the fate of exogenous micro-organisms inside the alimentary tract of mosquitoes

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Accepted 28 August, 2009

There is a great deal of current research interest in utilising bacteria for the control of intractable arthropod-borne diseases such as dengue. Although there is accumulating evidence that bacterial infection is a promising control strategy, most studies on bacteria-insect interactions lacked useful markers for detecting pathogenesis. This provided the impetus to investigate bacterial infection in the dengue vector *Aedes albopictus*. The infection persistence patterns in key organs of the alimentary canal of females were examined using a GFP-expressing strain of *Escherichia coli* (Migula). Just after feeding with sugar meal containing the bacteria, the crop and midgut as well as parts of the Malpighian tubules showed fluorescence. From 1 h onwards, bacterial populations declined sharply in both the midgut and crop, with complete elimination in the former but persistence of bacteria at 7 h post-feeding in the latter. After 24 h, neither organ retained the fluorescent marker. However, culture of homogenates of these organs in Luria-Bertani medium revealed the presence of a bacterial population in the crop, but not in the midgut. These observations suggest a difference in the potential physiological actions expressible by the two organs. In fact, both are storage sites for ingested fluids, but the midgut has greater physiological activity. Presumably, one of these activities contributed to eliminating GFP-expressing *E. coli* from the *A. albopictus* midgut after 24 h. The results of the present study using a fluorescent marker to detect infection may be useful for developing strategies to fully characterise the main steps involved in the bacterial infection process in insects.

Key words: Bacteria infection, fluorescent marker, crop, midgut, persistence.

INTRODUCTION

There is growing concern regarding the eventual impact of global climate change on the evolution of arbovirus infections (Chastel et al., 2002), particularly dengue. Despite tremendous effort to control this disease, its transmission is increasing due to the combined effect of changing human demographics and the spread of pathogens and vectors (Gubler, 2004). Dengue is caused by a flavivirus transmitted by the mosquitoes *Aedes aegypti* (L.) and *A. albopictus*. The later mosquito, which is native to Southeast Asia, is ranked fourth on the list of the most invasive organisms worldwide (http://www.is-sg.org/data base/welcome). It is an important vector of several arboviruses, including those responsible for yellow fever and various types of encephalitis as well as a competent laboratory vector of at least 23 arboviruses (Mitchell, 1995). Its larvae emerge from the eggs in containers and ingest some of the microbial fauna (Sota et al., 1992) associated with organic detritus, their major carbon source (Clements, 1992). As with most insects,

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