

# MICROBIAL CONTROL OF MOSQUITOES IN URBAN AREAS

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## INTRODUCTION

In terms of morbidity and mortality dengue is the most serious arbovirus disease confronting mankind. Approximately 2 billion people in the tropics, especially Asia, the Western Pacific region, the Caribbean, as well as Central and South America, live under the risk of dengue infections (Halstead, 1980 and 1982). The economic losses caused by this disease are immense. Due to its excellent adaptation to human habitation, *Aedes aegypti* became the principle vector of dengue and dengue haemorrhagic fever (DHF). The breeding sites of this mosquito vary widely, ranging from water containers, which are the most common breeding site, to tyres, rock pools, leaf axils, and tree-holes.

Due to uncontrolled urbanization in many tropical areas, the provision of drinking water has become a critical problem in less developed areas of the fast growing cities. In the absence of tap water, water for daily use has to be obtained from wells and then stored in containers. Such containers provide excellent developmental conditions for *Aedes aegypti*.

The rapid growth of many large cities raises also the problem of disposal of sewage. The immature stages of *Cx. quinquefasciatus*, as the main vector of lymphatic filariasis, predominantly inhabit sewage drains, cess pits and pools filled with eutrophic waters. Lymphatic filariasis persists as a major cause of clinical morbidity and a significant impediment to socioeconomic development in much of Asia, Africa, the West Pacific as well as in certain regions of the Americas. At least 120 million people are infected with the nematodes *Wuchereria bancrofti*, *Brugia malayi* and *Brugia timori*. More than 90% of all infections are caused by *Wuchereria bancrofti* which is mainly transmitted by *Cx. quinquefasciatus*.

Due to high water prices and limited natural water resources in many moderate climatic zones people catch rainwater in artificial containers e.g. to irrigate their garden areas. These containers are the most abundant breeding sites of the so-called house mosquito *Culex pipiens*. In rural areas cess pools provide ideal breeding conditions for this mosquito species due to the high content of organic substances in the water.

## INTEGRATED CONTROL OF MOSQUITOES IN URBAN AREAS

Mosquito control can be accomplished with chemical, physical and biological control tools. For the most part control operations are predominantly aimed at the adult stage through application of residual chemical insecticides (Lacey and Lacey, 1990). However, the often quick onset of resistance, the increasing costs for chemical insecticides and the concern for environmental damage have directed increasing interest towards environmentally safe and effective biological control tools as part of an integrated control strategy in order to reduce dependence on chemical insecticides. Integrated mosquito control should be an ecologically based approach that may involve several complementary interventions including e.g. microbial and biological control measures, environmental management and reduction of human mosquito contact based on community participation. The discovery and development of toxin-producing mosquitoicidal bacilli such as *Bacillus thuringiensis israelensis* (B.t.i.) and *Bacillus sphaericus* (*B. sphaericus*) inaugurated a new chapter in biological control of mosquitoes and black flies (Becker and Margalit, 1993; Margalit *et al.*, 1995). The rapid exploitation of microbial control agents was aided by their specific properties such as high efficacy against the target organisms, the relative ease with which they can









