ABSTRACT

This study mainly investigated the transmission dynamics of microfilaria (mf) uptake and infective larva (L_3) output of *Wuchereria bancrofti* in laboratory bred *Culex quinquefasciatus* in relation to host mf density. Mosquitoes were fed on carriers with mf densities 1-12415 mf/ml (0-996 mf/60µl). Mf concentration during ingestion and parasite depletion during incubation, significance of low-density microfilaraemia in transmission and parasite induced vector mortality were also studied. Finally the effects of parasitological indices (mf prevalence and intensity) of the community on variation of entomological parameters (mf uptake, immature larval output and L_3 output) in wild *Cx.quinquefasciatus* were studied in Walgama, Matara, Sri Lanka.

108 infection experiments were performed, feeding cohorts of lab-bred *Cx.quinquefasciatus*. The forearm of a carrier was introduced into a cage with 200-250 starved mosquitoes indoors, during 20h00-00h00. Mf uptake was determined dissecting 20-25% of fully gorged mosquitoes immediately after feeding. L_3 output was obtained dissecting mosquitoes surviving on day-14. Daily dead females were dissected to determine the parasite loss due to mortality. Effect of mf load on parasite development was studied dissecting mosquitoes daily or every second day. Regulation of parasitaemia in mosquitoes was determined comparing the parasitological indices obtained from mf surveys with dissection results of indoor resting *Cx.quinquefasciatus* in 1996 and 1997.

Epidemiological modelling, using maximum likelihood estimation showed that mf uptake was linearly related to host mf density, while L_3 output showed hyperbolic relationship (saturation). Initial slope for mf uptake was four times that for L_3 output suggesting a reduction in L_3 yield. Saturation level of L_3 output was 9.7 (95%CI = 8.3-11.6). Negative regression of L_3 yield with increasing mf uptake demonstrated '*limitation*' phenomenon in *W.bancrofti-Cx.quinquefasciatus* relationship. The reduction of prevalence in infective mosquitoes than infected suggesting a parasite loss during development.

Mf concentration in *Cx.quinquefasciatus* was density dependent. Mean number of larvae developed at incubation were dependent on mf uptake. Proportion of parasites successfully developed into L_3 reduced as parasite load increased. Density dependent survival of infected mosquitoes suggested a possible impact on '*limitation*'.

With 30 mf carriers of ≤30 mf/ml density, the mf uptake and L_3 output increased with increasing mf density (cubic model). Infection and infectivity rates in ultra low-density microfilaraemia (1-10 mf/ml) were less than 22% and 4%, while those in low-density microfilaraemia (11-30 mf/ml) were increased cubically upto 45% and 22%. Ultra low-density microfilaraemia does not play an important role in transmission as infective mosquitoes had only 1-2 L_3. In low-density group, 76.65% infective mosquitoes had single L_3 each. while 27.1% had 2-3 L_3 each. Success rate of mf developing into L_3 was highest at low-density. showing '*limitation*'. Prevalence of low-density carriers may increase with mass treatment since all mf carriers are not being cleared. With '*limitation*' this could trigger off the transmission of bancroftian filariasis. Therefore, reduction of mf density to zero or ultra low level is recommended.

Low mf prevalence and intensity in the community resulted in a higher L_3 yield under natural conditions. Thus, treating moderate and high-density carriers with selective treatment is essential. Alternatively the vector control together with Mass Drug Administration (MDA) programme is recommended. Current Programme for Elimination of Lymphatic Filariasis aims to reduce the mf prevalence/ intensity to elimination level. Further studies are necessary to evaluate the success of MDA in the reduction and interruption of transmission of bancroftian filariasis in Sri Lanka.