OBSERVATIONS ON THE CROSS-RESISTANCE STATUS BETWEEN DDT AND PERMETHRIN IN *ANOPHELES GAMBIAE S.L.* FROM ZANZIBAR, TANZANIA.

National Institute for Medical Research, Bombo Field Station,
P. O. Box 950, Tanga - Tanzania

R. T. Rwegoshora and S.M. Magesa

Permethrin and other pyrethroids have become very useful in malaria control following their superiority as insecticides of choice in the treatment of bednets and other fabrics against mosquitoes that transmit malaria. Some insects which are resistant to DDT have been shown to exhibit cross-resistance to permethrin. Among mosquito species, *Culex tarsalis* possibly possesses a gene that confers resistance to both DDT and pyrethrin. Field evidence for cross-resistance in mosquitoes was reported in *Aedes aegypti* in Bangkok, Thailand.

Similarities between DDT and pyrethroid insecticides have led to speculations that cross-resistance between them might limit the usefulness of the latter. Both insecticides act as neurotoxins on sodium channels and both DDT and pyrethroids exhibit two types of effect on insects, an initial knockdown (kd) effect that renders the insect motionless and a subsequent lethal effect. The extensive use of DDT in both agriculture and public health has led to cross-resistance with synthetic pyrethroids and pyrethrin insecticides and the gene concerned was given the name knock down resistance (*kdr*). Fears on the usefulness of pyrethroids for impregnation of bednet and other fabrics in controlling malaria in areas with DDT resistant mosquitoes have been expressed. *An. gambiae* from Zanzibar, United Republic of Tanzania show DDT resistance which was presumably selected by the DDT spraying programmes in the 1960s and 1980s. If this resistance conferred cross-resistance to pyrethroids it would threaten the

future use of insecticide treated nets in Zanzibar and this paper reports a test of whether this strain is also resistant to pyrethroids. A DDT-resistant strain of *Anopheles gambiae* from Mwera, Zanzibar was therefore tested for the possibility of cross-resistance with permethrin.

The *Anopheles gambiae* mosquito strain was collected from Mwera village, Zanzibar. Half and fully gravid mosquitoes were collected by indoor hand catch using an aspirator. Three hundred mosquitoes were collected and brought to the laboratory where they were kept in cages at 27±1 ^{0}C, 75±5% RH and light regime of LD 12:12. The mosquitoes were fed on 10% glucose solution. Selection pressure was applied for one generation to half of the mosquitoes collected using standard WHO adult susceptibility kits. Groups of twenty mosquitoes were exposed to 4% DDT impregnated papers for four hours followed by a 24 hours holding period. Those that survived were allowed to lay eggs in a petri-dish lined with a wet filter paper. These mosquitoes comprised the DDT-selected line. The other half of mosquitoes was also allowed to lay eggs in the laboratory and these formed the DDT non-selected line.

Eggs from both lines were hatched separately in plastic trays containing water (to a depth of 5cm). Larvae were fed on "Farex â" baby food every day until pupation. Pupae were removed from the trays using a dropper pipette within 24 hours of pupation and transferred to a 0.3L cup of water placed in mosquito cages. Newly emerged adults were kept in these cages before testing for cross-resistance. To examine for cross-resistance, batches of twenty mosquitoes from the F_1 of the DDT-selected and non-selected lines were exposed to 0.25% permethrin impregnated papers for one hour and then left for a twenty four hour holding period after which mortalities were recorded. Another group of mosquitoes from each line was tested with DDT to check for the status of resistance. These tests were conducted when the mosquitoes were one week old by which age part of their resistance would be expected to have been lost.

Results from these studies indicate that the *An. gambiae* strain from Zanzibar is resistant to DDT. There appears to be an increase in DDT resistance in the offspring of DDT selected parents. On exposing both lines to 0.25% permethrin for one hour, mortality was 100% in both lines. The results therefore show that there was no evidence for cross resistance between DDT and permethrin in *An. gambiae* from Mwera, Zanzibar. This is good news for the malaria control community as the results indicate that the use of permethrin for treatment of bednets in Zanzibar is therefore not threatened by presence of DDT resistant strains of *An. gambiae* on the islands.