

Abstract:

**Spatial and temporal patterns of *knockdown*-resistance in *Anopheles gambiae s.s.* from Uganda**

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Contemporary malaria vector control strategies rely on the use of insecticides for indoor residual spraying or impregnation of bed nets. Hence, the appearance of insecticide resistance can jeopardize malaria control efforts. Consequently, knowledge of vector resistance and understanding the spread of resistance in target species are basic requirements to guide insecticide use in malaria control programs. The most used insecticides in malaria control belong to the family of Pyrethroids. In West Africa, pyrethroid resistance is associated with a leucine to phenylalanine substitution at position 1014 of the sodium channel gene (L1014F). This is known as *knockdown* resistance (*kdr*). In East Africa, a different substitution is found, causing a change from leucine to serine (L1014S). In order to assess the spatial and temporal patterns of *knockdown*-resistance in *Anopheles gambiae s.l.* from Uganda, *Anopheles* mosquitoes were collected monthly in seven sentinel sites during a one year period. After morphological and molecular identification, *An. gambiae s.s.* and *An. arabiensis* were screened for the presence of L1014F and L1014S by allele specific PCR.

Both L1014F and L1014S *kdr* alleles were present in *An. gambiae s.s.* from Uganda. The West African *kdr* allele, L1014F, was found in two of the seven sentinel sites at a frequency of 1.3% and 0.4%. Clear spatial patterns of the L1014S *kdr* allele frequency were observed in *An. gambiae s.s.* The lowest frequency was found in a north-western rural village (3%) and in a peri-urban village (13%) near Kampala. The other villages showed a L1014S frequency between 25-29%. These differences are probably due to variations in insecticide pressure. In one rural village, located near the Kenyan border, the L1014S allele showed an increase during the dry season.

The observed *Kdr* frequency in *An. gambiae s.s.* from Uganda clearly contrasts with the situation from nearby countries. For example in Burundi (Karuzi) and Kenia (Kisumu) L1014S *kdr* allele frequencies between 4 and 8% were detected in *An. gambiae s.s.* Actually no nationwide malaria vector control activities are deployed in Uganda. However, the observed *kdr* frequency should be taken into consideration when designing malaria vector control activities.