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BLOOD-FEEDING AND IMMUNOGENIC *AEDES AEGYPTI* SALIVA PROTEINS

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Mosquito-transmitted pathogens pass through the insect's midgut (MG) and salivary gland (SG). What occurs in these organs in response to a blood meal is poorly understood, but identifying the physiological differences between sugar-fed and blood-fed (BF) mosquitoes could shed light on factors important in pathogens transmission. We compared differential protein expression in the MGs and SGs of female *Aedes aegypti* mosquitoes after a sugar- or blood-based diet. No difference was observed in the MG protein expression levels but certain SG proteins were highly expressed only in BF mosquitoes. In sugar-fed mosquitoes, housekeeping proteins were highly expressed (especially those related to energy metabolism) and actin was up-regulated. The immunofluorescence assay shows that there is no disruption of the SG cytoskeletal after the blood meal. We have generated for the first time the 2-DE profiles of immunogenic *Ae. aegypti* SG BF-related proteins. These new data could contribute to the understanding of the physiological processes that appear during the blood meal.

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THE CONTRIBUTION OF AESTIVATING MOSQUITOES TO THE SUBSEQUENT WET SEASON POPULATIONS IN THE SAHEL

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Persistence of African anophelines throughout the long dry season (4-8 months) where no surface waters are available remains one of the last mysteries of medical entomology. Recent studies demonstrate that aestivation (summer diapause) is one mechanism that allows the African malaria mosquito, *Anopheles gambiae*, to persist in the Sahel. However, migration from distant localities - where reproduction continues year-round - might also be involved. To assess the unique contribution of aestivating adults to the build-up of populations in the subsequent wet season, we compared two villages subjected to weekly pyrethrum sprays throughout the dry season with two nearby villages. We predict that in the treated villages, mosquito density during the subsequent wet season would be lower and it would peak later if most aestivating mosquitoes are killed by the insecticide. We selected four small, isolated villages in the Sahel region of Mali located over 10 km away from the nearest permanent larval site. Monitoring started in September 2009 in all villages. It consisted of pyrethrum spray collections conducted once a month in 25 houses selected at random in each village. Insecticide treatment in treated villages started after all larval sites dried up (December). Treatment consisted of four pyrethrum sprayings in all houses every month throughout the dry season, until the first rain. After the first rain, only monitoring was performed every ten days in all four villages. The mosquito density and composition before, during, and after the dry-season treatment was compared in each pair of treated and untreated villages based on their geographical proximity. Currently (March 2010), the dry season treatments are ongoing and house density is 0-0.04/house in all four villages. The complete results will be presented and discussed in respect to the role of aestivation to the persistence of mosquitoes in the Sahel and their implication for malaria control.

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SIMULATIONS OF MOSQUITO HOST-SEEKING BEHAVIOR

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Models of disease spread commonly make the assumption that susceptible and infected individuals are homogeneously distributed within a population or within subpopulations that are interconnected on a large spatial scale. The effect of small-scale spatial heterogeneity on disease transmission remains a relatively unexplored area, and may be particularly important in diseases where transmission occurs between members of different species. I present a computational model to explore the effect of small-scale spatial heterogeneity on the encounter rate between mosquito vectors and bird hosts in the context of West Nile virus transmission. The model includes behavioral rules for the motion of host-seeking vectors, a spreading odor plume generated by resting hosts, and non-uniform wind conditions. The behavior of the vectors and the spatial arrangement of the resting hosts are varied to measure the number and distribution of mosquito-bird encounters. The results may be used to modify the transmission parameter in models of disease spread, such as SIR and its variants, in order to account for the effects of small-scale spatial heterogeneity in host distribution and differences in mosquito behavior across species.

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CONTRASTING EXPERIMENTAL HABITAT OPTIMA FOR *ANOPHELES* AND *AEDES*

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The mosquitoes Anopheles arabiensis Patton (Diptera: Culicidae), a vector of malaria, and Aedes albopictus Skuse (Diptera: Culicidae), vector of Chikungunya and Dengue, are targeted for population control programs, such as the Sterile Insect Technique (SIT). These two species coexist in the same areas in Reunion Island but are usually found in different breeding sites. Studies were conducted to assess their optimal food concentration for development and survival in order to optimize mass rearing processes for conventional SIT and to better understand their habitat limitations. For each species, 32 first instar larvae were reared in Petri dishes filled with 32 ml of deionised water, and fed daily with 640 microliters of different concentration (1, 1.5, 2, 4 and 8%) of a diet developed in the IAEA laboratory. Diet concentration tolerance was different for the two species: 2% appeared to be a maximum for An. arabiensis whereas Ae. albopictus survived well until 4% and was still able to develop at 8%. When food concentration increased, the development duration was slightly increased for An. arabiensis but reduced for Ae. albopictus. For both species and sexes, wing length increased with food concentration. Considering all the parameters, the best food concentration was 1% for An. arabiensis and 2% for Ae. albopictus. The sensitivity to the organic content and concentration of the aquatic environment was different between these two species as substantiated by our results. Indeed, An. arabiensis is usually known as a "clean-water" species whereas Ae. albopictus is a "polluted-water" mosquito which can develop well in water with a high organic content.