female utilization of sperm from more than one mating. In this study, we report our results of female sperm usage patterns using a combination of approaches including PCR-based detection of sperm genotypes and screening of female reproductive output.

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BEHAVIOURAL PATTERN OF THE MALARIA VECTORS AND VECTOR CONTROL INTERVENTIONS IN LUANGWA VALLEY, SOUTHEAST ZAMBIA

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Insecticide treated nets and Indoor residual spraying are the principal vector control interventions in Africa. Understanding of the behaviour of malaria vectors in different vector control intervention areas is important for effective implementation of the control programs. Human landing catches conducted both indoor and outdoor allowed us to survey the preferred feeding patterns of mosquitoes while the human behavior data collected through the household surveys have allowed us to estimate actual patterns of human exposure. *Anopheles funestus* seems equally predisposed to bite indoor or outdoor, regardless of intervention treatments. However, *Anopheles gambiae* s.l exhibited its classically documented endophagic tendency, particularly in blocks where both insecticide treated nets and indoor residual spraying applied in combination. Data on the hourly mean catches of the malaria vectors indicates the peak biting of *An. gambiae* s.l was just after the average time that residents go to bed at approximately 20 hrs. Contrary to *An. gambiae*, the peak biting time of *An. funestus*, the predominant vector in the area was in the late hours of the night, well after people go to sleep in both intervention areas. The highest catch, regardless of the intervention treaments was between 4 and 5 hrs. Because residents typically go to indoors and into bed at 20 hrs and get up at 6hrs, rude estimates of the proportion of human exposure occuring indoors was high for both species, with mean values of 0.90 and 0.94 for *An. gambiae* and *An. funestus*, respectively, that are essentially unchanged by intervention status.

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SEXUAL PERFORMANCE OF *AEDES ALBOPICTUS* (DIPTERA:CULICIDAE) MALES IN THE FRAME OF A STERILE INSECT TECHNIQUE PROGRAM

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Aedes albopictus was described as a vector of at least 22 arboviruses. This species can transmit Alphavirus (Chikungunya, equine fever) and Flavivirus (4 dengue serotypes, yellow fever, west nile fever). This species is now considered as the most efficient vector of Chikungunya virus and second for the dengue. *Ae. albopictus* is well established in Asia (native area), North and South America, Africa, Europe and Australia. Its high vector competence is combined with an efficient spreading behaviour. Current mosquito control methods against this species consist of chemical or biological treatments. The major problem besides the persistence of insecticides in the field and their impact on non-targeted species is the rapid acquisition of insecticide resistance. In the context of an area-wide integrated vector management, the Sterile Insect Technique (SIT) could be suitable in La Reunion Island. The insularity creates a geographical isolation and the existence of cool and dry seasons bring a decrease in mosquito populations. The sexual performance of wild males of targeted populations needed to be investigated in a SIT strategy. The mating ability of males *Ae. albopictus* was tested with batches of females and different cage sizes under laboratory conditions (colony from Saint-Pierre, La Réunion). One male was able to inseminate an average of 9.5 females and filled an average of 15.5 spermathecal capsules. One male encaged with 2 females removed and replaced every 24 h for 12 days inseminated 5.3 females and filled 8.6 spermathecal capsules. One male with 10 females removed and replaced every 24 h for 14 days inseminated 8.6 females and filled 12 spermathecal capsules. In the last two experiments, a significant decrease of mated females was observed over time. The high number of mated females by one male is encouraging for a SIT control of mosquitoes. The duration of the male activity is also a good new, in spite of its decrease over time. These two results will be used to model the release of males Ae. alobpictus.

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DEVELOPMENT OF A NEW BIOMARKER OF EXPOSURE TO *ANOPHELES* BITES BASED ON HUMAN ANTIBODY RESPONSES TO SALIVARY PROTEINS: FROM THE CONCEPT TO THE APPLICATIONS

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Human antibody (Ab) IgG response to whole saliva of An. gambiae could be an epidemiological biomarker of exposure to An. gambiae bites. In the objective to increase the specificity to Anopheles exposure, the second step is to identify the salivary proteins i) specific to Anopheles genus and ii) antigenic in children exposed to malaria. First, the identification of immunogenic salivary proteins of An. gambiae by an immuno-proteomic approach was assessed. The second step was to design peptide sequences, from the selected An. gambiae gSG6 antigen using a bioinformatic approach, taking into consideration i) their potential antigenic properties and ii) the absence of cross-reactivity with other arthropods/organisms. The specific IgG Ab levels were then evaluated in Senegalese children in different context of malaria.

From five gSG6 peptides, one gSG6-P1 peptide presented all criteria to be an optimal candidate biomarker for evaluating exposure to An. gambiae bites. Indeed, in addition to high specificity to Anopheles genus, the anti-gSG6-P1 IgG level was associated with the intensity of exposure to An. gambiae bites. In addition, complementary studies indicated that gSG6-P1 represents a specific tool for detecting low exposure to An. gambiae and also one biomarker for evaluating the level of An. funestus bites. This new "salivary" biomarker of Anopheles exposure could be used as a geographic indicator for mapping the risk of malaria transmission and especially in low Anopheles density conditions, where entomological methods are limited in sensitivity (dry season, altitude or urban malaria). It could also represent a direct criterion of efficacy in the evaluation of anti-vector strategies.

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THE EFFECTS OF SUBLETHAL PESTICIDE EXPOSURE ON VECTORIAL CAPACITY OF BITING INSECTS

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Vectorial capacity is the efficiency of an arthropod to transmit disease to susceptible hosts. The Ross-Macdonald mathematical model identifies the parameters determining disease transmission efficiency and can be used to determine the role of insecticide use in reducing vector-mediated disease transmission (as reported previously). The frequent contact of disease vectors with insecticides via aerial spraying, residual spraying in houses or on barriers, bed nets, and larval treatments will reduce disease transmission but the sublethal aspect of insecticide exposure may also increase the surviving insect's vectorial capacity and contribute to the