on the experimental conditions. (2) *In vitro* and *in vivo* degradation of the nanoparticle were observed by monitoring a fluorescence from labeled antigen molecules. In *in vitro*, the antigen was released from the nanospheres slowly and continuously with nearly zero-order kinetics until 40 days. Then, in *in vivo* condition, the antigens were observed even at 28 days after implanting subcutaneously 1 mg of the nanosphere (4 µg antigen) in each nude mouse. (3) Mice were immunized by subcutaneous injection of 5 mg nanoparticle (50 µg antigen). The antibody response of the mice was over 50-fold increase at the 15 weeks if the IgG titer was compared with non-encapsulated control. The titers were increasing through 60 weeks. These results suggest that this synthetic nanoparticle is a promising candidate as a long-lasting antigenic material toward an effective malarial vaccine.

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INSECTICIDE RESISTANCE IN THE ANTHROPOPHILIC MOSQUITOES *ANOPHELES ARABIENSIS* AND *CULEX QUINQUEFASCIATUS* IN MACHA, ZAMBIA

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The mosquito *Anopheles arabiensis* is the major vector of *Plasmodium falciparum* in Macha, Zambia. The arboviral and filarial vector *Culex quinquefasciatus* is also present in high numbers throughout the Macha region. A major portion of Zambia's current malaria control program relies on long-lasting insecticide-treated nets (LLINs) and indoor residual spraying (IRS) with insecticides. Insecticide resistance in mosquito populations has the potential to lessen and even eliminate the effectiveness of these control methods. CDC bottle bioassays and LLIN survival assays were used to characterize the *An. arabiensis* colony established at Macha, and this data was used as a baseline against which to compare field mosquitoes. F1 offspring of field-collected adult *An. arabiensis* from and *Cx. quinquefasciatus* from eggs collected from oviposition traps were tested for insecticide resistance. High levels of resistance to DDT, pyrethroids, malathion, and deltamethrin-treated net material were detected in *Cx. quinquefasciatus*, and low levels of resistance to DDT and deltamethrin-treated net material were detected in *An. arabiensis*. Molecular assays revealed that the knock-down resistance (*kdr*) allele was frequent in the *Cx. quinquefasciatus* population, but further investigation is required to determine the level of this mutation in malaria vectors. Continued monitoring and assessment is necessary in these populations in order to determine levels of resistance and appropriately modify vector control operations.

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SPECIFIC IMMUNO-EPIDEMIOLOGICAL BIOMARKERS OF EXPOSURE TO *AEDES ALBOPICTUS* AND *AE. AEGYPTI* BITES

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Aedes mosquitoes are among the main vectors of mosquito borne diseases. Both *Aedes* mosquitoes and the mosquito borne diseases that they transmit are currently expanding geographically. This situation stresses the need for accurate monitoring of these vectors populations. We aim to develop new methods to evaluate Human/Vector contact by immuno-epidemiological tools complementary to entomological methods. Specifically our aim is to evaluate human IgG responses to *Aedes albopictus* (La Réunion) and *Aedes aegypti* (Bolivia) salivary proteins, to give insights on the population exposed to *Aedes* bites. Our results indicate that assessing human IgG anti *Aedes* whole salivary proteins by ELISA can be used to detect individual exposure to vector bites and can therefore help to evaluate the risk of pathogen transmission. We observe no systematic IgG cross reaction between *Ae. albopictus* and *Ae. aegypti* salivary proteins.

Western blot experiments also reveal different patterns of immunogenic salivary proteins between these two vectors: we find not only common immunogenic salivary proteins to *Aedes* genera, but also specific immunogenic proteins to *Ae. albopictus* and *Ae. aegypti*. In addition, these characteristics may be used to discriminate exposure to *Aedes* vectors and furthermore to develop specific biomarkers of exposure to *Ae. albopictus* and *Ae. aegypti* bites. Characterization of specific immunogenic salivary proteins of *Ae. albopictus* and *Ae. aegypti* is under investigation. Such biomarkers, specific to *Ae. aegypti* and *Ae. albopictus* bites, could be used for monitoring emerging *Aedes* borne diseases and to evaluate efficacy of vector control programs.

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EVALUATION OF LONG-LASTING BIOLOGICAL LARVICIDE AGAINST *ANOPHELES* MOSQUITOES IN KENYA

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Synthetic insecticides are the main chemicals for malaria vector control. Biological insecticides are attractive alternatives for larval mosquito control as they are benign to the environment. However, the currently available bio-larvicide formulations have a short effective duration, and consequently larval control incurs a high operation expense due to requirement for frequent re-treatment of larval habitats. Therefore, formulation of biological larvicides that has long-lasting effects is highly desired. A fourStarTM Single Brood Granules (SBG) of *Bacillus thuringiensis israelenis* (Bti) was evaluated under semi-natural and natural conditions in Kenya. This formulation is designed to be effective against mosquito larvae for up to 6 months. In semi-natural habitats containing soil and rain water, second-instar larvae of *Anopheles gambiae* were introduced, and FourStarTM Bti granules dissolved in rain water with appropriate concentrations were added. The number of pupae produced was recorded daily. We found 100% mortality rate within 48 hrs after fourStarTM Bti was dissolved for two months. The field trial in stable and productive natural habitats is currently ongoing.

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BIOCHEMICAL MECHANISMS INVOLVED IN DDT AND PYRETHROID RESISTANCE IN TRINIDAD AND TOBAGO STRAINS OF *AEDES AEGYPTI*

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The objectives of this study were to investigate the status of the organochlorine dichlorodiphenyltrichloroethane (DDT) and Pyrethoid (PY) resistance in Trinidad and Tobago strains of *Aedes aegypti* and the underlying biochemical mechanisms. Nine strains of *Ae. aegypti* larvae from Trinidad and Tobago were assayed to DDT and PYs (deltamethrin and permethrin) using the Centers for Disease Control and Prevention (CDC) time-mortality based bioassay method. A diagnostic dosage (DD) was established for each insecticide using the CAREC reference susceptible strain and a Resistance Threshold (RT) - time in which 98-100% mortality was observed in the CAREC strain - was calculated for each insecticide.