

## Vectors innate immunity

### Modulation of mosquito immune response



Henrique Silveira ([HSilveira@ihmt.unl.pt](mailto:HSilveira@ihmt.unl.pt))

*Plasmodium* development in the mosquito is crucial for malaria transmission and depends on the parasite's interaction with a variety of cells and specific mosquito factors. Understanding these interactions, how mosquito immunity reacts to the infection and how we may manipulate the system to interrupt malaria transmission is our frame of work. Our research is focused on several aspects of parasite development during the sporogonic cycle, mainly regarding mosquito response to infection. We are particularly focused on how this response is modulated by outside factors, such as anti-malarial drugs and immunomodulatory molecules. Several approaches involving rodent malaria models and *P. falciparum* and *P. vivax* experimental infections of *Anopheles albimanus* have been used to pursue these goals.

#### Our areas of activity are:

1. Modulation of the mosquito innate immunity to *Plasmodium* using anti-malarial drugs and immunostimulatory molecules. Characterization of *Anopheles gambia* immune responses to *Plasmodium* infection in the hemolymph.
2. Variability of mosquito immune-related genes using field isolates from several African locations
3. Studies of alterations in transcript abundance of immune-related genes in mosquitoes *A. albimanus* infected with *P. falciparum* and *P. vivax*.

4. CYP genes usage during *Plasmodium* infection of *A. gambiae*.

**Collaborations:** Collins V (Sweden), Dimopoulos G (USA), Reichhart JM (France) and Herrera S (Cali, Colombia), Domingos, Almeida P, Grácio A and J. Pinto (Portugal).

**Highlight:** We have established a strong association between chloroquine treatment and alterations in the mosquito immune response. Our data shows that chloroquine has a significant impact on the transcript abundance of mosquito genes implicated in defence against *Plasmodium* which may contribute to the increased infectivity and modulation of parasite gene expression (fig 19). In this context, it is possible that the effect of chloroquine on the mosquito response to infection has contributed to the rapid dispersal of chloroquine resistance observed in the last 40 years.

### Selected Publications:

1. Abrantes P, Dimopoulos G, Grosso AR, do Rosário VE, Silveira H. (2008) Chloroquine mediated modulation of *Anopheles gambiae* gene expression. PLoS ONE. 3(7):e2587.

2. Silveira H, Ramos S, Abrantes P, Lopes LF, do Rosario VE, Abrahamsen MS. (2007) Effect of chloroquine on gen expression of *Plasmodium yoelii nigeriensis* during its sporogonic development in the mosquito vector. Malar J. 6:84.

3. Lopes, LF, Abrantes P, Silva AP, do Rosario VE, Silveira H. (2007) *Plasmodium yoelii*: the effect of second blood meal and anti- sporozoite antibodies on development and gene expression in the mosquito vector, *Anopheles stephensi* Exp. Parasitol 115:259-69.



**Rute Felix**



**Susana Ramos Luis F. Lopes**



(PhD Students)



**Ana Catarina Alves**  
(Insectary technician)

