

Reference: 06/ID



Project Title: Hormone signalling-induced mosquito immunity and its role in the defence against the arbovirus Rift Valley fever virus

Supervisors: [Dr Isabelle Dietrich](#), [Dr Victoria Sy](#)

Research group: [Mosquito Immunology](#)

Project Summary: Rift Valley fever virus (RVFV) is a mosquito-transmitted, zoonotic and emerging bunyavirus. RVFV is endemic or epidemic in large parts of Africa, where it affects livestock, wildlife and people exposed to infected animals or animal products. To date, there are no human vaccines and no specific treatments available.

Our group studies host and viral factors that are essential for or inhibit RVFV infection of host cells and RVFV spread between hosts. We use a wide range of state-of-the-art virology and molecular biology techniques to characterise these interactions.

We are looking for a placement student to investigate the role of mosquito hormone signalling in RVFV infections of mosquitoes. Hormones are important regulators of many physiological processes, including metabolism, development, reproduction and immune responses. In insects such as mosquitoes, the steroid hormone 20-hydroxyecdysone (20E) regulates development, metamorphosis and reproduction. Importantly, 20E signalling is also crucial in priming innate immunity when a mosquito takes a bloodmeal that potentially contains bacterial, parasitic or viral pathogens. In *Anopheles* mosquitoes, it has been shown that 20E signalling reduces bacterial load and limits malarial parasite survival. On a molecular level, these effects are likely to be mediated through different immune pathways and changes to lipid metabolism. The role of 20E signalling in arbovirus infections, however, still needs to be investigated.

For this, we will firstly identify 20E signalling response genes both bioinformatically and in *Aedes aegypti* mosquito cells following 20E treatment. Response gene expression will be quantified using real-time PCR assays that the student will design. Similarly, we will blood feed mosquitoes or inoculate them with 20E and subsequently follow 20E response gene expression over time. Lastly, we will explore if 20E-induced immune priming affects RVFV infection in vitro and in vivo. Reversely, we will silence the expression of the ecdysone receptor complex and again analyse RVFV growth dynamics.

Further Details: The techniques the student will learn and employ are bioinformatic approaches, molecular biology and virology methods, insect cell culture and mosquito manipulations. Based on literature searches and the student's personal research interests, the student can develop selected aspects of the project further. As RVFV must be handled in high containment laboratories and extensive training is required to access these facilities. The student's work will be supported by group members who are fully trained to conduct RVFV infection studies. The student will further benefit from day-to-day supervision, regular group meetings and close interactions with other groups at The Pirbright Institute, as well as being a part of the local vibrant student community. This project will complement ongoing work on the interactions between RVFV and the mosquito immune system.

References for Suggested Reading:

Rus, F. et al. (2013) Ecdysone triggered PGRP-LC expression controls *Drosophila* innate immunity. *The EMBO Journal* 32: 1626-38.

Dietrich, I., et al. (2017) RNA interference restricts Rift Valley Fever virus in multiple insect systems. *mSphere* 2 (3): e00090-17.

Wright, D. et al. (2019) Rift Valley fever: biology and epidemiology. *Journal of General Virology* 100 (8): 1187-99.

Reynolds, R.A. et al. (2020) 20-Hydroxyecdysone primes innate immune responses that limit bacterial and malarial parasite survival in *Anopheles gambiae*. *mSphere* 5: e00983-19.

To Apply:

Please email your CV (no more than two sides of A4) and a covering letter, detailing why you would like to undertake the placement and the knowledge and skills that you will bring to the Institute, to studentship@pirbright.ac.uk.

Closing date to apply: 09.00, 7th February 2022