

Ref: 13/BS-B

Project Title: How do insects acquire lumpy skin disease virus from skin lesions on cattle?

Supervisors: Beatriz Sanz-Bernardo, Pip Beard

Research group: Large DNA Virus

Project Summary:

Lumpy skin disease virus (LSDV) is a high consequence poxvirus pathogen that targets the skin of cattle to cause lumpy skin disease. LSD is found in Africa and the Middle East and is emerging into Asia and Europe where it has caused substantial livestock and economic loss. Key gaps in our knowledge of LSD are currently hampering control efforts. For example the mode of transmission of LSDV is poorly understood. In order to address this knowledge gap this project will study how insect vectors acquire LSDV from the skin of cattle. Specifically, it will study the quantity and location of LSDV in the skin lesions of cattle and the quantity and location of LSDV in insects that have acquired the virus from these skin lesions.

Details:

Preliminary studies measured LSDV in skin lesions from diseased cattle using PCR and virus titration and found a high viral load to be present. Conversely, using immunohistochemistry, we detected only a small number of cells labelling with anti-LSDV antibodies. This project will investigate the discrepancy between these two results, providing definitive information on the amount and location of LSDV in the skin lesions of cattle.

Our recent studies have shown that LSDV can be detected in up to 15% of insects that are fed on skin lesions. However the location of the virus in the insect (mouthparts, salivary glands, gut, circulatory system) is unknown. This project will study insects that have fed on lesions *in vivo* and *in vitro* and identify the location of the virus using PCR, virus titration and microscopy.

A collection of tissue biopsies and insects from previous experiments will be made available to the student for their project. The student will be trained in quantitative PCR, virus titration and confocal microscopy methods. The student will also be trained to work within the high containment laboratories at The Pirbright Institute.

The student will work closely with the primary supervisor (Beatriz Sanz Bernardo) in the laboratory, and meet regularly with the co-supervisor (Pip Beard) to discuss results and progress. The student will be part of the PoxWorld team which currently consists of eleven scientists including four post doctoral scientists and three PhD students. The group holds weekly lab meetings and regular journal clubs that the student will participate in.

This project will support the research work of PoxWorld by providing a better understanding of the acquisition of LSDV by insects from a skin lesion:

1. Determining how reliable the qPCR assay is as a proxy for live virus at different stages of the lesion formation.
2. Providing information of the location and quantities of the virus in the different skin layers (and thus its accessibility by hematophagous insects).
3. Identifying the location of the LSDV within virus-positive insects.

References for Suggested Reading:

1. Beard, P. M. Lumpy skin disease: a direct threat to Europe. *Vet. Rec.* **178**, 557–558 (2016).
2. Chinota, C. M. *et al.* Mechanical transmission of lumpy skin disease virus by *Aedes aegypti* (Diptera: Culicidae). *Epidemiol Infect* **126**, 317–321 (2001).
3. Kahana-Sutin, E., Klement, E., Lensky, I. & Gottlieb, Y. High relative abundance of the stable fly *Stomoxys calcitrans* is associated with lumpy skin disease outbreaks in Israeli dairy farms. *Med. Vet. Entomol.* **31**, 150–160 (2017).
4. Möller, J. *et al.* Experimental lumpy skin disease virus infection of cattle: comparison of a field strain and a vaccine strain. *Arch. Virol.* **164**, 2931–2941 (2019).

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 yvonne.walsh@pirbright.ac.uk.

Closing date to apply: 31.01.20