Ref: 03/LJ
Closing Date: 16.02.26 (close of business)

Project Title: Determining the influence of life history traits on virus infection, dissemination and onwards transmission potential in *Culicoides* biting midges

Supervisors: Laura Jones, Rafael Homem and Chris Sanders
Research group: Entomology

Project Summary:

Culicoides biting midges are tiny flies that act as vectors of economically important viruses of livestock including bluetongue virus (BTV) and epizootic haemorrhagic disease virus (EHDV). Both of these exotic viruses threaten the UK. The UK is currently experiencing an outbreak of BTV, affecting cattle and sheep across England, whilst EHDV has recently been reported in northern France for the first time. Due to a complex interplay of genetic and environmental factors, *Culicoides* species and populations vary in their ability to transmit viruses such as BTV, this is known as 'vector competence'. The potential impact of factors such as larval density and nutrition on the vector competence of *Culicoides* have not been investigated as they have for other vector groups such as mosquitoes. Whilst vector infection varies, the transmission of BTV from *Culicoides* to livestock is very efficient. The bite of a single infectious *Culicoides* may be sufficient to initiate BTV infection in an animal. Quantifying the number of virions delivered by a single infectious bite from *Culicoides* and how this might vary between individuals is key to enhancing our understanding of transmission of BTV and similar viruses to ruminants.

In this project we aim to determine the influence of life history traits, such as size and lifespan, on infection and dissemination rates of *C. sonorensis* for BTV and EHDV. The project will further explore how these factors may influence the number of virus particles excreted in the saliva during blood-feeding of individual *Culicoides*. We hypothesise that adult fitness will influence infection and dissemination rates and that the number of virions expelled during blood-feeding will differ between individuals as well as with varying infection and fitness levels. The intern will be responsible, with supervisory support, for testing these hypotheses, selecting conditions to investigate fitness impacts on virus infection of *Culicoides* and developing approaches to collect and quantify virus from *Culicoides* bites. Findings from the project will contribute directly to our goals of understanding the key interactions between viruses, vectors and mammalian hosts that facilitate transmission.

Further Details: *(Again, make sure you use terminology that an undergrad student will be able to understand)*

The intern will join the Entomology group in this multidisciplinary project which provides an excellent opportunity to learn transferable skills and virology, entomology and molecular biology techniques in an active research environment. They will use unique resources and develop competency to experience work in state-of-the-art insectary and high containment (SAPO4/CL3) laboratories, collaborating across research groups to increase our understanding of diseases that are currently and will continue to impact the UK farming industry.

References for Suggested Reading:

Mills et al., (2017) Culicoides-virus interactions: infection barriers and possible factors underlying vector competence. Curr Opin Insect Sci. 22:7-15. doi: 10.1016/j.cois.2017.05.003.
Guimera Busquets et al., (2023). Visualisation of bluetongue virus in the salivary apparatus of Culicoides biting midges highlights the accessory glands as a primary arboviral infection site. Biological Procedures Online, 25, Article 1. doi.org/10.1186/s12575-023-00221-2
Newbrook et al., (2025) Clinical disease in British sheep infected with an emerging strain of bluetongue virus serotype 3. Vet Rec. 2024;e4910. https://doi.org/10.1002/vetr.4910

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