Reference: 01/AB

Project: Generating and characterising fluorescently tagged-Birnaviruses

Supervisor: **Dr Andrew Broadbent**
Research Group: **Birnaviruses**

Project Summary:
Birnaviruses are economically important veterinary viruses that infect birds, insects and fish, causing production losses in aquaculture and to the poultry industry. However, despite their importance, our understanding of how they cause disease is incomplete. Fluorescently tagged "reporter" viruses are important tools for studying the pathogenesis of viral diseases. We have made the first ever tagged reporter birnavirus and the aim of this project is to use it to study how birnaviruses interact with host cells in more detail using cell-culture, molecular biology techniques, confocal microscopy, live-cell imaging and *in vivo* studies.

Details:
Green Fluorescent Protein (GFP) is a commonly used tag, however it has not been possible to generate a GFP- tagged birnavirus, potentially because the virus is too small. Instead, we have tagged a small sub-unit of GFP (GFP11) to a virus protein to make a split GFP-birnavirus. When the split GFP-virus infects cells expressing the rest of the GFP (GFP1-10), the tag completes the molecule, which fluoresces. We have successfully made this tool using a birnavirus of birds known as infectious bursal disease virus (IBDV). This project will involve characterising the stability of the tag and how the tag affects the viral replication using cell-culture and molecular biology techniques such as reverse-transcription quantitative PCR (RTqPCR). The project will then progress to live cell-imaging experiments, making movies of fluorescing infected cells to study how viral proteins move in the infected cell. By treating infected cells with various chemicals that inhibit different cellular processes (for example cytochalasin D or nocodazole) and then studying changes in how the virus proteins move, we can start to examine what cellular factors the virus proteins are interacting with. Finally, the strain of IBDV we have used so far is a lab-adapted strain that is easy to work with in the lab but doesn't cause disease in birds. This project will involve generating a split-GFP virus using a very virulent strain of IBDV. Time permitting; the student will also help a postdoc in the lab with *in vivo* studies with the split-GFP virus.

The student will join a group comprised of the head, Dr Andrew Broadbent, a postdoctoral research scientist, and a PhD student. All the necessary training will be provided by Andrew Broadbent and the postdoctoral scientist. In addition, there is a PhD student who can provide help.

References for Suggested Reading:

- Avilov et al., 2011. Journal of Virology, doi:10.1128/JVI.05820-11
- Ingrao et al., 2013. Developmental and Comparative Immunology, doi: 10.1016/j.dci.2013.03.017