Project Title: The what and how of antigen presentation by cattle MHC class I in health and disease
Supervisors: William Mwangi, John Schwartz, Giuseppe Maccari & Abigail Hay
Research group: Immunogenetics

Project Summary:
The immunogenetics team are interested in better understanding the immune system of ruminants (e.g. cattle and sheep), and how genetics can shape the immune response to viral infections. The major histocompatibility class I (MHC-I) are amongst the most genetically diverse immune genes in mammals. MHC-I molecules bind small peptides derived from inside the cell and present these to cytotoxic T and NK cells.

In health, these will be from self-proteins signalling that all is well. During infection peptides derived from the virus will bind and trigger an immune response from interacting immune cells. Immune memory can also be generated against the presented peptides to protect against repeat infections. As such, studying this peptide repertoire is of great interest for the development of more efficient vaccines in addition to improving our understanding of immune cell interactions.

This project will therefore aim to isolate and purify cattle MHC-I molecules from infected and uninfected cells and analyse the bound peptides using mass spectrometry. The peptides will be analysed and compared to existing computer-based predictions to investigate how the cell’s processing of self and viral peptides may bias the repertoire which ultimately reaches the cell surface.

In addition, the successful candidate has downstream experimental options which include - determining the origins of the bound peptide repertoire; validating the binding of extracted peptide fragments; and investigating the impact on peptide binding when residues within the binding cleft are mutated.

Details:
Depending on progress, the successful student may undertake the following in the duration of the research project:

- Cell culture and white blood cell isolation
- Cell sorting
- Viral infection of cells
- Protein Purification
- Mass spectrometry analysis
- Basic bioinformatics analysis
- Peptide loading assays
- Mutagenesis studies

References for Suggested Reading:

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 lucy.drudge@pirbright.ac.uk

Closing date to apply: 01.02.21