Reference: 03/ET

Project Title: Why does coronavirus only sometimes cause severe disease?

Supervisors: Dr Elma Tchilian, Dr Veronica Carr, Dr Basu Paudyal
Research Group: Mucosal Immunology

Project Summary: The spectrum of outcomes following SARS-CoV-2 exposure is wide and largely determined by the host response. Currently mouse, ferret, hamster and non-human primate models have been developed to study SARS-CoV-2 but these are not natural host species for infection. In contrast, pigs are natural hosts for several host-specific coronaviruses (CoVs). Similarly to SARS-CoV-2, infection can be mild or asymptomatic, but in some instances can lead to severe lung damage and impaired immunity. However, it is not understood why some individuals get mild and other severe disease. Comparison of events in pigs infected with viruses known to cause severe disease with those that do not, will help us to answer this important question and help in the development of better vaccines and treatments for animals and humans.

Further Details: CoV infections induce immune responses which either clear the infection and limit disease or may cause pathology and tissue damage. To understand this, we have established a pig porcine respiratory coronavirus (PRCV) model in which different PRCV strains cause wither mild or severe disease with lung damage. The porcine PRCV model exhibits very similar tissue damage to human SARS-CoV-2. Tissues from animals infected with pathogenic or non-pathogenic strains are stored and available for the student to take part in experiments to define the immunological mechanisms causing pathology or protection. The analyses will include assays of T cell function such as ELISpot and flow cytometry and evaluation of antibody responses by ELISA and neutralisation assays.

No information is available about the early and late events in PRCV infection and the student will have the opportunity for the first time to dissect the innate and adaptive immune mechanisms of control of PRCV infection in a large natural host animal model. The student will acquire expertise in virological and immunological assays such as: virus propagation, plaque assays, cell culture, neutralisation, ELISpot and flow cytometry.

References for Suggested Reading:

1. Jung K et al, J Virology 2007, DOI: 10.1128/JVI.01702-07

2. Edmans M et al, Frontiers in Immunology 2020, doi: 10.3389/fimmu.2020.604913

3. Swadling L et al, Nature 2021, doi: 10.1038/s41586-021-04186-8

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