

PhD Studentship: Mechanisms of induction of protective lung tissue resident memory cells against influenza



Project Ref: 2022/10/ET/CR

Anticipated Start Date: January 2022 **Duration:** 3.5 years full-time

Closing date to apply: 10.10.21



Eligibility:

- This studentship is open to science graduates with, or who anticipate obtaining, at least a 2:1 or equivalent, in a relevant biological subject in their undergraduate degree, or a Masters degree - subject to university regulations. Other first degrees, e.g. veterinary science, will be considered. You should be looking for a challenging, interdisciplinary research training environment and have an active interest in the control of infectious diseases.
- This is a 3.5 year fully funded studentship open to UK nationals. EU and international applicants are welcome to apply, however international university tuition fees will apply and these are not included in the funding – please see funding information below.
- Students without English as a first language must provide evidence that they meet the English language requirement, e.g. with an average IELTS score of 7.0, with no lower than 7.0 in listening/reading and no lower than 6.5 in speaking/writing.

Supervision:

Principal Supervisors: [Dr Elma Tchilian](#) (The Pirbright Institute), Professor Christine Rollier (University of Surrey)

Co-Supervisor: [Dr Eleni Vatzia](#) (The Pirbright Institute)

Project Details:

Influenza is a global health threat to humans and livestock and animal influenza viruses are the CDC's top zoonotic pathogen. There is a critical need to develop vaccines that provide broad protection and decrease the need for annual immunisation.

We have established a powerful pig influenza model to study immunity to influenza. Pigs are a natural host for the same subtypes of influenza virus as humans and have the same distribution of sialic acid receptors in their respiratory tract. The pig is immunologically, physiologically and anatomically more similar to humans than small animals.

Lung tissue-resident memory T and B cells (TRM and BRM) are critical for cellular immunity to influenza and other respiratory pathogens. TRM and BRM are most effectively induced by natural infection or mucosal delivery of vaccines. However the factors necessary for their generation and maintenance are not well understood, but both the method of antigen administration and the nature of the antigen itself may play a crucial role. In this project we shall investigate the generation and properties of TRM and BRM induced by H1N1pdm09 influenza infection or mucosal immunisation with adenoviral vectored vaccine expressing influenza internal (nucleoprotein) and external (hemagglutinin) proteins.

The student will have the opportunity for the first time to dissect the mechanisms of induction of TRM and BRM in a large natural host animal model and to establish their role in immunity to influenza. The student will:

1. Define the phenotype and function of TRM and BRM following infection or immunisation.
2. Characterise the inductive microenvironment in the lung following infection or immunisation.
3. Adopt an unbiased data driven transcriptomic approach to identify TRM and BRM from well protected or poorly protected animals.

The student will be exposed to the unique scientific environment in Pirbright and Surrey which offer complementary skills and facilities. The student will also have the opportunity to collaborate with human immunologists from Oxford and Imperial College London. The proposed studies will determine whether alterations in the mode of priming affect the nature of the TRM and BRM response. This will be a crucial step in the more rational development of novel vaccine strategies for influenza and other respiratory diseases.

References for Background Reading:

1. Martini V et al. Simultaneous Aerosol and Intramuscular Immunization with Influenza Vaccine Induces Powerful Protective Local T Cell and Systemic Antibody Immune Responses in Pigs (2021). *J Immunol.* 206:652-663; doi: 10.4049/jimmunol.2001086
2. Holzer B et al. Protective porcine influenza virus-specific monoclonal antibodies recognize similar haemagglutinin epitopes as humans (2021). *PloS Pathogens* 17(3):e1009330. doi: 10.1371/journal.ppat.1009330
3. Canini L et al. Timelines of infection and transmission dynamics of H1N1pdm09 in swine (2020). *PLOS Pathogens*, 16(7): e1008628; doi: 10.1371/journal.ppat.1008628
4. Martini V et al. Distribution of droplets and immune responses after aerosol and intra-nasal delivery of influenza virus to the respiratory tract of pigs (2020). *Frontiers in Immunology* 11:594470; doi: 10.3389/fimmu.2020.594470
5. McNee A et al. Establishment of a pig influenza challenge model for evaluation of monoclonal antibody delivery platforms (2020). *J Immunol.* 205(3):648-660; doi: 10.4049/jimmunol.2000429

Registration, Training and Funding:

This is a Pirbright Institute/University of Surrey fully funded studentship. All students are eligible for the full award (stipend and **home rated** university tuition fees). **From 1st August 2021, EU and International students will be liable for tuition fees at the international rate and must be able to fund the difference between “Home” and “Overseas” tuition fees themselves. For Home student eligibility guidelines, please refer to the UKRI [Full Eligibility Criteria \(Annex One\)](#).**

The student will be based primarily at The Pirbright Institute and registered with the University of Surrey. The student will visit the university to meet with their supervisors and undertake training or complete specific project tasks as required. Eligible students will receive a minimum annual stipend of £15,609 plus a cost of living top-up allowance of £2,200 per annum. Home rated university registration fees will be paid. A full range of research and transferrable skills training will be made available to the student as appropriate.

Applications:

[How to Apply](#): Closing date 10.10.21.

Essential documents:

- Application Form
- CV
- Two references sent directly from your referees

Please email your application to studentship@pirbright.ac.uk by the closing date.