

Department of Veterinary Medicine

Available PhD Project:

Supervisor: Professor Clare Bryant

Supervisor profile page: [Professor Clare Bryant | Department of Veterinary Medicine \(cam.ac.uk\)](https://www.cam.ac.uk/research/news/farmed-carnivores-may-become-disease-reservoirs-posing-human-health-risk)

Project Title: How do evolutionary changes in innate immune genes influence the carriage of zoonotic pathogens

Description: Zoonotic pathogens, such as COVID-19, reside in animal hosts before jumping species to infect humans. How diversity in host immune genes across species impact upon pathogen carriage are poorly understood. There are interesting differences in the innate immune gene repertoires of the Carnivora compared to humans. The Carnivora, like mink, carry many zoonotic pathogens, surprisingly even more than bats, and we have shown that differences in their inflammasomes may explain their ability to carry zoonoses¹. The bird innate immune system is particularly interesting because it is more closely related to ancient animals like dinosaurs. Chickens carry a number of zoonotic pathogens and the diversity in the chicken gene immune repertoire, compared to humans is profound.

In this project we will investigate how proteins from the innate immune system from humans and animals diverge. We will determine the impact of these genetic differences on the responses of human and animal cell lines to infection. To do this will use CRISPR/Cas9 gene editing to remove or modify innate immune genes in human and animal cells to determine the functional consequences for the evolution of sensing of zoonotic pathogens.

The skills to be learnt by the student in this project will be

1. Basic comparative bioinformatic analysis of genes in the innate immune system
2. Cell culture and cellular infection techniques
3. CRISPR/Cas9 gene editing of human and animal cell lines to remove or modify innate immune genes
4. Analytical techniques including imaging, FACs, ELISA, PCR and western blot analysis.
5. Writing, presentation and literature analysis techniques

¹ <https://www.cam.ac.uk/research/news/farmed-carnivores-may-become-disease-reservoirs-posing-human-health-risk>

For further information about the project, please contact Prof Clare Bryant: ceb27@cam.ac.uk

Funding: This project is not funded - applicants are invited to apply before the Cambridge University Postgraduate Funding competition deadline in order to be nominated for suitable scholarships.

How to apply: Contact the Supervisor to discuss the project before submitting an official application.

More details on the application process here:

[How to apply — Department of Veterinary Medicine \(cam.ac.uk\)](#)