

Department of Veterinary Medicine

Available PhD Project:

Supervisor:

Dr Cinzia Cantacessi

Profile: <https://www.research.vet.cam.ac.uk/research-staff-directory/principal-investigators/infection-and-immunity/Cinzia-Cantacessi>

Project details:

Immune system-microbiota interactions in parasite gastroenteritis of livestock species and implications for helminth control

Gastrointestinal (GI) nematodes are the primary cause of parasitic gastroenteritis (PGE) in ruminants in temperate areas, costing the UK livestock industry >£150M each year. Whilst the use of anthelmintics results in elimination of susceptible parasites from animals, excessive use of these therapeutics has led to the emergence and spread of strains of parasites resistant against both 'traditional' and newly developed chemicals. Recombinant vaccines have shown to reduce worm burdens and parasite egg excretion, but do not confer protection against infection.

Further work is needed to develop optimal, cost-effective control strategies against PGE. A significant impediment is the lack of a comprehensive understanding of the host responses to parasite infection and establishment, and vaccine administration. These include the interplay between GI nematodes, the host immune system and the microbial flora. Given the plethora of evidence in humans and other animals infected by GI helminths pointing towards a primary role of the gut microbiota in shaping host immunity, investigations of the cross-talk between the host immune system and the gut flora are pivotal to guide strategies that will result in successful immunisation.

This project aims to undertake integrated quantitative analyses to disentangle the causality of relationships between GI parasites of relevance for the UK sheep and cattle industry, the host immune system and the gut flora. To achieve this aim, the student will (i) characterise the qualitative and quantitative fluctuations in the composition of the ovine and bovine gut microbiota and selected microbe-derived bioactive metabolites in response to acute and chronic experimental infection with *Teladorsagia circumcincta* and *Ostertagia ostertagi*, respectively, and immunisation followed by parasite challenge; using tissue samples from experimentally infected/immunised animals (ii) undertake comprehensive analyses of host gene expression profiles and (iii) perform quantitative immunohistochemistry via automated confocal microscopy to locate and quantify populations of key immune cells to understand how infection and vaccination influence host responses and immune cell phenotype in the gut environment. This interdisciplinary project will integrate key areas of parasitology, microbiology, immunology, immunohistochemistry, molecular biology, metagenomics, metabolomics and bioinformatics and will provide essential skills in these areas.

BBSRC DTP

This is a targeted BBSRC DTP studentship and as such the successful candidate will be involved in the Doctoral Training programme outlined here:

<https://bbsrcdtp.lifesci.cam.ac.uk/programme-description/standard-and-targeted-studentships>

This will include two rotation projects in the first year and a 3 month Professional Internship in years 2.4.

Funding:

UK and EEA students who meet the UK residency requirements will be eligible for a full BBSRC studentship (Fees and Maintenance). Students from EEA countries who do not meet the residency requirements may still be eligible for a fees-only award.

How to apply:

Contact the supervisor if you have any questions about the project. In order to be considered you should submit a formal application by the **deadline 30/10/18**.

Info on how to apply here: <https://www.graduate.study.cam.ac.uk/courses/directory/cvtpdvet/apply>