FoodBioSystems DTP - PhD Project Advertisement

Project title:

FBS2021-69-Morphew: Meta-omics to uncover rumen parasitic helminth-microbiome interactions

Lead supervisor:
Dr Russ Morphew, Aberystwyth University, Institute of Biological, Environmental and Rural Sciences

Email:

rom@aber.ac.uk

Co-supervisors:
Prof. Sharon Huws, Queen's University Belfast, School of Biological Sciences, Institute for Global Food Security.
Dr Cinzia Cantacessi, University of Cambridge, Department of Veterinary Medicine, Cambridge Veterinary School

Project description:
Helminth parasites are responsible for >55% of livestock diseases representing a major threat to global food security and food borne disease, with control being through anthelmintic drugs due to an absence of vaccines. A major obstacle to improving control options is a lack of understanding of host-parasite interactions. Links between helminth infection, the host and its microbiome are only at a basic level of understanding. Recent work from the Morphew group has suggested that there is a substantial contribution of parasite-mediated changes in the ruminant gut microbiota following investigation into the rumen fluke, *Calicophoron daubneyi*, within an *in vitro* rumen model. Furthermore, additional evidence from the Morphew and Huws groups suggests a direct role of rumen fluke-derived extracellular vesicles (EVs) in shaping the microbial communities of the host rumen. Therefore, this project aims to employ a combined meta-omics approach to reveal the interaction between the host rumen microbiome and the rumen fluke and its secreted EVs whilst generating an understanding of rumen functionality following exposure to the parasite or parasite derived EVs. This project will aim to 1) Confirm EV release from *C. daubneyi* into rumen fluid 2) assess any antimicrobial effect of *C. daubneyi* EVs on bacteria 3) Employ meta-omic techniques to assess the effect of *C. daubneyi* or *C. daubneyi* derived EVs on the rumen microbiome using an *in vitro* fermentation model and 4) Confirm *in vitro* findings *in vivo*. The discovery of the role rumen fluke infection has upon the ruminant microbiome will provide insights into any knock on effect on rumen function and thus animal productivity.

Training opportunities:

The student will gain experience and training in a wide range of molecular parasitological and microbiological methods including biochemistry and molecular biology. This will also include purification and analysis of extracellular vesicles. In addition, training will be provided in meta-omics technologies and bioinformatics for the analysis of large-scale omic datasets. The student will also spend time with Ridgeway Research Ltd, a UK-based veterinary service firm, where they will receive

training in parasite life cycle management. The student will also play a central role in communicating project goals and progress with stakeholders (local farmers and farmers unions etc).

Student profile:

We are seeking a student who has obtained (or predicted to obtain) a 1st class or upper 2nd class degree in a course relevant to the proposal (biochemistry, zoology, microbiology, molecular sciences, animal sciences, veterinary sciences, etc.) with evidence of considerable laboratory or computational experience. Advanced technical/practical training in parasitology, microbiology or omic data analysis would also be desirable.

Funding particulars:

This is a CASE project with in-kind support from Ridgeway Research Ltd, a UK-based veterinary serviced firm who will provide samples, as well as placement and diagnostics training for the successful student.

The project is part of the FoodBioSystems BBSRC Doctoral Training Partnership (DTP), it will be funded subject to a competition to identify the strongest applicants.

The studentship is open to UK and international students (including EU countries) however due to funding rules, no more than 30% of the projects can be allocated to international students.

The funding will include a tax free stipend (minimum £15, 285 per year), support for tuition fees at the standard UK rate (currently £4,407 per year) and a contribution towards research costs. **Please note** that the host universities have not yet confirmed the level of fees charged to international students funded by the DTP. Fee levels may vary across the institutions. This information will be shared on the FoodBioSystems DTP website as soon as it becomes available.

To apply

Please go to FoodBioSystems DTP website for information on how to apply for this studentship. The closing date for applications will be 8 February 2021.

References: (optional)

https://doi.org/10.1186/s13071-018-3225-6
https://doi.org/10.1371/journal.pntd.0007191