

## PhD Project Advertisement

**Project title:** Helminth extracellular vesicles – the key to reducing methane emissions from farmed livestock?

**Project No:** FBS2023-50-Robinson-qa

**Lead supervisor:** Mark Robinson, School of Biological Sciences, Queen's University Belfast

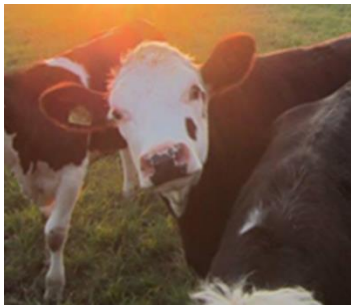
**Email:** mark.robinson@qub.ac.uk

**Co-supervisors:**

Russ Morphew, Aberystwyth University; Sharon Huws, Queens University, Belfast

### Project description:

Infections caused by parasitic helminths are responsible for >55% of livestock diseases and are a major concern for producers worldwide. Whilst it is well known that helminths secrete a range of molecules, that modulate the host immune response, to ensure their long-term survival and reproduction, we are just beginning to explore how helminths interact with, and influence, the host microbiome.



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. Helminth EVs have become recognised as an important route for molecular communication and blocking their production/effects is likely to have a significant impact on the outcome of infection and host microbiome diversity. Recently,

work from the Robinson group provided proof-of-concept that it is possible to block EV production and release from helminths, using the liver fluke, *Fasciola hepatica*, as a model.

Therefore, this project aims to target EV production by *C. daubneyi* and investigate the impact on host rumen microbiome diversity and function. Specifically, we aim to:

- 1) investigate the cellular and molecular mechanism of EV biogenesis/release by *C. daubneyi*
- 2) investigate the effect of anthelmintic compounds on EV production
- 3) determine the impact of blocking *C. daubneyi* EV biogenesis on rumen microbial diversity and methane production.

We envisage that determining the molecular interactions between helminth-microbiome-host will have broad implications for animal health, immunity, production efficiency and greenhouse gas emissions.

This 4-year project provides an exciting opportunity to work with an internationally recognized scientific team from leading UK Institutions to gain expertise in translational parasitology and microbiome research.

### 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 proteomics/metaproteomics technologies and supporting bioinformatics analyses. The student will also play a central role in communicating project goals and progress with stakeholders (animal health agencies, agricultural levy boards etc).

### Student profile:

We are seeking a highly motivated student who has obtained (or predicted to obtain) at least an 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 experience. Advanced technical/practical training in parasitology, microbiology or omic data analysis would also be desirable.

### Stipend (Salary):

FoodBioSystems DTP students receive an annual tax free stipend (salary) that is paid in instalments throughout the year. For 2022/23 this will be £17,668 and this will increase slightly each year at rate set by UKRI.

#### **Equality Diversity and Inclusion:**

The FoodBioSystems DTP is committed to equality, diversity and inclusion (EDI), to building a doctoral researcher(DR) and staff body that reflects the diversity of society, and to encourage applications from under-represented and disadvantaged groups. Our actions to promote diversity and inclusion are detailed on the [FoodBioSystems DTP website](#).

In accordance with UKRI guidelines, our studentships are offered on a part time basis in addition to full time registration. The minimum registration is 50% FT and the studentship end date will be extended to reflect the part-time registration.

#### **References:**

<https://doi.org/10.1074/mcp.RA120.002175>

<https://doi.org/10.1186/s13071-018-3225-6>

<https://doi.org/10.1371/journal.pntd.0007087>

<https://doi.org/10.1007/s00436-022-07610-8>

**For up to date information on funding eligibility, studentship rates and part time registration, please visit the [FoodBioSystems website](#).**