PhD Project Advertisement

Project title: Blood and guts: functional genomics to probe blood-feeding in liver fluke.
Project number: FBS2024-0210Robinson-qa

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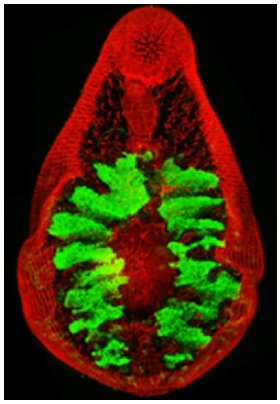
Project description:

Infections caused by parasitic worms (helminths) are believed to burden over one third of the global human population. The diseases caused by these parasites are endemic in over 100 countries where they typically affect people living in poverty. In addition, helminth infections are responsible for >55% of livestock diseases and are a major concern for farmers/producers worldwide. Although drugs to treat helminths are available, the spread of drug resistance has severely reduced their use in many areas. Thus, new ways to combat parasitic helminths are urgently needed.

Whilst displaying varied life-cycles, host species and biology, the majority of helminth parasites share one thing in common – they feed on host blood. Blood is an excellent source of nutrition and provides all the raw materials (notably amino acids from degradation of haemoglobin) the parasites need to grow and produce huge numbers of eggs to complete their life-cycle. Just like in our stomachs, the parasite gut is acidic, a strict requirement for digestion of haemoglobin because it:

- Activates the digestive enzymes secreted by the parasite gut cells
- It helps burst red blood cells and release haemoglobin
- It relaxes haemoglobin structure making it susceptible to degradation



Whilst we have a good understanding of the digestive enzymes secreted by helminths, and how they degrade haemoglobin, we know little about how the parasites maintain acidic conditions within their gut. We propose that blocking this mechanism could starve the parasite and lead to new treatment options.

In this project, we will use the liver fluke, *Fasciola hepatica*, as a model to investigate blood-feeding in helminths. It is an exciting time for liver fluke research; the availability of novel resources (such as genome, transcriptome and proteome datasets), together with an improved "molecular toolbox" (e.g. gene silencing via RNAi and advances in sequencing technologies) allow researchers to investigate parasite gene function like never before. Specifically, we will identify the ion pumps/transporters responsible for creating acidic conditions within the fluke gut and

investigate the impact of silencing these genes on parasite digestion and survival. We envisage that a greater understanding of how helminth parasites acquire nutrition will reveal new means of parasite control which will have far-reaching benefits for human and animal health.

This 4-year project provides an exciting opportunity to work with an internationally-recognised scientific team from leading UK Institutions and gain expertise in molecular cell biology research.

Training opportunities:

The student will gain experience and training in a wide range of cellular and molecular biology methods with additional computational-based analyses. The student will also gain skills in parasite culture and experience of working within biological containment laboratories. The collaboration between Queens University Belfast and Aberystwyth University provides a unique opportunity for the student to gain experience of a broad range of tools, including manipulation of gene expression via RNA interference, localisation of proteins and transcripts in parasite tissues (and associated bio-imaging techniques) and high-throughput bio-assays to investigate phenotypic effects in genetically manipulated parasites. The student will gain experience of isolating fluke tissues/cells using laser microdissection and RNA sequencing and will also play a central role in communicating project goals and progress to stakeholders (agricultural boards, pharma etc).

Student profile:

We are seeking a 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 laboratory and/ or computational experience. Advanced technical/practical training in parasitology, molecular biology 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 2023/24 this is £18,622 and it 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.

For up to date information on funding eligibility, studentship rates and part time registration, please visit the FoodBioSystems website.

References:

DOI: 10.3390/ijms23105525
DOI: 10.1371/journal.pntd.0000369
DOI: 10.1016/j.ijpddr.2020.08.004
DOI: 10.1038/s41467-020-20092-5