PhD Project Advertisement

Project title: Bleeding us dry? Protecting livestock from haematophagous parasite coinfections in a warming world
Project No: FBS2024-033-Morgan-qa

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Project description:

Haematophagous (blood-feeding) parasites are spreading globally but the UK has been fortunate so far because many are best adapted warmer climates. This is changing of course with global warming. Worms like Haemonchus, which suck blood from the stomach of cattle, sheep and goats, have greatly increased in recent years and now add to the burden of better-known blood-suckers such as liver fluke. This is a real challenge for farmers. Coinfection - the added infection of several species – could be disastrous to the animal if these species each take additional blood. Simply treating the paraites with drugs is getting less effective due to resistance.

This project will address the growing problem of blood-sucking parasite infections in ruminant livestock in the UK, by developing predictive bioclimatic models, tests that identify animals in need of targeted intervention, and decision support tools to apply these in practice.

First, it will develop and apply predictive models to identify changing patterns of coinfection. Our groups have developed models that predict Haemonchus spp. transmission potential as a function of temperature and rainfall and validated them globally. These will be extended to Fasciola spp. and confronted with disease incidence data. The extent of overlap in transmission hazard and subsequent blood loss will be quantified and used to assess the times of year and geographical regions when coinfections are most damaging and should be prioritised for targeted intervention.

Then, we will develop novel diagnostic tests for haematophagous endoparasites. Blood-feeding ectoparasites like ticks can be counted by inspection, but not internal worm infections. Tests for occult blood in faeces will be combined with existing parasitological tests including egg counts for mature parasites (supplemented with semi-quantitative PCR for species specificity) and copro-antigen for immature infections to detect blood-feeding and ascribe it to specific parasites. Systems for pen-side detection of associated pathophysiology, co-developed with collaborators in Africa, will be validated in the UK context, including the Famacha conjunctival anaemia colour chart.

Applying these tests together on monitored farms will identify high risk periods (e.g. ewes at lambing, calves at housing) and also heavy infections among individuals within herds. Targeting treatments at group and individual levels could alleviate the negative impacts of infection while limiting cost, selection of drug resistance and environmental impacts. Data will be used to calibrate simulations of targeted versus whole-herd individual treatments on parasite populations and disease outcomes.

Project outcomes will be converted to nowcasting of infection hazard for Haemonchus, Fasciola, and possibly Ixodes ticks (based on questing thresholds) as real-time maps of environmental conditions favouring infective stage availability. These will be shared with COADAPT project partners and provided digitally to their vet and farmer networks to guide management decisions. Information on animal inspection procedures and diagnostic tools and targeted treatment application will be combined with seasonal and risk point information from the models into decision support tools for advisors to manage emerging blood-feeding risks on farms.

Training opportunities:

The student will access the full range of research skills training provided at PGR level at QUB, and optionally at Aber. Within the project there is a strong emphasis on quantitative skills and brining them to bear not only onto scientific

questions but also to support management of pressing industry problems. The graduate from this PhD will be well versed in using computer models to predict and project effects of climate change on infectious diseases, which is an issue for society as a whole and not just the farming sector. They will also have unrivalled opportunities to engage with industry by playing a supporting role in the delivery of two major BBSRC endemic disease projects (combined budget £2M). These projects have impact at their core and involve key partners from industry and government, not only boosting data collection opportunities but also providing experience of stakeholder interaction and ready access to placements.

Student profile:
Interest in parasite biology, predictive biology and helping farmers cope with disease problems.

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.