Meaningful microbiomes: Investigation of host-microbiome interactions in liver fluke infections

Supervisory team:
Main supervisor: Prof Mick Bailey (University of Bristol)
Second supervisor: Dr Laura Peachey (University of Bristol)
Prof Andrew Dowsey (University of Bristol), Dr Vicky Hunt (University of Bath)

Collaborators: Prof Jane Hodgkinson (University of Liverpool)

Host institution: University of Bristol

Project description:
The widespread development of drug resistance currently threatens the future control of parasite infections in food producing animals, which in turn, constitutes a serious threat to global food security. Liver fluke (or Fasciola hepatica) is a highly pathogenic trematode parasite infecting cattle, sheep and goats in the UK, to which widespread drug resistance has been reported. As a result, current research is focusing on the identification of novel integrated strategies to improve our control of these infections. One key approach is the identification of host factors which impact upon the host animal's immune response to infection; in particular, gut commensal bacteria have been identified as playing an important role in regulating such responses. However, to date, there have been no studies exploring the role of the commensal microbiota in liver fluke infections.

In this fully funded studentship we will, for the first time, provide a detailed examination of the alterations to GI microbiota, GI metabolites and host immune responses caused by F. hepatica infection in sheep. A range of state-of-the-art sequencing (including microbial 16S rRNA sequencing and RNA sequencing), and metabolite detection techniques (including nuclear magnetic resonance spectroscopy (NMR), gas/liquid chromatography-mass spectrometry (GC-MS/LC-MS)) will be employed by the student to profile host responses to infection. Following this, bioinformatics analyses and advanced biostatistical data integration techniques will be developed to identify associations between stages of liver fluke infection and alterations to the GI microbiota, metabolites and immune responses. The data resulting from this study will contribute significantly to our overall knowledge of host-parasite-microbiome interactions, and will form the basis of future studies aimed at improving our control of this economically important parasite.

The studentship would suit an applicant with a strong first degree or masters which has elements of both biology and a mathematical discipline (e.g. bioinformatics, systems biology, mathematical biology). The successful applicant will be based within Prof Bailey's group at Bristol Vet School at both the Langford campus and the main Bristol campus. The student will benefit from a strong collaboration with Dr Laura Peachey, also at Bristol Vet School, whom will provide further expertise on microbiome/metabolome analyses; Dr Vicky Hunt, at the University of Bath, whom will provide expertise in transcriptomic analysis; and Professor Andrew Dowsey in Population Health Data Science, University of Bristol, whom will provide expertise in omics data integration and statistical data science.