

Rational microbial-based interventions against enteric disease in young livestock

Supervisory team:

Main supervisor: Prof Paul Wigley (University of Bristol)

Second supervisor: Dr Benedetta Amato (University of Bristol)

Collaborators: Dr Amanda Warr (Roslin Institute, University of Edinburgh)

Host institution: University of Bristol

Project description:

Young livestock are particularly susceptible to infectious disease due both to limited immune function and poorly developed microbiomes, the ecosystem of microbes that colonise a range of body sites including the gut and act to inhibit colonisation by pathogenic microbes. In the past high levels of antibiotics were used to control such infections. However, the emergence of antimicrobial resistance has led to tighter control of such use, and alternatives that can prevent or reduce infection early in life where vaccination is difficult are needed. One such approach is to modulate the microbiome to offer greater resistance to infection through the use of live microbial interventions like probiotics. Probiotics are, by definition, “live microorganisms that, when administered in adequate amounts, confer a health benefit on the host”.

Although probiotics are increasingly used in veterinary practice, the approaches to identify and apply probiotic cultures are largely empirical with limited understanding of any mechanisms that underlie their function. The aim of the project is to identify selected strains of probiotics and understand and clarify their beneficial role in preventing and treating common bacterial causes of diarrhoea in calves and piglets. In particular, the effects produced against *Escherichia coli* and *Salmonella enterica* infection which are amongst the most frequent causes of, often fatal, neonatal or post weaning diarrhoea.

The project will use sequencing-based approaches to analyse the intestinal microbiomes of diseased versus healthy animals to determine which bacterial species are associated with a ‘healthy’ gut and select these as potential probiotics. Alongside this we will develop 2-D and 3-D bovine and porcine intestinal cell-based infection models that will allow us to determine host:pathogen:microbiome interactions at a cellular and molecular level using a range of approaches including imaging, microbiological and transcriptional analysis as the project develops.

The successful candidate will join an interdisciplinary team and will offer training in a range of disciplines including microbiology, cell culture, pathology, immunology, imaging and microscopy. The microbiome sequencing will develop skills in genomics and basic bioinformatic analysis of the microbiome. The project will be based at Bristol’s Langford Campus where recent recruitment is developing a vibrant, young community of research in infection, immunity and antimicrobial resistance. Opportunity will be made to work with national and international collaborators and to undertake placement within industry.

Informal enquiries should be directed to Prof. Paul Wigley: paul.wigley@bristol.ac.uk

Our aim as the SWBio DTP is to support students from a range of backgrounds and circumstances. Where needed, we will work with you to take into consideration reasonable project adaptations (for example to support caring responsibilities, disabilities, other significant personal circumstances) as well as flexible working and part-time study requests, to enable greater access to a PhD. All our supervisors support us with this aim, so please feel comfortable in discussing further with the listed PhD project supervisor to see what is feasible.