

PhD Project Advertisement

Project title: Modifying the gut microbiota to reduce chronic inflammatory disease

Project No: FBS2023-33-Lewis-rs

Lead supervisor: Marie Lewis, Food and Nutritional Sciences, University of Reading

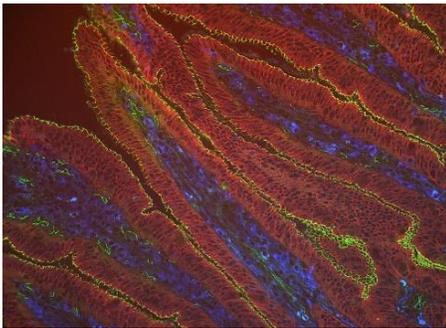
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Project description:

The gut microbiota is increasingly being linked to various chronic inflammatory diseases including cardiovascular and liver disease. Some dietary protein remains undigested and enters the colon where it is utilized by proteolytic bacteria. This can skew the microbiota which then produces metabolites such as phenol and ammonia in much higher concentrations.



Such metabolites appear to be important factors in the development of 'leaky gut' syndrome where the intestinal barrier does not work as it should. Consequently, harmful molecules from food and bacteria cross over into the blood stream and generate low-level immune responses. It is this low-grade inflammation which is known to contribute to later chronic disease.

Some promising *in vitro* studies have shown that specific probiotics and prebiotics can reduce the effects of high protein diets on the production of bacterial metabolites associated with leaky gut. However, this is a novel area and much more information is required before it can be translated into human healthcare.

For example, female and male guts, immunity, metabolism and microbiotas are very different, which suggests they could respond differently to excess dietary protein. We have also demonstrated that the effect of both prebiotics and probiotics on immunity are highly sex-dependent. This has important implications for the development of interventions to reduce leaky gut and therefore later chronic disease.

Pigs share many characteristics of immunity, microbiota, gut physiology and metabolism which makes them highly translatable models for humans.

The overarching aim of this project is to establish if specific pre and probiotics can mitigate the negative effects of high-protein diets on gut barrier function in a sex-dependent manner, using *in vitro* human gut modelling and a pig trial.

Training opportunities:

Specific training will be provided in analytic techniques including:

- Microscopy (4-colour quantitative immunofluorescence)
- Microbiota population analysis (high throughput sequencing, fluorescent *in situ* hybridization coupled with flow cytometry).
- *in vitro* gut modelling
- *In vivo* pig trial design and delivery
- Metabolic profiling (gas chromatography/mass spectroscopy)
- Ammonia quantification assays and elisa

- Cell culture
- Statistical techniques in handling large datasets

The successful candidate will also enter a program to promote the development transferable skills. For example, in scientific communication skills (oral presentations, paper writing, thesis writing) in addition to interview skills, time management and other valuable skills required in future careers.

Since this PhD project is in partnership with the University of Surrey, there will be additional valuable opportunities for gaining experience in veterinary microbiology and human nutritional trials.

Student profile:

Due to the multidisciplinary nature of this program, we do not expect the successful candidate to have knowledge and experience in all relevant areas. However, we do expect the appointed student to have a background in any of the following: immunology, metabolism, microbiology nutrition, gut health (or other appropriate subject) with at least a BSc (2.1) in a closely related subject and ideally (but not essentially) work-place experience.

Full support and training will be provided by experienced staff.

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 will increase slightly each year at the 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://www.frontiersin.org/articles/10.3389/fimmu.2019.02705/full>

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