

PhD Project Advertisement

Project title: Precision Nutrition for Gut Health: Development of a novel seaweed-containing, gut microbiota targeted nutraceutical

Project No: FBS2023-62-Wijeyesekera-ra

Lead supervisor: Anisha Wijeyesekera, Food and Nutritional Sciences, University of Reading

Email: a.wijeyesekera@reading.ac.uk

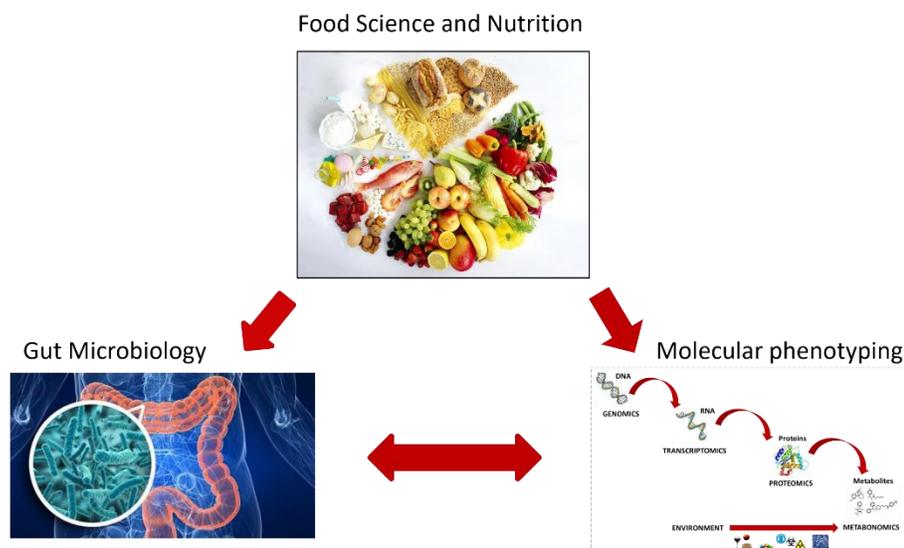
Co-supervisors:

Jessica Adams, Aberystwyth University; Paul Smith, Cargill; Glenn Gibson, University of Reading

Project description:

The human gut is inhabited by a complex ecosystem of microorganisms (referred to as the gut microbiota) which plays an important role in human health. Illness, age and changes in diet and lifestyle factors can disrupt this community of microbes, often causing gastrointestinal issues that can affect overall health. Dietary interventions targeting the gut microbiota such as prebiotics (substrates selective for beneficial gut microbes) and probiotics (live microbial feeds) are safe and well established approaches that improve gastrointestinal health, by altering the composition of bacteria in the gut to a more favourable composition (e.g. increasing levels of beneficial microbes, such as bifidobacteria), and produce microbial metabolites (e.g. short chain fatty acids) which have positive local and systemic effects. Thus, there is growing interest in other dietary components that may also favourably affect the gut microbiota.

Inclusion of seaweed in the diet is of growing interest (especially in Western populations). Seaweeds are a rich source of natural bioactives (for example, antioxidants, vitamins, minerals and essential micronutrients such as iodine) and they also contain macronutrients such as proteins, and novel polymers which are both a good source of fibre and potentially a prebiotic. Hence, the development of a novel nutraceutical harnessing the power of seaweed bioactives in conjunction with more established gut microbiota-targeted dietary interventions (such as prebiotics and probiotics), presents an exciting opportunity to apply a precision nutrition approach in developing an optimised food product to support gut health. We hypothesise that a seaweed-containing, gut microbiota-targeted nutraceutical, will positively alter the composition and activity of the human gut microbiota, resulting in improved gut health. This will be assessed in vitro using laboratory models of the human gut as well as in vivo, through the use of a human intervention study. There is growing evidence on the effectiveness of gut microbiota-targeted dietary interventions for therapeutic benefit (for example, prebiotics for travellers' diarrhoea, and probiotics to aid gut health recovery following a course of antibiotics).



To our knowledge, there are no commercially available nutraceuticals containing seaweed-derived ingredients or nutrients, that target the gut microbiota in order to positively influence gut health. Hence, in this project we will generate new mechanistic information on how seaweed-derived food ingredients and nutrients impact on the gut microbiota and overall host health.

This PhD project spanning the entire Food System, entails a cross-disciplinary approach to better understand the impact of a seaweed-containing, gut microbiota-targeted nutraceutical on the

human gut microbiota. Applying the knowledge and expertise of the academic supervisors and industrial supervisor (Cargill), it will involve cutting edge techniques in seaweed processing and preparation, *in vitro* microbiological studies (including setting up and running laboratory models of the human gut), producing a food product at scale in an industrial environment, and running a human dietary trial. A molecular phenotyping analytical approach (applying microbiomics, metabolomics and multivariate statistical analysis) will be used to conduct a holistic assessment of the dietary intervention on the entire system, by characterising the change in microbial and metabolic profile following nutraceutical intervention, and improve knowledge of microbes as well as biomarkers/molecular pathways involved in changes to gut health.

Training opportunities:

This multidisciplinary DTP project combines specialist seaweed and microbiological knowledge with expertise in gut microbiology and molecular phenotyping and a multi-national industry; with training opportunities available from all partners within these areas.

As a CASE studentship, the student will benefit from at least 3 months training at Cargill, where food products for the human trial will be made, providing first-hand experience of the food industry research pipeline, and the opportunity to be part of the translation of research from bench to product development. Further short placements at Aberystwyth University will develop skills and techniques to prepare and process seaweeds. Whilst at the University of Reading, the student will learn techniques relevant to studying the gut microbiota (gut models, microbial and metabolic profiling) and will gain experience in conducting a human trial.

Student profile:

This studentship is available only to individuals who are eligible for UK/home student fees status. We seek a student with an interest in cross-disciplinary research approaches to better understand the impact of gut microbiota targeted dietary interventions on health. Training in all techniques will be provided, but an ability and desire to learn new skills quickly would be advantageous. This project would be suitable for students with a degree in biology, chemistry, nutrition, agriculture, food science or a closely related subject.

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 this will increase slightly each year at rate set by UKRI.

This is a Collaborative Awards in Science and Engineering (CASE) Studentship. The PhD includes a 3-month placement with Cargill. The student will receive a stipend during this placement to cover accommodation and travel costs.

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](#).