

The role of iron metabolism in gut microbiota homeostasis and its impact on probiotic viability

Project ID: 3523

Supervisory team

Main supervisor: Dr James Robson (University of the West of England (UWE))

Second supervisor: Dr Lee Parry (Cardiff University)

Non-academic (CASE) supervisor: Dr Jenny Bailey Cooper (FerryX Ltd)

Other supervisors: Dr David Qualtrough (University of the West of England (UWE))

Host institution: University of the West of England (UWE)

CASE partner: FerryX Ltd

Project description: The gut microbiota consists of billions of microorganisms and has numerous effects on both gut and systemic health. Moderating the composition of the gut microbiota through the use of probiotics could provide new avenues to tackle chronic conditions such as inflammatory bowel disease, irritable bowel syndrome and cancer which have all been linked to gut dysbiosis. Despite increasing knowledge of the species that reside in the gut, translation into new therapeutic options has proved challenging. A key obstacle is the ability of probiotic species to establish a niche within the colon after administration. Additionally, there are concerns over the long-term impact of altering the microbiota composition on future gut homeostasis. FerryX Ltd. has developed a novel probiotic that utilises established microbiota species with abundant iron metabolism pathways to improve competitiveness in the colonic microbiota, meaning that probiotic microorganisms can exert their beneficial effects long term. This project will seek to improve our understanding of how these microorganisms effect normal gut homeostasis through their interactions with other microbiota members and the colonic epithelium itself. It will provide new insights into the dynamics between resident microbiota species and the colonic epithelium. This project will seek to address the following objectives: 1. Determine the effects of novel probiotic species on key markers of epithelial homeostasis including cell cycle, cell death, barrier integrity, wound healing and gene expression. 2. Investigate the interaction of probiotic species with biological substrates (e.g. collagen, mucus) and determine their impact on microbial metabolism. 3. Explore the metabolic requirements of the probiotic species and determine fitness in response to challenge from common microbiota members using microbial co-culture systems. 4. Investigate the potential of the probiotic species to alter the behaviour of other microbiota members to promote gut homeostasis (e.g. biofilm formation, gene expression). This project will use an interdisciplinary approach that will combine both in vitro and in vivo systems, mammalian cell culture, microbiology and bioinformatics. The prospective student will be primarily based at the University of the West of England (UWE) but will also be supported by Dr. Lee Parry at Cardiff University. They will work closely with our industrial partners at FerryX Ltd. and have the opportunity to experience a growing biotech environment and be involved in product research and marketing.

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.