**Developing oxygen-impermeable microfibre networks for encapsulation of sensitive probiotics**

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Probiotics have been broadly recognized as health beneficial ingested living microorganisms. Since the beginning of the 20th century, different varieties of bacterial and yeast strains have been investigated for their diverse impacts on human health, such as supporting the immune system, improving gut microbiome and food digestion and the prevention of colon cancer. Nevertheless, the delivery of these health benefits largely depends on their environment in the food matrix, gastrointestinal fluid and gut microbiome. Extremely oxygen-sensitive probiotics (e.g. *Faecalibacterium prausnitzii*) are a class of health beneficial living species that have shown antipathogenic, anticancer and anti-inflammatory activities. Nevertheless, their potential health benefits are largely compromised under aerobic and harsh conditions during laboratory production, product formulation and storage.

This PhD project aims to engineer novel functional soft material for the encapsulation of living microorganisms to protect them against gases while providing nutrients and metabolites to ensure their viability. An appropriate encapsulation approach would protect the probiotics, miniate their viability and suit ultimate applicability as next generation active food supplements.

In this PhD project, you will explore advanced electrospinning as non-thermal biopolymer processing technology, and apply X-ray scattering to control their nanostructures, leading to the sustainable development of novel functional biomaterial. The biomaterial will provide protection against oxygen, appropriate mechanical strength and stability and suitable digestibility. The protection efficiency and other functional properties of fibre systems will be examined under controlled humidity and oxygen environment. The release kinetics and viability of the microorganism will also be explored under probiotic production and simulated gastrointestinal conditions, including interactions with the human gut microbiome using model systems.

This is an interdisciplinary research project that offers an excellent opportunity to work at the intersection of soft matter design and gut microbiology. You will graduate with three key areas of expertise: i) electrospinning as a ubiquitous biopolymer processing technique and ii) X-ray scattering for polymer structural analysis, iii) microbiology. This project would suit a graduate with a strong background in chemical and physical sciences but interested in applying advanced soft matter design to biological or food related applications.

**Keywords**: chemistry, physics, oxygen-sensitive probiotics, encapsulation, biopolymer, gut microbiome small angle X-ray scattering, electrospinning, bioprocessing