**How does the structure of carbohydrate polymers in foods impact the community composition of the human microbiome?**

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Carbohydrates, particularly starch, are a key component of the human diet and as a result have a huge impact on our health. This can be through direct physiological effects, for example on glycaemic responses, or through indirect effects mediated by the gut microbiome. This talk explores how novel approaches to modifying the starch biosynthesis pathway in crop plants can generate starches which have unique structures. Using a combination of structural analysis methods, it is possible to characterise how processing of novel starches impacts their structure and small intestinal digestion, both in model systems and in human intervention studies, to impact digestibility and glycaemic response.

Starch structure also exerts indirect effects on health through fermentation by the gut microbiome. Using hybrid short- and long- read metagenomics sequencing it can be demonstrated that in model systems, resistant starches with different structural characteristics promote significant changes in the microbiome composition. Different key species are identified which degrade structurally distinct starches.

Finally, this work is extended to directly explore the effects of structured carbohydrates on colonic physiology and the gut microbiota. Using samples directly obtained from patients who have undergone small and large bowel MRI imaging it is demonstrated that a combination of microbiome and gut physiology mediated effects impact on gas and metabolite production in the colon, which can be mediated by changing the composition and viscosity of carbohydrate components in the gut.

Through this talk, I aim to demonstrate that carbohydrate structure can be manipulated in order to influence health outcomes in a range of different ways, mediated by the gut microbiota.

**Biography**

Fred Warren graduated from King’s College London with B.Sc. in Biochemistry (2007) and Ph.D. in Nutritional Biochemistry (2011). His Ph.D. focussed on the relationship between starch granule architecture and the binding kinetics of pancreatic α-amylase. Following his Ph.D., Dr Warren spent a year working at PerkinElmer (Seer Green, UK) as an Applications Scientist where he developed infrared spectroscopy methods for the application in the food industry. He then moved to The University of Queensland (Brisbane, Australia) as a University Research Fellow. Here he developed an interest in linking carbohydrate structure and gut microbiome function. He returned to the UK in 2015 to join the Institute for Food Research (now Quadram) as a Career Track Group Leader. He was also a Marie Curie Fellow from 2017-2019. He now leads a multi-disciplinary research team spanning plant science, chemistry and biology of carbohydrate polymers and the human digestive system at the Quadram Institute.