PhD Project Advertisement

Project title: Bioaccessibility of lipids from dairy products: the cheese matrix
Project No: FBS2024-054-Kliem-rs

Lead supervisor: Kirsty Kliem, Department of Animal Sciences, University of Reading
Email: k.e.kliem@reading.ac.uk
Co-supervisors:
Terri Grassby, University of Surrey
Colette Fagan, University of Reading

Project description:

The perception that milk and dairy products have adverse effects on health and risk factors for chronic diseases is changing. This is mainly due to long-term prospective cohort studies that have demonstrated significantly reduced cardiovascular disease (CVD) mortality and markers of risk in high vs low dairy consumers. Evidence from randomised control trials suggests that dairy fat in the form of cheese resulted in lower plasma total and LDL-cholesterol concentrations than dairy fat in the form of butter. This supports evidence from animal and human studies that the physico-chemical properties of the cheese matrix may minimise lipid absorption from the digestive tract. It is thought this may partially be related to the formation of calcium soaps of fats in the post-gastric phase which are not as easily absorbed as free fatty acids. A recent *in vitro* study concluded that more solid dairy matrices form calcium (Ca) soaps more readily than more liquid products. Also, it is possible that the cheese fatty acid (FA) profile/Ca content/Ca form may have an impact upon this matrix effect.

This project will unravel the mystery of the "cheese matrix" effect. This will be achieved by using a combination of techniques, to establish the mechanism behind why cheese lipid appears to not be as accessible for absorption compared with other lipid sources:

- Firstly, the project will adapt an established in vitro gastric/small intestinal digestion model at the University of Surrey.
- Then a range of different Cheddar cheeses will be prepared at the University of Reading's Food Processing Centre, using milk from cows at the University's Centre for Dairy Research. These types will vary in terms of chemical (Ca content, pH, FA profile) structure, which might impact upon digestion.
- Cheese will be ripened and stored appropriately.
- Different microscopy techniques (environmental scanning electron microscopy, confocal microscopy), will be employed to assess the physical structure of the cheese.
- Following this the cheeses will be subjected to digestion within the *in vitro* model at the University of Surrey.
- Samples of digesta from the model and cheese will be analysed for composition (including presence of Ca soaps, fatty acid profile), and fluorescently-labelled lipases will be used in order to visualize enzyme/substrate proximity during digestion.

This project offers a unique opportunity for a "food chain"-based PhD project. It incorporates all aspects of the food chain, from primary production, through processing, to *in vitro* digestion and then commercial aspects through links with industry. It also includes a novel combination of methods which have not been used with dairy products before. This project will be of great interest to dairy processors, and will contribute significantly to knowledge of lipid digestion within all food matrices.

Laboratory work in this project will be partially supported by Arla Foods.

Training opportunities:

Supervision and training will be shared by the University of Reading and University of Surrey, who have an excellent track record for collaboration.

The student's work will equally be spread across both sites (Reading and Guildford). The student will receive training in laboratory analysis (at both sites), cheese making and food safety/hygiene practices (University of Reading Food Processing Pilot Plant). This project will also incorporate a short work placement at a world leading dairy producer (Arla Foods).

Student profile:

We are searching for a student who is passionate about the production and pathway of dairy foods through the food chain. Applicants should have a degree in food science, nutrition or a closely related science, and laboratory experience would be advantageous.

Stipend (Salary):

FoodBioSystems DTP students receive an annual tax free stipend (salary) that is paid in instalments throughout the year. For 2023/24 this is £18,622 and it will increase slightly each year at 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.

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