PhD Project Advertisement

Project title: WheyBetter: A fundamental approach to redesigning whey protein isolates to step change their oral performance, leading to protein fortified products that will enable muscle mass maintenance over lifecourse

Project No: FBS2022-45-Methven-ra

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Project description:

Protein intake in older adults is essential to maintain muscle mass and avoid muscle wasting, known as sarcopenia. Whey protein is a protein source with high bioavailability, which can be used to increase protein intake and help distribute consumption over the day, which promotes muscle protein synthesis. However, whey protein beverages have mouthdrying textural properties, which build up during consumption. Solids foods fortified with whey protein and characteristically dry and hard. The sensation of mouthdrying that results from the consumption of whey protein fortified products can reduce the desire to consume them. This is particularly important to older adults where the problem may be exacerbated by changes in saliva and impairment to oral processing, taste and smell perception.

The adhesion of whey protein to the mouth, known as mucoadhesion, may be caused by hydrophobic interactions and increased sulfhydryl exchange between the whey proteins and saliva. This adhesion is considered to reduce lubrication, and lead to mouthdrying. We hypothesise that increased lubrication will substantially decrease protein-derived mouthdrying, and that modification of whey proteins can improve dispersion in saliva, reduce mucoadhesion, oral-friction and mouthdrying.

This project aims to reduce mouthdrying in whey protein isolate using novel mitigation strategies. This first of these aims to increase lubrication by coating whey protein isolate particles with emulsions through spray drying and agglomeration. Secondly, to modify protein structure to reduce hydrophobicity and mucoadhesion, for example by making changes to the processes used to manufacture whey protein powder or adding ingredients which may modify or cross-link with proteins as they unfold on heating. It is important that any modifications do not reduce the bioavailability of whey protein, which is one of its many advantages over plant-based protein sources, therefore, protein digestibility will be measured.

This is a Case PhD studentship in partnership with Volac International Ltd who will provide materials and technical expertise to the project. The project is hosted at the University of Reading in the Department of Food and Nutritional Sciences with access to the Sensory Science Centre, the Food Processing Centre and the Chemical Analysis Facility. The project is co-hosted by Aberystwyth where the project will benefit from expertise in membrane fractionation of proteins at the BEACON biorefinery.

Training opportunities:

Within this PhD, the researcher will develop analytical, process and sensory skills, enabling them to make fundamental links between processing parameters and the sensory and nutritional value of whey proteins; thereby applying science to solve a real issue in the whey industry. By understanding the upcycling of whey to avoid waste in the dairy industry, through to optimising the functional, sensory and nutritional value, the successful applicant will develop cross-disciplinary skills applicable throughout agri-food-nutrition.

Specific training will be provided in techniques including:

- sensory and consumer evaluation including temporal methods
- jaw tracking technologies
- physicochemical analytical techniques (e.g. dynamic light scattering, surface hydrophobicity)
- biochemical assays
- oral retention methodologies

As this project is in partnership with Aberystwyth University, there will be the opportunity to work in a pilot scale facility on process development including membrane and other purification technologies.

During placements at the Volac International sites in the UK you will have opportunities to explore the application of whey proteins and visit industrial facilities to gain an insight into processing technologies.

Student profile:

This project would be particularly suitable for students with a degree or expertise in Food Science, Food Technology, Food Engineering, Chemistry, Biology or a closely related subject.

Funding particulars:

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