PhD Project Advertisement

Project No/title: FBS2026 44 Lloyd ar / *Comparative Neuro-Nutrition: Cognitive and Biomarker Effects of Cruciferousand Basil Microgreens*

Lead supervisor: Dr Amanda Lloyd, Department of Life Science, Aberystwyth University

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Co-supervisors:

Dr Maria Jose Oruna-Concha, University of Reading

Professor Carien van Reekum, Reading University

Dr Alexander Taylor, Aberystwyth University

Project Details

As we reach midlife, natural changes in the body—such as increased inflammation, oxidative stress, and shifts in gut health—can gradually affect memory, concentration, and the ability to manage stress. Diet is one of the most effective ways to support the brain during this stage of life. Microgreens, which are young vegetable seedlings harvested soon after sprouting, contain much higher levels of vitamins and protective plant compounds than their mature forms. Cruciferous microgreens like broccoli and kale produce sulforaphane, which helps the body combat oxidative stress, while basil microgreens contain polyphenols that support anti-inflammatory and brain-signalling pathways. This project will explore whether adding these microgreens to the daily diet can improve thinking skills, reduce markers of inflammation and stress, and support gut–brain communication in adults aged 45–65. The findings will help determine whether microgreens could be a simple, sustainable dietary strategy for healthier ageing.

Research aims: To determine whether daily supplementation with cruciferous or basil microgreens improves executive function and working memory, modulates oxidative stress and inflammatory biomarkers, and supports gut–brain axis activity in midlife adults, identifying the most effective microgreen type for cognitive resilience and healthy ageing.

What you will do: The student will undertake an integrated programme spanning plant characterisation, human nutrition, and cognitive neuroscience. In Year 1, they will optimise microgreen formulations, analyse phytochemical profiles, validate biomarker assays, and complete core training in EEG, cognitive testing, and statistical methods. In Year 2, they will design and deliver a 60-participant pilot trial to assess feasibility, adherence, and preliminary cognitive and biomarker responses, alongside an industry placement focused on translational neuro-nutrition. Year 3 will involve implementing the main 12-week randomised controlled trial, including participant recruitment, sample collection (urine, saliva, dried blood spots), EEG/ERP acquisition, and online cognitive assessments. In Year 4, the student will perform advanced data integration across cognitive, electrophysiological, and biochemical datasets, applying biostatistics and machine learning where appropriate, before writing the thesis and disseminating findings. Throughout, they will engage with supervisors, industry partners, and interdisciplinary research groups to develop technical and professional skills.

References: Finley et al., 2024. Resting EEG Periodic and Aperiodic Components Predict Cognitive Decline Over 10 Years | Journal of Neuroscience Hoang et al., 2025. Improving cognitive impairment through chronic consumption of natural compounds/extracts: a systematic review and meta-analysis of randomized controlled trials - PubMed Lloyd et al., 2025. Frontiers | Oral supplement in healthy older adults to support physical fitness and mental wellbeing Bouranis et al., 2024. Sulforaphane and Sulforaphane-Nitrile Metabolism in Humans Following Broccoli Sprout Consumption: Inter-individual Variation, Association with Gut Microbiome Composition, and Differential Bioactivity - PubMed

Student profile

Essential for project: Experience in one or more of the following: psychology and neuroscience, as well as nutrition, food science, biomedical sciences, or plant sciences, with awareness of diet–health interactions and interest in cognitive or biomarker research.

Desirable for project: Prior exposure to biomarker analysis, phytochemistry, cognitive assessments, or human nutrition research is desirable. Comprehensive training will be available to support candidates developing these skills during the studentship.
All FoodBioSystems applicants: An upper 2nd class degree (or equivalent) in a subject relevant to the project. Candidates with a lower class of Bachelors degree, but merit or above at Masters level will also be considered**.** Demonstrable skills in problem-solving, team-working, communication and time management.

Training

Project specific training opportunities: The student will receive comprehensive project-specific training spanning nutritional science, phytochemistry, cognitive testing, and electrophysiology. They will be trained to cultivate, process, and analyse microgreens, including phytochemical profiling and quality assessment. Laboratory training will cover biomarker handling and analysis using urine, saliva, and dried blood spot samples, alongside Good Laboratory Practice (GLP) and Good Clinical Practice (GCP). In neuroscience, the student will gain hands-on experience in EEG/ERP acquisition, preprocessing, and interpretation, including event-related potentials and resting-state metrics. They will also be trained in administering and scoring standardised cognitive tasks and digital assessments. Bioinformatics and statistical training will support multi-omics integration and data modelling. A placement at the University of Reading will provide additional training in translational neuro-nutrition, stakeholder engagement, and supplement formulation. Engagement with industry partners (Agroceutical Products Ltd, Tetrim Teas, Madarch Cymru) will develop skills in product development, commercialisation pathways, and scientific communication.

FoodBioSystems training opportunities: Throughout their studentship, all FoodBioSystems doctoral researchers participate in cohort training that covers four key themes: food systems, big data (data analytics and modelling), business, and research fundamentals. All doctoral researchers complete a placement: either project-related with a non-academic (CASE) partner, or unrelated to the project and outside the academic environment (PIPS). Details of training are available on the DTP website: https://research.reading.ac.uk/foodbiosystems/training/.

Project supervision style

The student will meet weekly with the lead supervisor, Dr Amanda Lloyd, during the first year, transitioning to fortnightly meetings as independence develops. These 1:1 meetings will focus on experimental planning, data analysis, and professional development. Monthly meetings with the full supervisory team—including Dr María José Oruna-Concha, Prof. Carien van Reekum, and Dr Alexander Taylor—will review progress, address challenges, and monitor training milestones.Written feedback on submitted work (e.g. reports, manuscripts) will be provided within two weeks. The student will also participate in regular research group meetings and seminars across nutrition, neuroscience, and food science, including WARU, Food and Bioprocessing team, and CINN.

Stipend (Salary)

FoodBioSystems DTP students receive an annual tax-free stipend (salary) that is paid in instalments throughout the year. For 2025/26 this is £20,780 and it will increase slightly each year at rate set by UKRI.

Equity Diversity and Inclusion

The FoodBioSystems DTP is committed to equity, 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 and include:

- Offering reasonable adjustments at interview for shortlisted candidates who have disclosed a disability or specific learning difference.
- Guaranteed interview and applicant mentoring schemes for applicants, with UK home fees status, from eligible under-represented ethnic groups who also meet academic eligibility criteria and the student profile essential for the project.

These are opt-in processes**.**
Our studentships can be offered to home students on a part-time basis, and studentship end date and stipend payments will be amended to reflect the part-time registration. The minimum registration for DTP funded part-time students is 0.5 FTE (studying an average of 20 hours per week over 8 years). We regret that part time registration is not available to international students due to complexities of visa restrictions.

Funding note

We welcome applications from candidates with Home/ROI fees and international fees status. This studentship is funded by UKRI and covers stipend, fees at Home/ROI rate, and research costs. The host university will not charge UKRI funded international students the difference between Home/ROI fees and international fees.

Costs that must be found from other sources or met by the individual student include: visa fees, healthcare surcharge, relocation costs and guarantor services.

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