PhD Project Advertisement

Project No/title: FBS2026 66 Sacchi sq / *GRIN-FISH Green Remedies for Immunity and Nutrition in FISHeries*
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Project Details

GRIN-FISH
Green Remedies for Immunity & Nutrition in Fisheries

Aquaculture is vital for global food security, producing over 50% of seafood, but the industry faces significant challenges such as disease outbreaks, antimicrobial resistance (AMR), and concerns over animal welfare. The EU zinc oxide (ZnO) ban highlights these pressures, removing a widely used prophylactic and presenting the urgent need for safe natural alternatives. One promising candidate is *Malva sylvestris*, a herb with proven anti-inflammatory and immunomodulating properties. In fish, extracts boost growth, immunity and resistance in rainbow trout and carp. This PhD project will investigate a patented polysaccharide extract of *M. sylvestris* originally developed for livestock health. The approach offers a scalable, natural solution for aquaculture, aligning with sustainability goals by reducing antimicrobial use and enhancing biodiversity. Amid rising welfare standards and climate pressures, this project is timely, addressing the UN Sustainable Development Goals for zero hunger and life below water.

Research aims: Can extracts from European ethnomedicinal plants replace antimicrobials by enhancing immune function, gut health, and welfare in aquaculture species?

What you will do:

1. Known chemical constituents of an exemplar medicinal plant (*M. sylvestris*) will be used to develop computational models predicting interactions with immunological targets to refine dosing hypotheses.
2. Immunological and welfare benefits of a patented *M. sylvestris* extract will be validated using behavioural, imaging and molecular assays in a high-throughput zebrafish model.
3. Metabolomic profiling will evaluate the metabolic and nutritional benefits of extract inclusion in fish feed.
4. Findings will be translated to farmed species (tilapia, salmon) through controlled trials measuring growth, feed conversion ratio (FCR), and disease resistance.

These objectives directly support the research question by progressing from mechanistic prediction (Obj. 1) to empirical validation (Objs. 2-3) and applied testing (Obj. 4), ensuring a comprehensive evaluation of the plant's potential in aquaculture.

References:

1. Rashidian, G.; Kajbaf, K.; Prokić, M. D.; Faggio, C., Extract of common mallow (Malvae sylvestris) enhances growth, immunity, and resistance of rainbow trout (Oncorhynchus mykiss) fingerlings against Yersinia ruckeri infection. Fish & Shellfish Immunology 2020, 96, 254-261.
2. Villani, V.; Di Marco, G.; Iacovelli, F.; Pietrucci, D.; Canini, A.; Gismondi, A., Profile and potential bioactivity of the miRNome and metabolome expressed in Malva sylvestris L. leaf and flower. BMC Plant Biology 2023, 23 (1), 439
3. Ulloa, P. E.; Medrano, J. F.; Feijoo, C. G., Zebrafish as animal model for aquaculture nutrition research. Front Genet 2014, 5, 313.

4. Aparicio, S. A Systematic Computational Study on Flavonoids International Journal of Molecular Sciences, 2010, 11, 2017.

Student profile

Essential for project: A background in one or more of the following: computational biology, biochemistry, immunology, fish physiology, aquaculture science, metabolomics, or related biosciences, with demonstrable interest in sustainable aquaculture and antimicrobial alternatives

Desirable for project: Experience in molecular modelling, zebrafish assays, microbiome or metabolomic analysis, or aquaculture nutrition. Prior involvement in laboratory or computational research is beneficial. Full training will be provided for all specialised methods.

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: This studentship provides multi-disciplinary training across computational biology, aquaculture science, nutritional metabolomics, and translational feed development. The student will develop expertise in:

- Computational modelling and data science: advanced training in machine learning, molecular docking, molecular dynamics, and QM/MM simulations, including statistical modelling.
- Aquaculture and behavioural science: zebrafish husbandry, welfare monitoring, behavioural phenotyping (aggression, anxiety, whole-brain Ca^{2+} imaging), and immune function assays (qPCR, histology, cytokine profiling).
- Metabolomics and nutritional science: sample preparation, LC–MS analysis, metabolite identification, and integration with feed formulation strategies, supported by training in experimental design and data analysis.
- Applied aquaculture research: hands-on experience with controlled tilapia and salmon trials at partner facilities, measuring growth, feed conversion ratios, and disease resistance.

In addition, the student will spend time with Aramune Technologies Ltd., gaining insight into industrial innovation, regulatory translation, and product development.

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 receive joint supervision from MS (Surrey), BG (QUB), and MP (Surrey). Weekly meetings with MS will provide consistent day-to-day guidance, complemented by monthly joint supervisory meetings to integrate expertise across modelling, zebrafish behavioural assays, aquaculture, nutritional metabolomics, and feed formulation.The student will participate in fortnightly Surrey lab meetings for peer feedback, collaborative discussion, and skills sharing. Two research visits to QUB will provide training in nutritional metabolomics and feed formulation within BG's group. In-person and online seminars and workshops at Surrey and QUB will further support cross-institutional collaboration. All formal supervisory meetings will be logged in the doctoral training system, with progress reviewed against objectives, training needs, and well-being.

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.