

PhD Project Advertisement

Project title: Beyond bone health: a multidisciplinary approach to define the functional effects of vitamin D on genomic stability

Project No: FBS2024-081-Elliott-sr

Lead supervisor: Ruan Elliott, Department of Nutrition, Food and Exercise Sciences, University of Surrey

Email: r.m.elliott@surrey.ac.uk

Co-supervisors:

Marcus Tindall, University of Reading

Lisiane Meira, University of Surrey

Philip Aston, University of Surrey

Project description:

This exciting collaborative project offers the opportunity for you to develop multidisciplinary skills in research studying a novel mechanism of action of vitamin D in human health. You will work under the supervision of a team of leading scientists at both the University of Surrey and the University of Reading and develop expertise in human nutrition, molecular and cellular biology, and mathematical modelling of biological systems.

Vitamin D deficiency is a global public health concern. In the UK, 13-21% of people aged 11 to 64 are vitamin D deficient as assessed based on the minimum vitamin D status required for bone health [1]. The situation is similar or worse in many other countries. Furthermore, higher vitamin D status may be necessary to reap the full health benefits of its many other biological effects. However, the mechanisms by which vitamin D exerts these other effects and the levels of vitamin D in the body needed to fully activate these processes are not fully understood.

This project will focus on one such biological activity; the capacity of vitamin D to help protect cellular DNA. This is important for health because accumulation of DNA damage is associated with the aging process and increased cancer risk, as well as increased risk of other non-communicable diseases. The capacity of vitamin D to improve the protection of cellular DNA has been demonstrated in skin cells in culture and in skin in situ. This observation suggests vitamin D may serve a central function in a protective feedback loop because most vitamin D in humans is synthesized in skin via the action of UV light from the sun. However, UV also damages cell components, including DNA. Therefore, high vitamin D levels in skin may act as a signal of UV exposure, triggering adaptations to better protect the cells from the damaging effects of the UV. Importantly, vitamin D also protects skin cells against other sources of damage such as nitrosative and oxidative stress. Exactly how this protection is achieved, and whether it is unique to skin cells, is unknown as is whether the protection could be achieved by increased dietary vitamin D intake without the inherent risks of UV light exposure.

We hypothesize vitamin D protects against DNA damage in skin and other tissues by modulating cell proliferation/cycling and enhancing DNA repair. In this project, you will test this hypothesis using a multidisciplinary strategy to gain new insights into the functional effects of vitamin D on genomic stability in cells in culture and assessing the relevance of those findings in human populations by taking advantage of a sample bank available from a large vitamin D supplementation study.

Training opportunities:

The Universities of Surrey and Reading provide a vibrant, interdisciplinary research environment, with access to state-of-the-art facilities. We see our postgraduate researchers as an integral part of our research community, collaborating and innovating together with academics at all levels. We want the most talented researchers from diverse backgrounds to join us, bringing new ideas and perspectives. We will help you make the most of your potential, removing barriers where we can and supporting you with dedicated career guidance. We offer sector-leading researcher development training and mentoring, and dedicated employability support.

- You will be provided with comprehensive training in all relevant nutritional, cellular, molecular, and mathematical techniques.
- You will develop skills in cell culture, real-time cell proliferation and apoptosis analysis, flow cytometry, DNA damage and repair analyses [2].
- You will also learn to develop mathematical models that shed new light on the biological effects of vitamin D observed in your cell experiments.
- You will learn about the ethical and legal frameworks for research involving human participants, gain first-hand experience working with human study participants, and learn techniques for isolation of peripheral blood mononuclear cells.
- Depending on your background, you can opt to take taught courses, delivered by the host Universities, to strengthen your understanding key areas of the proposed project, including the biology and/or the mathematics.
- You will benefit from access to a wide range of training courses, workshops, mentoring and coaching, regular research seminars/events as well as plentiful opportunities to present and discuss your research within the two Universities, across the DTP and at conferences.
- You will also complete a 3-month professional internship, potentially with one of our commercial or non-governmental partners, giving you the opportunity to gain a broader perspective on the contribution of research to the agri-food sector.

Student profile:

Applicants should hold a minimum of a BSc honours degree at 2:1 level or equivalent in a relevant life science subject, have a particular interest in cellular/molecular biology and nutrition and be confident and competent in mathematics to at least A level standard (or equivalent). We will also consider graduates in relevant physical sciences who have a good understanding of the concepts for the mathematical modelling elements of this project and who can also demonstrate a good understanding of biology, to at least A level standard (or equivalent), as well as particular enthusiasm to learn more about human biology and nutrition.

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.

References:

1. Scientific Advisory committee on Health. Vitamin D and Health (2016) Available at <https://www.gov.uk/government/publications/sacn-vitamin-d-and-health-report>
2. Healing E et al. A panel of colorimetric assays to measure enzymatic activity in the base excision DNA repair pathway. Nucleic Acids Res 2019 47: e61. DOI: 10.1093/nar/gkz171

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