

Polyphenol-Mediated Regulation of Skeletal Muscle Remodelling

Project ID: 3561

Supervisory team

Main supervisor: Dr Mary O'Leary (University of Exeter)

Second supervisor: Dr Tim Podlogar (University of Exeter)

Other supervisors: Prof Jo Bowtell (University of Exeter), Dr Jozsef Vuts (Rothamsted Research)

Host institution: University of Exeter

Project description: This project will investigate how naturally occurring compounds found in fruits such as tart cherries and blueberries influence the way skeletal muscle adapts, repairs and remodels following physiological stress. Polyphenol-rich supplements are widely used by athletes to support recovery after exercise. We have recently shown that such compounds can accelerate recovery following orthopaedic surgery. The biological mechanisms responsible for these effects remain poorly understood. Work from our research group suggests that polyphenols may do more than reduce inflammation and oxidative stress. They may also influence structural and contractile proteins that govern how skeletal muscle repairs damage and adapts over time. Understanding these mechanisms could help inform the development of evidence-based nutritional strategies to improve performance, rehabilitation and long-term musculoskeletal health. The PhD will combine human experimental research with laboratory-based mechanistic studies. In a human study, participants will complete a period of intensified endurance training designed to induce muscle stress, remodelling and adaptation. The student will investigate whether and how supplementation with tart cherry polyphenols influences recovery, physiological adaptation and resilience to training stress. This work will involve exercise physiology testing, muscle biopsy analysis and quantitative assessment of molecular and structural adaptations within skeletal muscle. Using their data science skills, and supported by a primary supervisor with expertise in human skeletal muscle proteomics, the student will integrate these data with evidence from the skeletal muscle molecular biology and omics literature to identify candidate molecular mechanisms underlying the observed responses. The most promising targets will then be prioritised for further mechanistic investigation. In the second phase of the project, the student will use primary human skeletal muscle cell models to test these candidate mechanisms. Cells will be exposed to physiologically relevant polyphenol metabolite mixtures and circulating metabolite fractions isolated from blood samples collected during the human intervention study. The project provides interdisciplinary training and will suit a student with interests spanning exercise physiology, nutritional bioscience, biomedical science and skeletal muscle biology. The successful applicant will join a supportive and collaborative research environment and contribute to research with relevance to both human performance and musculoskeletal health. The second supervisor combines research expertise in exercise physiology with active practice as a performance nutritionist in elite sport. This provides a valuable perspective for candidates seeking strong molecular training while maintaining a clear pathway to future applied practice.

Our aim as the SWBio DTP is to support students from a range of backgrounds and circumstances. Where needed, we will work with you to take into consideration reasonable project adaptations (for example to support caring responsibilities, disabilities, other significant personal circumstances) as well as flexible working and part-time study requests, to enable greater access to a PhD. All our supervisors support us with this aim, so please feel comfortable in discussing further with the listed PhD project supervisor to see what is feasible.