

## **U-RHYTHM: developing a novel technology for the investigation of tissue-level thyroid and sex hormone dynamics in humans**

### **Supervisory team:**

**Main supervisor:** Prof Stafford Lightman (University of Bristol)

**Second supervisor:** Dr Thomas Upton (University of Bristol)

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**Host institution:** University of Bristol

### **Project description:**

Rhythms characterise all living things, and our physiology can be considered as a state of continuous dynamic equilibrium. Despite this, almost all clinical tests of human health consist of single time point measurements, which inevitably do not reflect normal and inherent daily or even hourly variation. To overcome this, we have developed a novel microdialysis-based ambulatory technology which allows 24-hour ambulatory, minimally invasive, blood free sampling (U-RHYTHM, [www.designworks.studio/ultradian-u-rhythm](http://www.designworks.studio/ultradian-u-rhythm), [www.u-rhythm.co.uk/](http://www.u-rhythm.co.uk/)).

Using the technique we have successfully demonstrated the dynamics of adrenal hormones including the stress hormone cortisol in hundreds of human participants ([www.ultradian.eu](http://www.ultradian.eu)). To broaden the use and impact of the technique we now wish to investigate the use of U-RHYTHM to understand dynamics of other hormones crucial to normal growth and development, in particular sex and thyroid hormones that exhibit differential effects across tissues and the lifespan.

The student will undertake a multidisciplinary programme of work to test the hypothesis that sex and thyroid hormone dynamics can be measured in subcutaneous tissue. This will involve learning and applying the technique of U-RHYTHM microdialysis, using state of the art physical chemistry methods to describe the interaction of hormones with the U-RHYTHM microdialysis system and conducting a proof-of-principle clinical trial in human participants.

The project will be based at the University of Bristol within the Labs for Integrative Neuroscience and Endocrinology and the Department of Chemistry. The student will learn techniques for the analysis and interpretation of dynamic data under supervision of the Department of Mathematics for Healthcare at the University of Exeter. The project will be supported by clinical experts at the University of Cardiff and Bristol.