Establishing the impact of plastic-derived endocrine-disruptors on adipose tissue function and health

Supervisory team:
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Project description:
There is considerable public and scientific interest in the potential effect of microplastics on human health. Epidemiological studies indicate that exposure to microplastics and associated chemicals are risk factors for the development of chronic diseases. There have been some preliminary reports that these plastics and chemicals can accumulate in various tissues in humans and are associated with negative health outcomes (e.g., PMID:38446676). Given that many of these molecules are lipid-soluble, this SWBio PhD project will investigate whether these molecules act as "endocrine disruptors" (PMID:32796699) which negatively impact adipose tissue phenotype and function. Adipose tissue is a major endocrine organ that actively participates in the maintenance of health through the secretion of adipokines and other small molecules (e.g., lipids, metabolites, extracellular vesicles).

One previous preliminary study reported substantial heterogeneity in the accumulation of Bisphenol A (BPA) in adipose tissue in humans (PMID:17689919). However, this study did not examine broader adipose phenotype to understand the impact of this heterogeneity, and we know little about the accumulation and effect of other potentially important molecules. Thus, this PhD will investigate if the accumulation of endocrine disruptors such as BPA in adipose tissue in humans impacts adipose tissue function and health.

This project is an excellent training opportunity, including technical training in mass spectrometry, qPCR, western blotting, and cell culture – plus the development of bioinformatics skills using curated datasets. There is also the opportunity to develop skills in the conduct of human studies, ranging from working with existing patient samples and datasets through to the development and implementation of new human studies (as desired). We propose that this project should begin with the measurement of BPA and other potential endocrine disruptors in existing adipose tissue and blood/urine samples from a cohort of men and women collected in a previous BBSRC-funded project. Along with access to samples, we have a comprehensive dataset for this cohort including adipose tissue gene expression (RNAseq data), adipose explant adipokine secretion, immunophenotype (flow cytometry data), as well as health-related outcomes such as insulin sensitivity and inflammation. The subsequent direction of the work will be developed with the student – for example, examining mechanisms in culture using cell models (e.g., 3T3-L1 adipocytes), collecting new primary cells from specific populations (e.g., older people), exploring methods to establish exposure, or testing the effect of interventions that affect adipose tissue mass/function via randomised controlled trials (e.g., weight/fat loss, exercise).

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.