Characterizing the role and function of lipid droplets in neuronal metabolism.

Project ID: 109

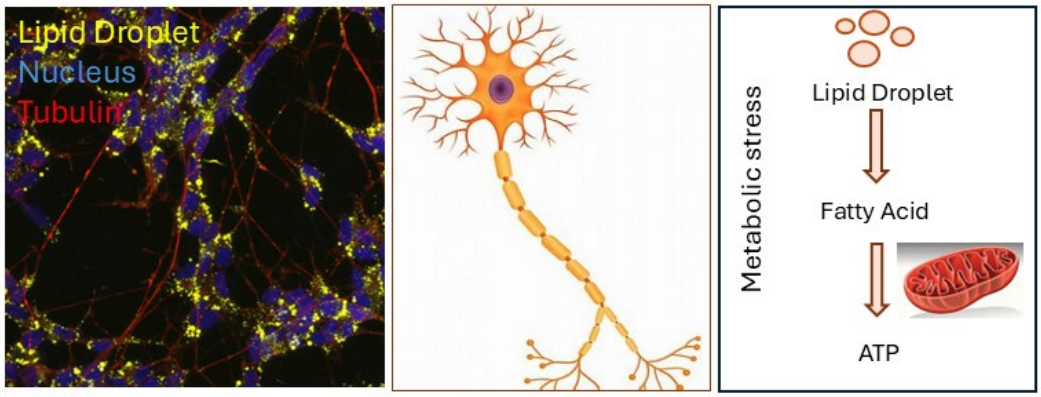
Supervisory team

Lead supervisors: Dr Maria Victoria Niklison Chirou (University of Bath) and Dr Tim J Craig (University of the West of England (UWE))
Other supervisors: Prof David Tosh (University of Bath), Dr Lucy Crompton (University of the West of England (UWE))

Collaborators: Dr Michael Zachariadis (University of Bath), Prof Elena Bochukova (Queen Mary University of London), Dr Alaa Othman (University of Zurich)

Host institutions: University of Bath / University of the West of England (UWE)

Project description: The brain is the body's most energy-demanding organ, yet our understanding of its metabolism remains incomplete. While lipids—including fatty acids and cholesterol—are well-known for their role in cardiovascular health, their function in the brain is a significant frontier in neuroscience. Importantly, we now know that dysfunctional lipid storage and metabolism are key features of major neurodegenerative diseases, such as Parkinson's and Alzheimer's. Despite being the most lipid-rich organ, how neurons manage and utilise these critical resources is a mystery.Neurons have long been considered to run almost exclusively on glucose. However, recent discoveries show they can also metabolise fatty acids for energy, particularly under stress—a condition consistently seen in neurodegenerative disorders where glucose metabolism is reduced. This raises a crucial question: How lipids are metabolized in neurons?



Neuron

This interdisciplinary project, jointly supervised by the Niklison-Chirou Lab (Bath) and the Craig Lab (UWE), aims to answer this question. We will investigate the fundamental mechanisms of neuronal lipid metabolism using human induced pluripotent stem cell (iPSC)-derived neurons and other cell models. We will study how neurons store, process, and use a range of physiologically relevant lipids, including oleic acid and cholesterol.Through advanced imaging and functional assays, we will track the journey of these lipids to key organelles like mitochondria and peroxisomes—the cell's energy factories. We will also measure ATP generation under stress conditions to understand how neurons balance their energy sources. In parallel, we will explore the regulation of lipid droplets, the cell's lipid storage organelles, and investigate how their dysregulation contributes to cellular stress and disease.By addressing these critical gaps, the project aims to

uncover how neurons manage their lipid resources. Ultimately, this work could reveal new therapeutic targets for conditions linked to metabolic dysfunction.This studentship offers a unique opportunity to work at the intersection of neuroscience, cell biology, and metabolism. It provides a highly multidisciplinary and exciting approach to exploring the frontiers of brain research.

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.