

Decoding Neuron-Astrocyte Lipid Trafficking (copy)

Project ID: 3759

Supervisory team

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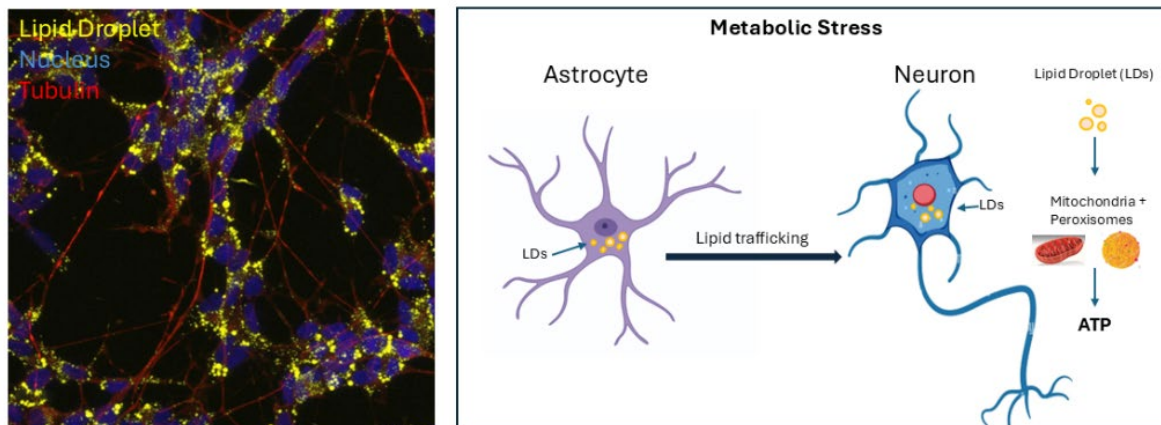
Collaborators: Prof Elena Bochukova (Queen Mary University of London) & Dr Alaa Othman (University of Zurich)

Registered institution: University of Bath

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. Lipids—including fatty acids and cholesterol— have clear roles in cardiovascular health, however their function in the neurological health is not understood. Importantly, 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 are lipids metabolized in neurons? This interdisciplinary project, jointly supervised by the Niklison-Chirou Lab (Bath), the Craig Lab (UWE) and the Lane Lab (Bristol) 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 astrocytes. We will study how neurons store, process, and use a range of physiologically relevant lipids, including oleic acid and cholesterol, and how lipids are transferred between neurones and astrocytes under basal and stressed conditions. 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. Using co-culture techniques, we will explore the influence of astrocytes in the regulation of these processes. By addressing these critical gaps, the project aims to uncover how neurons manage their lipid resources, and the contribution of astrocytes to this. 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. Continued on next page.....

Decoding astrocyte-neuron lipid trafficking in the brain



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.