Interplay between cholesterol homeostasis and neural development

Supervisory team:
Lead supervisors: Prof Meng Li (Cardiff University), Prof Yuqin Wang (Swansea University)
Dr Marija Fjodorova (Cardiff University), Prof William Griffiths (Swansea University)

Host institutions: Cardiff University, Swansea University

Submit applications for this project to Cardiff University

Project description:

The brain is the most cholesterol rich organ in the body. Cholesterol is an essential structural molecule in cell membranes, a major component of myelin sheaths and is important for synapse formation. Inborn errors of cholesterol biosynthesis lead to neurodevelopmental defects, in addition altered cholesterol homeostasis has been linked to neurodevelopment disorders, including autism. Mounting evidence argues that neurodevelopment defects cannot be simply explained by alterations in the steady state level of cholesterol per se. Indeed, cholesterol precursors and metabolites display biological activities towards signalling pathways that are important for neural development, e.g. hedgehog signalling. Little is known about what type of sterols are produced during human neural development and what roles they play. It is also important to find out how neuronal cells regulate their cholesterol homeostasis during different developmental stages.

This studentship will combine state-of-the-art neural stem cell technology (Cardiff) and advanced mass spectrometry (Swansea) to address these questions. The student will benefit from a multidisciplinary collaboration of two leading laboratories. She/he will learn how to differentiate cortical neurons from human stem cells, immunostaining and imaging analysis of neural cell markers. He/she will also learn how to identify and quantify sterol molecules using liquid chromatography-mass spectrometry. The student will also be trained in other modern molecular biology techniques to study gene expression, protein-DNA interactions and protein-protein interactions.