Targeted Project / AY 2024 -2025

GABAergic inhibitory control of visual learning and attention in mouse models of schizophrenia

Project Reference: TRG-PDN-JP

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Department/Institute: Physiology, Development and Neuroscience

Website: https://www.pdn.cam.ac.uk/svl

Research area: Neuroscience

BBSRC DTP main strategic theme: Understanding the rules of life

BBSRC DTP secondary strategic theme: Transformative technologies, Bioscience for an integrated understanding of health

Project outline:

The brain is continuously bombarded with visual input but has limited processing capacity. Selective processing of visual features relevant for behaviour is therefore crucial for decision-making and relies on GABAergic inhibitory interneurons. Altered inhibition is linked to perceptual, learning, and attentional impairments and associated with neurodevelopmental disorders like schizophrenia.

This project will determine the circuit mechanisms of altered inhibition in both a pharmacological and genetic mouse model of schizophrenia. Mice have a similarly organized visual cortex and complex decision-making behaviours. Mouse brain circuits can be measured and manipulated in ways not possible in humans.

We train mice in visual decision-making tasks and measure activity in visual cortex in specific cell types using 2-photon imaging and use optogenetics to activate or inactivate activity of specific interneuron cell types. We also apply new innovative methods to optically measure the inhibitory neurotransmitter GABA and locally pharmacologically manipulate GABA levels in the brain to determine the mechanisms of GABAergic control of visual learning and attention.

The PhD project is associated with a Wellcome Trust funded Collaborative programme with a cross-disciplinary international research team to investigate the role of GABAergic inhibition in mice and humans at different scales, from local circuits to global brain networks.