Project Details	
Project Code	MRC23NMHEx Ellacott
Title	You are what your mother eats? Influence of maternal diet on brain development and behaviour
Research Theme	Neuroscience and Mental Health
Summary	This project seeks to understand how a mother's diet impacts the baby's brain development, including how neural circuits form and function. Epidemiology studies have linked maternal diet and/or body weight to increased risk of metabolic disease and neuropsychiatric conditions in their children. Changes in neuronal function are already implicated, but the roles of non-neuronal cells such as glia, are relatively underexplored and will be the focus of this project.
Description	The brain is an incredibly plastic organ whose form and functions are impacted by changes in the environment; this includes during early brain development while a baby is in the womb, known as the "in utero environment". Studies have linked maternal diet and/or body weight with increased risk of metabolic disease and neuropsychiatric conditions in children. Using a high-fat high-sugar diet, like those commonly eaten by people in the UK and USA, studies in animals indicate that the offspring of female mice fed this diet show changes in how their brain circuits develop and communicate, which can contribute to changes in their physiology and behaviour when they grow up. These include changes to their metabolism, leading to an increased pre-disposition to obesity and diabetes, and increased stress and anxiety-like behaviours. Understanding more about this process will advance knowledge of brain development and the influence of maternal diet, which longer-term could inform policy and healthcare advice for people during pregnancy. Glial cells critically support neuronal functions, including synaptic activity, but also have key regulatory and signalling roles in the brain: controlling entrance and exit of substances from the brain, maintaining a healthy tissue environment, and serving immune functions. In adult animals, glial cells are causally implicated in metabolic disease (obesity and diabetes) and neuropsychiatric disorders. To date, most of the studies examining how maternal diet impacts brain development have focused on neurons, and contributions of other brain cells, such as glia, are less understood. This project aims to bridge this knowledge gap. Research question: How does maternal diet alter glial cell function during critical windows in brain development and do these glial changes influence physiology and behaviour during adulthood? Objectives: 1) To establish how feeding a high-fat high-sugar diet to the mother during critical windows in early brain development changes molecular and cellular properties of glia in the offspring; 2) To investigate in the offspring whether these maternal diet-associated glial molecular and cellular changes persist into adulthood, potentially contributing to changes in physiology and behaviour; 3) To determine if experimentally manipulating glial function during early brain development can alter physiology and behaviour in adulthood. This project builds on existing expertise in the collaborative supervisory team: Kate Ellacott (glial biology and metabolic physiology), Valentina Mosienko (glial biology and neuropsychiatric disorders), Craig Beall (glial biology, cellular metabolism, and diabetes), Rachel Lippert (maternal programming, brain

	development, and metabolic physiology). Using mice as an experimental model, the project will provide training in a variety of key techniques including whole animal physiology, neurobehavioural assessment, neuroanatomy, cell culture, and measures of cellular metabolism. Within this broad remit, as the project develops there is potential scope for the student to shape and focus the project in-line with their developing interests; for example, deciding on which type of glial cell to focus on e.g., astrocytes, microglia, oligodendrocytes, or concentrating on a particular brain region, neural circuit, or aspect of physiology or behaviour. Supported by the combined expertise of an international collaborative research team, you will have outstanding opportunities to train in an exciting area of neuroscience at the interface between physiology, behaviour, and endocrinology. The supervisory team are based at the Universities of Exeter and Bristol and the German Institute of Human Nutrition (Potsdam-Rehbruecke) and have a proven track-record of successful on-going interaction, including PhD student co-supervision. The project will be based primarily in Exeter, but you may spend time with the research teams in Bristol and Germany if desired.
Supervisory Team	
Lead Supervisor	
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