Project Details	
Project Code	MRC21NMHEx Ellacott
Title	Regulation of food preference and reward by the brain
Research Theme	Neuroscience & Mental Health
Summary	Like drugs of abuse, food activates parts of the brain associated with rewarding and pleasurable feelings. People living with obesity show changes in activity of these brain areas. Using mice as a model system, this project will investigate how controlling the activity of brain cells called astrocytes alters motivation and food preference, which may contribute to obesity.
Description	Like drugs of abuse, food can activate parts of the brain associated with rewarding and pleasurable feelings. This neural network is called the mesolimbic dopamine pathway. In common with what is seen in individuals who are addicted to drugs, people living with obesity show differences in the activity of this brain reward pathway, which may contribute to overconsumption of food. Understanding more about this pathway and how it is regulated by consumption of different foods may help in the development of new treatments for obesity. Astrocytes are a class of glial cell in the brain. Dynamic changes in astrocyte activity are recognised increasingly for their role in mediating physiological processes by modulating neuronal communication. Past work by our collaborative research team has demonstrated that astrocytes in a part of the brainstem which receives direct input from the stomach are important for regulating food intake in mice. Recently, published work has identified that the gut-brain axis is important for regulating the brain reward pathway and regulating preference for sweet tastes. Building on ongoing work, this project will investigate whether controlling the activity of astrocytes alters motivation and preference for foods that typically are rewarding, such as those which are high in fat and/or sugar. Using cutting-edge technologies including chemogenetics and 2-photon microscopy, the student will investigate the following key questions: 1) How does consumption of diets high in fat and sugar impact the function of astrocytes in different brain regions associated with food reward, and how is this changed by obesity?; 2) Can modulating the activity of brainstem astrocytes impact the consumption of high-fat and/or high-sugar foods, and subsequent activation of the mesolimbic dopamine system?; and 3) Does modulating astrocyte activity in different parts of the mesolimbic dopamine system change motivation to eat and preference for foods which are high in fat and/or sugar? Using the mouse as an experimental model, the student will employ virally mediated transgenic modulation of astrocyte signalling followed by characterization of changes in physiology and behaviour in the living animal. This will be combined with training in calcium imaging, measurement of neurotransmitter flux using biosensors, histology, and molecular biology; which will be utilised to investigate the underlying molecular mechanisms. Supported by the combined expertise of a collaborative research team based at the Universities of Exeter and Bristol with a proven track-record of successful on-going interaction, including co-supervision of PhD students, you will have outstanding opportunities to train in an exciting area of neuroscience at the interface between physiology, behaviour and endocrinology.

Supervisory Team	
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