Does time of day predict stress resilience/sensitivity across species?

Supervisory team:
Main supervisor: Dr Karen R Mifsud (University of Bristol)
Second supervisor: Prof Johannes Reul (University of Bristol)

Collaborators: Jean Golding Institute (University of Bristol), Michelle Taylor (University of Bristol)

Host institution: University of Bristol

Project description:
Evidence is emerging that the timing of a stressful challenge in relation to the individual's natural rhythm of hormone secretion, could be influencing the genomic response to stress, and resultant stress coping ability (Mifsud et al., 2021; Sterina et al., 2022). Studying adaptive responses to stress is important in order to understand processes of stress adaptation, resilience and the development of stress-related disorders which can have a significant impact on an individual's welfare.

Endogenous glucocorticoid hormones are secreted by the adrenal glands of mammals in a circadian manner, with maximal levels of secretion peaking during the organism's active phase and lower levels occurring during rest. In some species this occurs in a monophasic manner (diurnal, nocturnal species) but some species display multiphasic patterns (crepuscular, cathemeral/ metaturnal). This project will seek to determine the relevance of the endogenous corticosteroid level at the time of stress exposure for stress coping ability across a range of species with different activity patterns including companion animals and livestock. Stress coping ability will be measured in an interdisciplinary way, utilising the most appropriate method of study for each species in relation to the species-specific stressors they face. This will involve a combination of behavioural studies, owner feedback questionnaires, physiological measurements and molecular analyses. Examples of commonly encountered stressors encountered for companion animals include vet or grooming visits, fireworks, kennel/cattery stays and for livestock stressors included castration, horn debudding and transportation.

These 'real world' responses will be supported by experiments in vivo to understand the underlying (epi-)genomic consequences of endogenous glucocorticoid hormone levels on stress responses in the hippocampus, a key brain area regulating adaptive behaviour, and the impact this has on an individual's stress coping ability. There will also be the opportunity to develop bioinformatic skills by integrating existing (including our own) publicly available datasets of relevance for the hippocampus into ongoing analysis.

Together this project offers the student the opportunity to develop a truly interdisciplinary skill set under the guidance of an experienced supervisory team.

This work brings together two of BBSRC strategic priorities 'Frontier bioscience: understanding the rules of life' and 'Bioscience for an Integrated Understanding of Health. This project has the potential to enhance animal welfare by developing recommendations regarding the timing of stressful experiences to minimise the negative impact of the stressor.

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.