Non-genetic paternal effects on offspring reproduction and health: mechanisms and evolutionary consequences in a bird model system

Supervisory team:
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Host institution: University of Exeter (Penryn)

Project description:
Evidence is accumulating that a father's condition can be transferred non-genetically to the next generation and affect offspring development, performance and health. To date, the mechanisms underlying such paternal condition-transfer effects remain poorly understood and their evolutionary consequences are largely unexplored. In this project you will use a bird model system (Japanese quail, Coturnix japonica), in which paternal condition-transfer effects on offspring reproductive performance have previously been demonstrated, to identify the origin, function and evolutionary consequences of non-genetic paternal effects using a highly multidisciplinary and integrative approach.

Using in vivo experiments, combined with state-of-the-art -omics and physiological techniques, you will test how favourable or harsh early life conditions experienced by males affect their sperm and seminal fluid composition, and how different components of the male's ejaculate mediate cross-generational effects on the daughters' reproductive performance and health. Experimental in vivo and molecular work will be complemented by evolutionary modelling to quantify the role of paternal condition-transfer effects in altering the response to selection, as well as the potential of experimental interventions to modify evolutionary trajectories of reproductive traits under selection through paternal effects. The project will provide fundamental novel insights into the mechanisms underlying paternal condition-transfer effects across generations and the potential of early life interventions to alter evolutionary trajectories, both directly relevant to the management of animal health and performance as well as our understanding of the reproductive lives of birds.

During the project you will obtain interdisciplinary training in a variety of state-of-the-art approaches and techniques that are highly sought-after by employers in and outside of academia, including experimental in vivo skills, molecular techniques, bioinformatics, and mathematical modelling. You will be based in a thriving, friendly and inclusive department and benefit from the complementary expertise of a highly multidisciplinary supervisory team.

Relevant papers Pick et al (2019) doi: 10.1002/evl3.125 Immler (2018) doi: 10.1038/s41437-018-0111-0 Gawehns et al (2022) doi: 10.1111/1755-0998.13597

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.