You are what your mother eats: understanding mother-offspring interactions in tsetse vectors of disease

Supervisory team:
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Host institution: University of Bristol

Project description:
How does maternal malnutrition impact offspring health? While this question has long been relevant in the field of human public health, little is known about transgenerational effects of food stress and its impact for offspring quality in disease vectors. This project will focus on the link between maternal nutritional stress and offspring quality in an important vector, the tsetse fly. Tsetse transmit sleeping sickness in humans and nagana in livestock, causing great societal and economic concern across sub-Saharan Africa. They are unusual disease vectors: females give birth to single, live offspring the same size as the mother. Thus, understanding maternal investment in this species is key to predicting how changes in their diet will impact tsetse populations and the risk of tsetse-borne disease. The student will use cutting-edge methods of stable isotope marker tracing to follow the fate of macronutrients (fat, proteins and lipids) from mothers to offspring in live-bearing tsetse. They will manipulate the diet of tsetse by providing bloodmeals which mimic nutritionally stressed hosts, and compare how mothers allocate nutrients across generations with those given control meals. They will also examine how such allocation decisions depend on the quality of the diet offspring themselves experience. In tandem, the student will analyse field samples collected in Zimbabwe to investigate how the levels of nutritional stress in the laboratory reflect those observed in the wild. The student will also develop new evolutionary and physiological models of how mothers adjust their allocation towards their own survival or that of their offspring under food stress, and how this balance depends on conflict between mothers and young. By collaborating with theoreticians in the University of Bristol and the South African Centre for Epidemiological Modelling and Analysis, the student will have the opportunity to integrate these models into simulations to test how such maternal allocation shapes tsetse population responses to environmental change under conditions of drought and malnutrition.