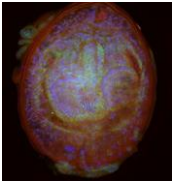


Parasite interference in regulation of host gene expression



PhD position in Evolutionary Biology

Registration deadline: 20 January 2022

Application deadline: 27 January 2022

The Foitzik group at the Johannes Gutenberg University of Mainz (Germany) is offering a 3-year PhD position (DFG, fully funded with the possibility of extension, 65% TVL E13) to study the role of gene regulation in the division of labour in the ant *Temnothorax longispinosus*. The PhD student will be supervised by Susanne Foitzik (JGU Mainz) in collaboration with Peter Baumann (JGU Mainz & IMB) and Joan Barau (IMB), and will be integrated in the GenEvo research training program (<https://www.genevo-rtg.de/>).

Many parasites, especially those with complex life cycles, manipulate life history traits and behaviour of their hosts to increase transmission. Alterations in host gene expression are often linked to these parasite-induced phenotypic changes - termed the parasites' extended phenotype by Dawkins. We hypothesise that parasites manipulate host phenotypes by interfering with host gene regulation and test whether and how they do this on a molecular level. In particular, we want to elucidate which gene regulatory processes they interfere with. Infection of *Temnothorax nylanderii* ant larvae with the parasitic cestode *Anomotaenia brevis* strongly transforms the adult phenotype of these ants. Infected workers exhibit altered behaviour, morphology, chemical profile and an **extreme lifespan extension** (Beros et al. 2015, Beros et al. 2021). In a three-year study, the survival rates of infected workers matched those of queens, which can reach 20 years in this species (Beros et al. 2021). We could show associated changes in gene expression e.g. the upregulation of immunity and longevity genes (Feldmeyer et al. 2016, Stoldt et al. 2021), such as the silver gene carboxypeptidase B-like, linked to postponed senescence in *D. melanogaster*. Recent results show that infection intensity strongly affects fat body transcriptomes, with genes with telomerase maintenance, apoptosis and transposon activity functionalities being differentially expressed between highly infected ants (over 18 cestodes) and lowly infected (1 cestode) or uninfected ants. The cestode, residing in its cysticercoid stage in the haemolymph of the ants' abdomen is transcriptionally active (Stoldt et al. 2021). In collaboration with Falk Butter, we compared the proteomes of the haemolymph of healthy workers + queens and infected workers and contrasted them with that of the cestode. The majority of proteins only found in infected workers originated from the cestode. Bioinformatic analyses revealed that the cestode is releasing proteins affecting lifespan (such as antioxidants) and gene regulatory processes including histone acetylation and the piwi-pathway. The next steps are to investigate how epigenetic processes are altered in infected ants.

To demonstrate to which extent and how parasite-induced changes in host phenotype are actively promoted by the parasite, we will investigate how the cestode interferes with the hosts' gene regulation, which gene-regulatory mechanisms are utilised and whether these alterations are permanent or have to be actively maintained. We will do this by

- a) studying histone modifications (using ChIP-seq and CUT&RUN), DNA methylation (Bisulfite-Seq), miRNA and lncRNAs associated with parasite infection and link them to observed transcriptomic changes,
- b) altering the infection status by clearing the infection (using antihelminthics) or infecting ants experimentally

and analysing changes in the phenotype, including gene expression and regulation and c) Phenotyping host and cestode candidate genes using RNAi.

We are looking for a highly motivated student with a Master degree (or equivalent) in biology, good English skills, and a keen interest in evolutionary biology. Previous experience with social insects, molecular biology, statistics and bioinformatics is advantageous, but is not required. The successful applicant will join an international, interactive, dynamic and English-speaking scientific environment in a brand new building with access to state-of-the-art, newly equipped laboratories and climate-controlled rooms. The JGU of Mainz hosts many excellent scientific institutions, and Mainz is a historic city located on the Rhine River with a large student population and a rich social and cultural life.

Interested candidates should [register](#) to the IPP before 20 January 2022 and complete their application before 27 January 2022. Informal enquiries should be sent to Prof. Dr. Susanne Foitzik (foitzik@uni-mainz.de). The starting date for the position is 1 July 2022. The Johannes Gutenberg University of Mainz is interested in increasing the number of women in science. Applications from women are therefore strongly encouraged. In addition, qualified candidates with disabilities will be preferred.

