

PhD position, Berlin, Germany

“Decomposing virulence: host, pathogen, and microbiota contributions”

The Evolution and Ecology of Insect Defences group (<https://armitagelab.com/>) at the Institute of Biology, Freie Universität (FU) Berlin, Germany, would like to invite applications for the research project: **Decomposing virulence: host, pathogen, and microbiota contributions**.

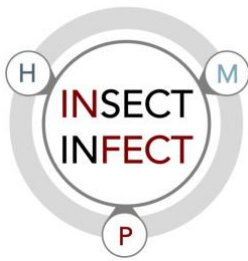
The doctoral candidate position is part of the “Insect Infect” Research Unit FOR 5026 funded by the DFG, which brings together the fields of host-microbiota interactions, insect innate immunity, and bacterial resistance evolution. The Research Unit gives the opportunity to interact with a diverse group of doctoral candidates, post-docs, and PIs, to obtain methodological training, and to receive statistical and bioinformatics support. Furthermore, the project will entail close collaboration with theoreticians. There will be yearly retreats and access to a graduate training programme. **The deadline for applications is 29.03.2024** and the positions will start in early summer 2024 or as soon as possible thereafter. The position is fixed term and **available for 4 years**, paid according to TV-L E13, 65 %, and will start in early summer or as soon as possible thereafter.

Project background:

Our research lies in the field of eco-evo-immunology. Virulence describes the negative health or fitness effect of a pathogen, and there is long-standing interest in understanding how virulence changes over evolutionary time. Virulence will be determined by pathogen^{1,2} and host factors³, but it is not trivial to understand the degree to which each partner affects virulence patterns. Nonetheless, we can start to understand the drivers of virulence changes by “decomposing” virulence into pathogen and host components (e.g. ^{1,2}). More recently there has been a blossoming of interest in the tripartite interaction between host, pathogen and microbiota, and the role that microbiota play in pathogen virulence evolution⁴. In the project we will decompose virulence into host and pathogen components, whilst taking the interaction with microbiota into account. Experimentally evolved pathogens will be used in this project. Infection assays and measures such as bacterial load, survival and transcriptomics will be used. This project will give insight into the generalisability of virulence patterns, it will help us to uncover hidden drivers of virulence, and it will give insight into the generalisability of the components of virulence. The host organism will be *Drosophila melanogaster* and the pathogen and microbiota will be bacteria.

The project will involve:

- Literature research
- Experimental design and hypothesis formulation
- Preparation and execution of experiments, including infection of insects (*Drosophila melanogaster*) with bacteria, molecular biology (RNA extractions), and analysis of host fitness
- Statistical data analysis, including transcriptomic data analysis and manuscript writing
- Collaboration with researchers of the InsectInfect research group



Essential criterion:

- A completed University master's degree in biology, microbiology, or similar topic

Desirable criteria:

- We would like applications from enthusiastic students with a background/interest in evolutionary ecology, e.g., in host-microbiota-pathogen interactions and virulence evolution
- Laboratory experience with bacteria and insects
- Experience with molecular biology or transcriptomic analyses
- Good basic knowledge of statistics (e.g., using "R") and experimental design
- Proficient in spoken and written English
- Good team-working and communication skills and ability to work independently
- Completed projects/internships on topics relevant to the research area are advantageous

How to apply: Applications should be written in English, submitted as **one single PDF**, and include the following documents:

(1) a one-page (maximum) letter of motivation with details of previous research experience and future goals, (2) your CV (if applicable, including any publications). Please include the names of 2-3 possible contact people who can provide a reference for you and explain why you have named them (e.g., they were your MSc thesis supervisor), (3) An abstract/short summary of your MSc thesis, (4) A copy of your BSc and MSc certificates.

Please send the application to sophie.armitage@fu-berlin.de, with the following identifier in the subject field: **WiMi_InsectInfect2_SA**. The deadline for applications is **29.03.2024**. Interviews will take place as soon as possible after this date. The working language of the group is English. For further information, please contact Sophie Armitage.

Relevant background reading

1. Acuña Hidalgo B*, Silva LM*, Franz M*, Regoes RR, Armitage SAO. (2022) Decomposing virulence to understand bacteria clearance in persistent infections. *Nat Commun* 13:5023. *Joint first authors. <https://doi.org/10.1038/s41467-022-32118-1>.
2. Franz M, Armitage SAO, Rolff J, Regoes RR. (2023) Virulence decomposition for bifurcating infections. *Proc Roy Soc B* 290:20230396. <https://doi.org/10.1098/rspb.2023.0396>.
3. Kutzer MAM, Kurtz J, Armitage SAO. (2019) A multi-faceted approach testing the effects of previous bacterial exposure on resistance and tolerance. *J Anim Ecol* 88: 566-579. <https://doi.org/10.1111/1365-2656.12953>.
4. Armitage SAO, Genersch E, McMahon DP, Rafaluk-Mohr C, Rolff J. (2022) Tripartite interactions: how immunity, microbiota and pathogens interact and affect pathogen virulence evolution. *Curr Op Ins Sci* 50: 100871. <https://doi.org/10.1016/j.cois.2021.12.011>.