



CHEMICAL COMMUNICATION IN ECOLOGICAL SYSTEMS

Application Call 2024 - Project 8

Disentangling multipartite symbiont and pathogenic associations in a leafhopper plant pest

Supervisors:

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Background:

Numerous insects host symbiotic microorganisms (bacteria, fungi, protists and viruses) that are integral to their life history, ecology and evolution. However, insects can also be vectors for pathogenic bacteria and viruses resulting in e.g. disease symptoms in host plants. The planthopper *Pentastiridius leporinus*, originally associated with common reed, has expanded its host plant range to wheat, sugar beet and recently to potato plants. *P. leporinus* is a major vector for the transmission of the plant pathogens *Arsenophonus* and *Phytoplasma* to both sugar beet and potato, resulting in severe crop losses. Strikingly, bacterial associations in *P. leporinus* display an unprecedented level of complexity. In addition to the plant pathogenic bacteria and three putative primary symbionts, preliminary data indicate the presence of several additional bacterial species with unknown function.

Project description:

The aim of the project is to understand the (potentially dynamic) interactions between the host, the primary symbionts, additional associated bacteria as well as *Arsenophonus* and *Phytoplasma* species transmitted to the respective host plants. Furthermore, the successful applicant will address questions related to the host plant range expansion to phylogenetically distant plant species observed for *P. leporinus*. The focus of the project is expected to be co-developed by the successful applicant, and the applied methods will include metagenomic profiling, microbiology, phenotypic descriptions of the bacterial associations, biochemical and genetic manipulation of both host and bacteria.

Candidate profile:

- Highly motivated with a deep interest in research questions related to the molecular biology and evolutionary ecology of insect-microbe interactions
- A dedicated team player who enjoys creatively doing interdisciplinary science and adapting new techniques
- Excellent background in insect or molecular biology, insect physiology, or microbiology

- Very good communication skills and the ability and willingness to interact with other scientists in the group
- An MSc (or equivalent), ideally in Molecular Biology, Microbiology, Biochemistry, Genetics or a related field.
- Proficiency in English, both written and oral

Reading:

Behrmann SC, Witczak N, Lang C, Schieler M, Dettweiler A, Kleinhenz B, Schwind M, Vilcinskas A, Lee K-Z (2022). Biology and Rearing of an Emerging Sugar Beet Pest: The Planthopper *Pentastiridius leporinus*. *Insects* 13(7). doi:10.3390/insects13070656

Behrmann SC, Rinklef A, Lang C, Vilcinskas A, Lee K-Z (2023) Potato (*Solanum tuberosum*) as a New Host for *Pentastiridius leporinus* (Hemiptera: Cixiidae) and Candidatus *Arsenophonus Phytopathogenicus*. *Insects* 14(3). doi:10.3390/insects14030281

Bennett GM, Mao M (2018). Comparative genomics of a quadripartite symbiosis in a planthopper host reveals the origins and rearranged nutritional responsibilities of anciently diverged bacterial lineages. *Environ Microbiol* 20:4461-72. DOI: 10.1111/1462-2920.14367

Bressan A, Séméty O, Nusillard B, Clair D, Boudon-Padieu E (2008). Insect Vectors (Hemiptera: Cixiidae) and Pathogens Associated with the Disease Syndrome “Basses Richesses” of Sugar Beet in France. *Plant Dis* 92(1):113–119. doi:10.1094/PDIS-92-1-0113