

Postdoctoral position on an insect-bacteria mutualistic symbiosis

Functional Biology Insects and Interactions - BF2i Lab. (INRAE/INSA ; <https://bf2i.insa-lyon.fr>)
Biosciences Department, INSA-Lyon
Lyon, France

24 months position, open from October 2021 or as soon as possible thereafter

We are seeking a highly motivated and talented post-doc who wants to do great science on nutritional mutualistic symbiosis!

Context: Nutritional endosymbiosis is of high prevalence in insects and are instrumental to their evolution and adaptation to unbalanced diets. Endosymbiotic bacteria are present inside the insect cells, and transmitted maternally from generation to generation, co-evolving with their host for million years. Understanding the molecular mechanisms of integration of the mutualistic bacteria in regards to the host immune system and metabolism is a central aim in the field. While these questions have been largely addressed in long-lasting associations, we use the cereal weevil association with Gram-negative bacteria *Sodalis pierantonius* to address these interactions in a recently established association.

S. pierantonius are hosted in specialized cells, the bacteriocytes, which themselves group into bacteriome organs. The nutrient exchange between the two partners takes place in these specialized cells: the bacteria provide amino acids, vitamins and co-factors to the host, while receiving carbohydrates the host digests from the cereal grain (Oakeson *et al.* GBE 2014; Parisot *et al.* under review). We have shown that bacteria seclusion inside bacteriocytes is ensured by a specific immune response of the host, which favors both symbiont control and systemic immune homeostasis (Login *et al.*, Science 2011; Maire *et al.* Microbiome 2018; Maire and Vincent-Monégat *et al.* PNAS 2019). The bacteria load is modulated along the host development according to insect metabolic and physiological needs (Vigneron *et al.* Current Biol 2014). Recently, we have described how coordinated transcriptomic and cellular changes ensure symbiosis maintenance and reorganization during the insect metamorphosis (Maire *et al.* PNAS 2020). The bacteria are highly active during this process: imaging approaches indicate that they infect host stem cells *de novo*, and dual RNASeq analysis revealed up-regulation of the T3SS and flagella gene expression. Our working model is that this stem cell infection drives their differentiation into bacteriocytes.

Postdoc project: The position is associated with a fully funded ANR project FOCuS: “Deciphering the Functional Organization of Cross-kingdom ‘metabolic factories’ in insect endosymbiosis” led by Anna Zaidman-Rémy. FOCuS aims at deciphering the process of co-differentiation of the bacteria and host bacteriocytes into efficient cross-kingdom metabolic factories, using a combination of state-of-art transcriptomic, imaging and functional genomics. The recruited post-doc will take part in this exciting project by identifying and studying the genes involved in the co-differentiation process. **Methods** include microdissection and/or spatial RNA Seq during the process of differentiation at metamorphosis, RT PCR *in situ*, RT-qPCR, RNAi, FISH, immunohistology, Immunogold combined with fluorescent and electron microscopy, cell culture, flow cytometry, insect manipulation and biology (note that the bacteria are so far not cultivable).

Team, Lab and location: The post-doc will be part of the Abdelaziz Heddi’s Symbiosis and Immune Signaling team, a dynamic and very supportive team with high-level of technical expertise and acknowledged accomplishments in the field of endosymbiosis. They will have access to the funding and infrastructures needed for this project, in a dynamic scientific environment. Lyon is a beautiful city with high quality of life.

The ideal candidate:

- You have a PhD either:
 - o in microbiology and are now looking to study the interactions also from the host side

- in the field of symbiosis
- in insect development or immunity and aim to join the field of symbiosis
- You love functional genomics approaches

Relevant expertise:

- Molecular biology
- Imaging approaches, cellular biology, histology. Experience in electron microscopy is a plus.
- Experience with RNAi or functional analyses
- Interested in acquiring expertise in experimentation with insects: care, injection, dissection...
- Expertise in bioinformatic analyses is a plus

Ideally, we are looking for a 2-3 years-experienced post-doc but we are open to the possibility of a junior post-doc if autonomous and highly motivated. We expect a publication record of quality, in relation to the career stage.

We are an equal opportunities employer, actively supporting inclusivity and diversity. We offer an exciting, stimulating, diverse research environment and a friendly workplace. We constantly seek to increase the staff diversity and multiculturality –currently a third of the lab has another nationality than French.

Application to be sent to anna.zaidman@insa-lyon.fr, with:

- Motivation letter
- Curriculum vitae, including complete list of publications
- Two referee contacts