

Deciphering the molecular dialogue between the mutualistic symbiosis between the cereal weevil *Sitophilus oryzae* and the endosymbiotic bacteria *Sodalis pierantonius*: datamining of Dual RNA Seq datasets

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Project : Cereal weevils are common insect crop pests causing an estimated worldwide loss of hundreds of millions of dollars and hence their study is crucial for ecological and economical reasons. *Sitophilus oryzae*, the rice weevil, has partnered along evolution with the Gram-negative bacterium *Sodalis pierantonius*, allowing the insect to thrive exclusively on cereals despite their low amount in amino acids and vitamins. The bacteria are present within specialized insect cells called bacteriocytes, that are organized into organs, the gut and ovarian bacteriomes. In the last decade, our team has used this association to untangle the molecular interactions between host and bacteria, and to understand how the insect immune system has co-evolved with the endosymbionts. We demonstrated that the host controls the localization of the bacteria through the action of an antimicrobial peptide (AMP), Coleoptericin A (Login et al., Science 2011). AMPs are key effectors of the immune response in many organisms, including insects. However, Coleoptericin A does not kill bacteria in the cereal weevil, but prevents the endosymbiotic bacteria to escape the bacteriocytes and to invade other host tissues.

In order to further understand this molecular dialogue, we have recently obtained transcriptomic data from both the insect and the endosymbiotic bacteria through 12 timepoints of bacteriome development (from larvae to 20 day old adults). We uncovered multiple pathways associated with metabolic exchanges, immunity, and gene regulatory networks. Moreover, we have targeted one of the immune pathways of the insect (using RNAi) and performed a dual RNA Seq to identify the repertoire of genes regulated by this pathway in the host as well as the consequences on the bacterial transcriptome.

The aim of the M2 project will be to extensively analyze the differentially expressed genes in these two Dual RNA Seq datasets, in order to:

- 1) Define the repertoire of host genes regulated by the immune pathway (by pattern correlation along development, filtering of the genes which are not differentially expressed in absence of bacteria, and analysis of the DEG under different RNAi conditions), and their associated functions (analysis of GO and KEGG annotations, and literature search)
- 2) Analyze the transcriptomic response of the bacteria to the host immune pathway, in the context of this symbiotic relationship, by a similar approach on the bacterial transcriptomic data.

This project relies on already acquired quality datasets and is expected to provide very interesting results for publication, and to further explore during a following PhD. We are looking for motivated students, who envision pursuing a PhD after their master. The student will be closely working with the two co-directors, along with other members of the BF2i laboratory, and will benefit from a very supportive team. We expect a proactive person who enjoys being part of a team and is passionate about science.

Lab: The BF2i laboratory is affiliated to both the National Research Institute for Agriculture, Food and the Environment (INRAE) and the 'Institut National des Sciences Appliquées de Lyon' (INSA Lyon). The lab research work focuses on the biology of different types of interactions involving insects, plants and insect symbiotic bacteria. It also aims at investigating emerging technologies required for insect pest control. The successful applicant will benefit from fully equipped laboratories for genomics, molecular biology, biochemistry and histology research.

Environment: Lyon is built around the Rhône and Saône rivers. It is the second economic French city and its rich history and architecture made it part of the Unesco World Heritage. The city is also culturally very dynamic. Within France, Lyon has a strategic geographical position, close to the Alps and the Mediterranean coast, Switzerland and Italy. Paris is only two hours away by TGV. Last but not the least, Lyon is considered the French capital of gastronomy, offering a wide variety of food and wine from the surrounding areas.

Keywords: Bioinformatics, symbiosis, insects, immunity, bacteria, dual RNA Seq