COEVOL MULTI-SCALE COEVOLUTION

EVOLUTIONARY GENETICS OF INTERACTIONS GROUP

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Who am we? Who are I?

These two strange questions perfectly define my research interests. I study interspecific relationships, anotably symbiotic interactions, using as a model the interactions between arthropods and bacteria with mainly vertical transmission (from mother to offspring). The objective is to understand the dynamics of this chimeric individual, the factors that orient these interactions towards conflict or cooperation, and their consequences on the extended phenotype of the individual and the evolution of each of the partners. The subtlety of these interactions, which continually navigate between selfish and shared interests, is particularly important to consider and integrate into the trendy study of the holobiont and the microbiota. This general theme is currently structured around 3 main projects:

Co-adaptation within holobionts. Within the framework of the ANR Hmicmac project, we are seeking, with Laurence Mouton, to test the hypothesis that host-microbiota interactions should lead to co-adaptation between partners. This hypothesis is tested using experimental evolution based on situations where these possible co-adaptations are initially broken and then left free to evolve again. This approach is being carried out on the whitefly *Bemisia tabaci* and its symbiotic bacteria at the LBBE, and will be compared with similar experiments carried out on the pea aphid. This project also involves the IGEPP (Rennes) and BF2I (Lyon) laboratories.

Response of symbioses to stress. Within the framework of the RESIST project (ANR JCJC, coord. Natacha Kremer, LBBE), we are seeking to test whether symbiosis is a driving force or a barrier to adaptation to new environmental stresses. We are using the association between *Drosophila melanogaster* and *Wolbachia* (*w*MelPop strain), which is subjected to punctual or chronic stresses with either a pro-oxidant agent (the herbicide paraquat), or virus C, or both simultaneously.

Dynamics of obligate symbiotic interactions in ticks. Within the framework of the MICROM project (ANR, coord. O. Duron, MIVEGEC), we are seeking to understand the whys and wherefores of recurrent replacements of obligate nutritional symbionts in ticks. Indeed, these strict haematophagous arthropods depend on nutritional symbionts providing them with B vitamins. However, multiple replacement events have occurred during tick evolution. Future work at the LBBE will be dedicated to comparative genomics of symbionts from different tick species.

Finally, within the framework of several projects (SBP MicroBeHave, 2 CIFRE theses, an ANR and a project), we have developed with Julien Varaldi and Natacha Kremer, in collaboration with the BF2I laboratory and the company Izinovation, a new project on **bedbugs**, a re-emerging pest due to its resistance to insecticides, strictly haematophagous and totally dependent on symbionts of the *Wolbachia* genus for the supply of B vitamins. Our work seeks to characterise the genetic mechanisms of resistance and to better understand the genetic and metabolic dialogue between the insect and its symbiont.

Development of "One Health" approaches in Lyon

In addition to these scientific aspects, I am also involved in the construction of the research ecosystem in Lyon on One Health approaches. This has led me to lead the Symbiotron platform project for more than 10 years, and since 2021 to coordinate the recently funded Equipex+ Infectiotron project led by the University of Lyon 1. This project seeks to develop a set of coordinated tools for the operational development of projects on infectious diseases from their natural environment to the laboratory, with a particular focus on level 3 pathogens. I am also actively involved in the implementation and development of the SHAPE-Med@Lyon project, also led by the University of Lyon 1, and in particular for the development of the Lyon Transdisciplinary Health Institute.