

**Master 2 internship project
Year 2024-2025**

Laboratory/Institute: TIMC
Team: TrEE

Director: Alexandre Moreau-Gaudry
Head of the team: Fabien Pierrel

Name and status of the scientist in charge of the project:

Thomas Hindré (MCF)

HDR: yes no

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Program of the Master's degree in Biology:

- Microbiology, Infectious Diseases and Immunology Structural Biology of Pathogens
 Physiology, Epigenetics, Differentiation, Cancer Neurosciences and Neurobiology

Title of the project:

Evolution of antibiotic resistance mediated by integrons

Objectives (up to 3 lines):

This project aims at characterizing the evolutionary dynamic of genetic element called resistance integrons in bacterial populations propagated in the presence of antibiotic at sub-inhibitory concentrations.

Abstract (up to 10 lines):

Resistance integrons (RI) are low-cost genetic structures that allow bacteria to evolve rapidly towards antibiotic resistance by acquisition, stockpiling, excision and rearrangement of resistance gene cassettes. RI are highly associated with the emergence of multidrug resistance in clinical settings but the sustaining mechanisms are not yet fully understood. In this project, we will use experimental evolution and synthetic RIs that have been integrated in the genome of one *E. coli* strain to characterize their evolutionary dynamics during propagation of this strain in liquid cultures containing antibiotic at sub-inhibitory concentrations. The objectives is to identify if and how rearrangement of the gene cassettes in the RI as well as point mutations within this genetic structure contribute to an increased resistance to antibiotics. Moreover, the same strategy but propagating the bacterial strain in biofilm will be used by one of our collaborator to ultimately characterize the impact of bacterial mode of life on the evolution of antibiotic resistance mediated by RIs.

Methods (up to 3 lines):

Bacterial culture, characterization of bacterial phenotype (Ab minimal inhibitory concentration), molecular biology to identify genetic rearrangement (PCR, DNA sequencing)

Up to 3 relevant publications of the team:

Tree Team: Consuegra J. Insertion-sequence-mediated mutations both promote and constrain evolvability during a long-term experiment with bacteria. *Nat Commun.* 2021 12(1): 980.

Collaborator: Baltazar M. Activation of class 1 integron integrase is promoted in the intestinal environment *PLoS Genet.* 2022. 18(4): e1010177

Requested domains of expertise (up to 5 keywords):

Skills in bacteriology and molecular biology
Knowledge in antibiotic resistance and general bacteriology