

**Master 2 internship project  
Year 2025-2026**

**Laboratory/Institute:** TIMC  
**Team:** TrEE (<https://www.timc.fr/TrEE>)

**Director:** A. MOREAU-GAUDRY  
**Head of the team:** F. PIERREL

**Name and status of the scientist in charge of the project:** Fabien Pierrel, CNRS Researcher

**HDR:** yes ☒ no ☐

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[morgane.roger-margueritat@univ-grenoble-alpes.fr](mailto:morgane.roger-margueritat@univ-grenoble-alpes.fr) (PhD student)

**Program of the Master's degree in Biology:**

- ☒ Microbiology, Infectious Diseases and Immunology ☐ Biochemistry & Structure  
☐ Physiology, Epigenetics, Differentiation, Cancer ☐ Neurosciences and Neurobiology

**Title of the project:** Quinone exchanges in the gut microbiota

Objectives (up to 3 lines):

Identify importers and exporters of quinone precursors using genetic approaches in *E. coli*.  
Characterize the type of quinones produced by gut microbiota (GM) bacteria from the menadione precursor

Abstract (up to 10 lines):

Isoprenoid quinones are lipophilic molecules shuttling electrons in the electron transfer chains used by most organisms to produce ATP. Bioinformatic and experimental approaches developed in our team have established that a significant proportion GM bacteria have lost the upper part of the biosynthesis pathway for the isoprenoid quinone menaquinone and rely on exogenous precursors (DHNA and menadione) to synthesize their menaquinone. The objectives of the internship will be to identify the importers and exporters that allow the trafficking of DHNA between GM bacteria. For this, genetic screens with *E. coli* will be developed. In addition, we will also identify which quinones are produced from menadione. For this, stable isotope-labelled menadione will be added to mouse GM and the labelled quinones will be identified by HPLC-MS-MS. The results will enhance our understanding of the exchange of important metabolites between bacteria in the GM.

Methods (up to 3 lines):

Molecular biology, bacterial cultures in anaerobic conditions, quinone quantifications by HPLC chromatography coupled to electrochemical and mass spectrometry detections

Up to 3 relevant publications of the team: <https://www.timc.fr/TrEE>

Kazemzadeh et al., Mol Biol Evol. 2023 ; <https://doi.org/10.1093/molbev/msad219>

Arias-Cartin et al., mBio 2023 ; <https://doi.org/10.1128/mbio.03298-22>

Chobert et al., ISME J. 2025 ; <https://academic.oup.com/ismej/article/19/1/wrae253/7927901>

Requested domains of expertise (up to 5 keywords):

Microbiota, Microorganisms, Genetics, Biochemistry, Metabolism