

**Master 2 internship project
Year 2019-2020**

Laboratory/Institute: TIMC-IMAG (CNRS UMR 5525-Université Grenoble Alpes)

Director: Philippe Cinquin

Team: Genomics and Evolution of Microorganisms (GEM)

Head of the team: Dominique Schneider

Name and status of the scientists in charge of the project: Corinne Mercier et Dominique Schneider

HDR: yes no

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Program of the Master's degree in Biology:

- Immunology, Microbiology, Infectious Diseases Integrative Structural Biology
 Physiology, Epigenetics, Differentiation, Cancer Neurosciences and Neurobiology
 Planta International

Title of the project:

Dynamics of membranes and membrane lipids during the Long Term Experimental Evolution in *Escherichia coli*

Objectives (up to 3 lines):

Analyze the evolutionary dynamics of lipid synthesis, membrane plasticity and cell division during a long-term experiment with *E. coli*.

Abstract (up to 10 lines):

The Long-Term Evolution Experiment (LTEE) consists in 12 *E. coli* independent populations that are propagated by serial daily transfers since 1988 in a minimal glucose medium, representing 70,000 generations of evolution (equivalent to 2 million years at the human scale). A complete and revivable fossil record from all twelve populations including samples collected over time and the ancestor is available in our freezer. The composition in lipids and the architecture of the bacterial membranes have not been investigated in this evolutionary framework. Our recent results have identified changes in phenotypic traits related to the membrane metabolism and cell division (unpublished results). The aim is to characterize the underlying mutations and the effect of these changes on the evolutionary dynamics of these bacterial cells.

Methods (up to 3 lines):

Bacterial cultures, lipid extraction and analyses (HP-TLC, GC/MS, LC-MS), protein quantitation, SDS-PAGE, microscopy (light and confocal microscopy, transmission electron microscopy), genome analysis, molecular cloning, allelic exchange.

Up to 3 relevant publications of the team:

- 1) **Lamrabet O, Martin M, Lenski RE, Schneider D.** 2019. Changes in intrinsic antibiotic susceptibility during a Long-Term Evolution Experiment with *Escherichia coli*. MBio. 10: e00189-19. doi: 10.1128/mBio.00189-19.
- 2) Couce A, **Caudwell LV**, Feinauer C, **Hindré T**, Feugeas JP, Weigt M, Lenski RE, **Schneider D**, Tenaillon O. 2017. Mutator genomes decay, despite sustained fitness gains, in a long-term experiment with bacteria. Proc Natl Acad Sci U S A. 114: E9026-E9035. doi: 10.1073/pnas.1705887114.
- 3) **Consuegra J, Plucaïn J, Gaffé J, Hindré T, Schneider D.** 2017. Genetic basis of exploiting ecological opportunity during the long-term diversification of a bacterial population. J Mol Evol. 85: 26-36. doi: 10.1007/s00239-017-9802-z.

Requested domains of expertise (up to 5 keywords):

Biochemistry, molecular biology, microbiology, statistics, cell biology.