UFR de Chimie et de Biologie
UNIVERSITÉ Grenoble Alpes

Master's degree in Biology – Chemistry-Biology Department

Master 2 internship project
Year 2023-2024

Laboratory/Institute: TIMC UMR5525
Director: Alexandre Moreau-Gaudry
Team: TrEE
Heads of the team: Bertrand Toussaint and Fabien Pierrel

Name and status of the scientists in charge of the project: Béatrice Schaack & Elisabetta Boeri **HDR: yes** [x] **no**
Address: Bâtiment Jean Roget, 38700 La Tronche & IBS, 38000 Grenoble
Phone: **e-mail:** beatrice.schaack@ibs.fr & elisabetta.boeri-erba@ibs.fr

Program of the Master's degree in Biology:

[x] Microbiology, Infectious Diseases and Immunology [x] Structural Biology of Pathogens
☐ Physiology, Epigenetics, Differentiation, Cancer ☐ Neurosciences and Neurobiology

Title of the project: Evolution of bacterial extracellular vesicles during synthesis and transcytosis

Objectives (up to 3 lines):

All living organisms produce extracellular vesicles (EVs). They are involved in communication between cells and in the transport of biomolecules. Bacterial EVs play a role in microbiota, tolerance, bacterial colonization, transmission of virulence factors and disease pathogenesis. We will analyze *Escherichia coli* outer membrane vesicles (OMVs) before and after intestinal transcytosis.

Abstract (up to 10 lines):

We postulate that transcytosis through the intestinal epithelium and the vascular endothelium modifies the LPS and membrane proteins of OMVs in order to modulate their inflammatory properties.
We will study 1/ the remodeling of both the LPS and the membrane proteins from the producing bacteria and their OMVs; 2/ the remodeling of both LPS and membrane proteins from the same OMVs after their transcytosis through the intestinal epithelium and then the endothelium of blood vessels.
We will provide new, original and important data on the maturation of OMVs from their secretion to their transcytosis and the importance of this biochemical and biophysical maturation for the immune tolerance of OMVs secreted by the intestinal microbiota. This project brings together experts in microbiology, OMVs, membrane proteins, LPS, molecular structure investigation by mass spectrometry and cellular immunology.

Methods (up to 3 lines):

We will produce and analyze OMVs from a characterized *E. coli* strain using immunoblots, dynamic light scattering (DLS), nanoparticle tracking analysis (NTA), electron microscopy and finally mass spectrometry (MS).

Up to 3 relevant publications of the team:

- Exploring the structure and dynamics of macromolecular complexes by native mass spectrometry. Boeri Erba E, Signor L, Petosa C. J Proteomics 2020, doi: 10.1016/j.jprot.2020.103799.
- Extracellular Vesicles from 50,000 Generation Clones of the *Escherichia coli* Long-Term Evolution Experiment. Laurin D, Mercier C, Quansah N, Robert JS, Usson Y, Schneider D, Hindré T, Schaack B. Int J Mol Sci 2022, doi: 10.3390/ijms232314580.
- Microbiota-Derived Extracellular Vesicles Detected in Human Blood from Healthy Donors. Schaack B, Hindré T, Quansah N, Hannani D, Mercier C, Laurin D. Int J Mol Sci. 2022, doi: 10.3390/ijms232213787.

Requested domains of expertise (up to 5 keywords):

Microbiology, biochemistry