**Master 2 internship project**

**Year 2023-2024**

**Laboratory/Institute:** TIMC UMR5525 **Director:** Alexandre Moreau-Gaudry

**Team:** TrEE **Head of the team:** Bertrand Toussaint

**Name and status of the scientist in charge of the project:** Béatrice Schaack & Elisabetta Boeri **HDR: yes x no**

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**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 OMV in order to modulate their inflammatory properties.

We will study 1/ the remodeling of LPS and membrane protein from the producing bacteria and their OMVs; 2/ this same remodeling at the level of OMVs after their transcytosis through the intestinal epithelium and through 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 Western Blot, Dynamic Light Scattering (DLS), Nanoparticle Tracking Analysis (NTA), electronic 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, human health, microbiota-host interface, extracellular vesicles