Master Biologie Moléculaire et Cellulaire 'BMC',
Université Paris Cité - *UFR Sciences du Vivant*

Parcours : **Biologie et Développement Cellulaires 'BDC'**
https://master2bdc.ijm.fr/
Fiche de Projet de Stage de M2, 2025-2026

Unité INSERM ou CNRS ou Université : **Institut Jacques Monod-UMR7592/ERL1340** **Intitulé Equipe :** **Quantitative cell biology of bacterial infection** **ED d'appartenance : BioSPC** **Responsable de l'Equipe : Daria Bonazzi**	**Responsable du Stage : Daria Bonazzi** **Contacts** Adresse : 15 rue Hélène Brion 75013 Paris Email : daria.bonazzi@ijm.fr Tel :

Titre du projet : Mechanobiology of Meningococcal Infection

Résumé du Projet de Stage (en 300 mots maximum, mots clés en gras)

Pathogens can cross tissue barriers to invade and disseminate into the host. Past research has identified the molecular mechanisms involved in these key steps of infection. However, the forces at play during these processes and their impact on the surrounding environment (e.g., the extracellular matrix and neighboring cells) remain poorly understood. In the lab, headed by Daria Bonazzi, we will shed light on **the link between tissue mechanics and barrier function by using a combination of live imaging, micro-fabrication, microfluidics, and genetic tools in in vitro cellular and tissue barrier models of infection**. We will mostly focus on ***Neisseria meningitidis***, an extracellular bacterium responsible of severe pathologies in humans such as septic shock and meningitis.
The intern will investigate how meningococcal bacteria mechanically manipulate the host for bacterial dissemination and vascular damage, focusing on the role of **Type-IV pili** and their capacity to exert high pulling forces. We will characterize the impact of bacterial adhesion on cell mechanics, cell polarity and cell motility, by using traction force microscopy and surface micropatterning.

Publications de l'équipe relatives au projet de stage (max 5)

-Bonazzi D.*, Lo Schiavo V.*, Machata S., Djafer-Cherif I., Nivoit P., Manriquez V., Tanimoto H., Husson J., Henry N., Chaté H., Voituriez R. and Duménil G.: Intermittent pili-mediated forces fluidize Neisseria meningitidis aggregates during vascular colonization, Cell, 2018, 174 (1), 143-155.
-Ershov D., Phan M.-S., Pylvänäinen J. W., Rigaud S. U., Le Blanc L., Charles-Orszag A., Conway R. W., Laine R. F., Roy N. H., Bonazzi D., Duménil G., Jacquemet G. and Tinevez J.-Y.: Bringing TrackMate into the era of machine-learning and deep-learning, Nature Methods 2022
-Charles-Orszag A., Tsai F.C., Bonazzi D., Manriquez V., Sachse M., Mallet A., Salles A., Melican K., Millien C., Goussard S., Lafaye P., Shorte S., Piel M., Krijnse-Locker J., Brochard-Wyart F., Bassereau P. and Duménil G.: Adhesion to nanofibers drives cell membrane remodeling through one-dimensional wetting, Nature Communications, 2018, 9 (1), 4450 (Comment in Nature News and Views).

Upcoming

-Le Blanc L., Alric B., Rollin R., Xénard L., Ramirez Finn Laura, Goussard S., Mazenq L., Ingersoll M.A., Piel M., Tinevez J.-Y., Delarue M. , Duménil G. and Bonazzi D.: Bacterial growth under confinement requires transcriptional adaptation to resist metabolite-induced turgor pressure build-up; under review in Nat Microbiol, https://www.biorxiv.org/content/10.1101/2024.09.20.614086v1.
-Sahnine M, Charles-Orszag A, Sartori-Rupp A, Salles A, Tachon S, Penard E, Bomme P, Mallet A, Bonazzi D, Duménil G, Obino D. Arp2/3-dependend actin nucleation stabilizes 1D wetting-mediated plasma membrane protrusions; under review in Nat Comm