

Internship Opportunities for Master students

in the new team “Quantitative cell Biology of Bacterial Infections” at Institut Jacques Monod

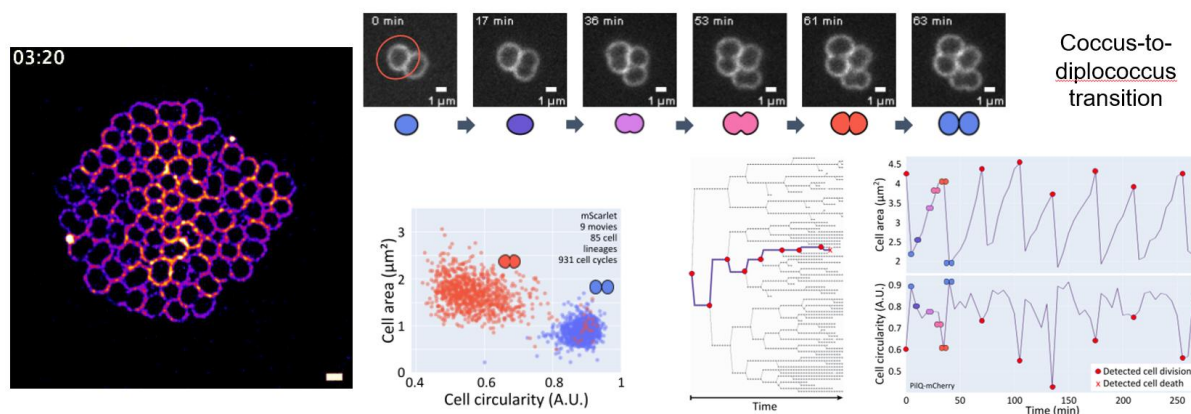
Host Lab

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 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* (*Nm*), an extracellular bacterium responsible of severe pathologies in humans such as septic shock and meningitis.

Research Projects

Project 1: Cell morphogenesis and growth of a diplococcus

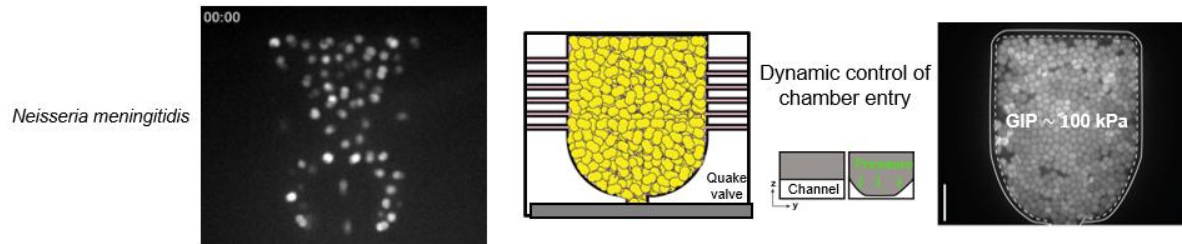
The intern will study how *Nm* grows and divides in order to ensure a proper diplococoid shape. More specifically, we will characterize how proper chromosome segregation is coordinated with cell wall synthesis and the proper localization of the cell division machinery. For this, we will use a variety of strains expressing fluorescent reporters of cellular components and quantitatively characterize their dynamic distribution during cell growth and division by high resolution live cell microscopy. These experiments will be performed in the wild-type strains and in mutants lacking regulators of cell shape and cycle. Data will be quantified by using custom-built segmentation and analysis tools developed in the lab, which are mostly based on the use of Python and Fiji.



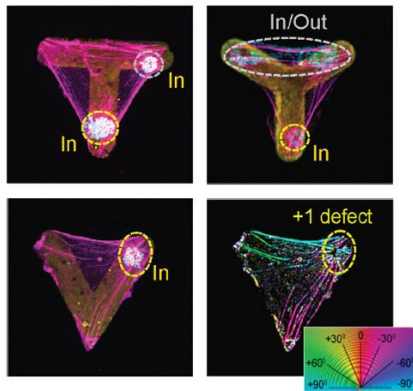
Project 2: Response of *Nm* to mechanical confinement

The intern will study how meningococci respond to growth within a limited space, as it occurs at late stages of vascular colonization when they fill up the entire vessel lumen. To address this, we have designed the bacterial confiner in collaboration with Morgan Delarue (LAAS Toulouse), a microfluidic chamber to monitor bacterial growth in a controlled mechano-chemical environment,

and we are now able to dynamically observe the impact of confinement on the morphology of different bacterial components of *Nm* and gene transcription using fluorescent reporters.



Project 3: Impact of *Nm* adhesion on endothelial cell polarity and ECM interaction



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.

What you will find:

- Potential to pursue a PhD project in the lab.
- Interdisciplinary research environment in a new emerging team.
- Learning dynamic confocal microscopy, image analysis, bacterial and cell culture, biophysical approaches (TFM, microfabrication, microfluidics).

Please send a CV, a motivation letter summarizing previous work experience and research interests, and contact information to Daria Bonazzi (daria.bonazzi@ijm.fr).