PhD/Postdoctoral position

Cellular topography sensing by one-dimensional wetting

Research Project

By studying the interaction of the pathogenic bacterium *Neisseria meningitidis* with endothelial cells, we recently revealed how cells can form plasma membrane protrusions along adhesive nanofibers, Type-VI pili in this case (Charles-Orszag *et al*, *Nat commun*, 2018). During this physical process called one-dimensional wetting, cells encounter nanoscale adhesive fibers and adhesion forces drive the formation of tubular membrane protrusions along the fibers. Cortical actin subsequently reorganizes and occupies the protrusion, however the molecular mechanisms at play in this cytoskeletal remodeling remain to be elucidated. Current work in the lab has highlighted the central role of the Arp2/3 complex in the formation of a branched actin network within tubular protrusions induced by bacterial adhesion (Sahnine et al, *in preparation*). We hypothesize that this cellular process described in the context of bacterial infections might allow cells to probe the topography of the surrounding microenvironment through the interaction with the dense network of adhesive fibers constituting the extracellular matrix.

We are looking for a highly motivated researcher willing to **explore the role of 1D wetting in topography sensing**, by developing 3D *in vitro* models in collaboration with the laboratories headed by Sylvie Coscoy at Institut Curie and Vincent Semetey at Chimie Paristech. Two-photon induced polymerization of photoactivable resin will be used to form adhesive fibers of different shapes and sizes. Cellular behavior on these 3D microstructures will be observed and quantified and the mechanisms leading to the remodeling of the actin cytoskeleton will be determined. We will also assess how this topography sensing process impacts essential cellular processes, such as cell motility and interaction of bacteria with host cells. Overall, this project aims at understanding how cells navigate in the complex environment formed by the extracellular matrix and how pathogenic bacteria take advantage of this process during infection.

Host Lab

This project will be hosted and funded by the Pathogenesis of Vascular infections Unit (Head: Guillaume Duménil) at Institut Pasteur. The candidate will be integrated in an interdisciplinary team that combines biochemistry, microbiology, cell biology, biophysics and animal models of infection.

Activities

The candidate will apply innovative and ambitious approaches to investigate the mechanism and function of one-dimensional wetting (*e.g.* plasma membrane remodeling, actin/membrane crosstalk, molecular signaling and structural biology). This includes microfabrication, high-resolution live microscopy and quantitative image analysis. All these expertises are present in the host labs and reinforced by well-established collaborations with the technological platforms at Institut Pasteur.

Knowledge & Skills

Prior training in the field of cell biology and dynamic imaging is strongly recommended. The candidate should feel comfortable with interdisciplinary science including biophysics and engineering.

Please send a CV, a cover letter, a research statement summarizing previous work experience and research interests, and contact information of two references to Guillaume Duménil (Guillaume.dumenil@pasteur.fr)