# Biomimetic approaches to blood cells/vascular walls interactions


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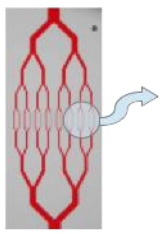
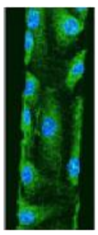
Interactions between circulating cells and blood vessel walls are central to many physiological processes such as the early stages of the immune or inflammatory response, gas exchanges with tissues, or vascular remodeling. A key player in regulating such processes is the so-called endothelial glycocalyx, a soft and µm-thick layer of biomacromolecules lining the lumen of blood vessels. While the glycocalyx is recognized as the primary « gatekeeper » of the vascular walls, its mechanical role in controlling the adhesive and hydrodynamic interactions with flowing cells is far from being elucidated.

In this talk, I will present the biomimetic strategies developed at LIPhy to address this issue. Combining microfluidics with endothelial cell culture, we create microvasculatures-on-a-chip, which we have shown to recapitulate in vitro the nature of the blood vessel surface and some of the salient features of microconfined flow of red blood cells [1]. In a complementary approach, we use well-controlled biopolymer layers in order to mimic the glycocalyx and study how such layers affect the motion of particles flowing nearby [2]. I will discuss how these experimental strategies help us to better understand the physics of cell/wall interactions in blood flows.

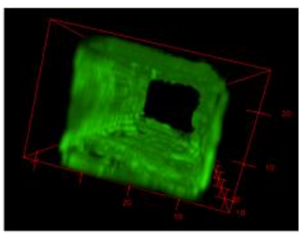

[1] D. Tsvirkun et al. Microvasculature on a chip: study of the Endothelial Surface Layer and the flow structure of Red Blood Cells, Sci. Rep. **7**, 45036 (2017)
[2] H. S. Davies et al. Elastohydrodynamic lift at a soft wall, Phys. Rev. Lett. **120**, in press (2018)

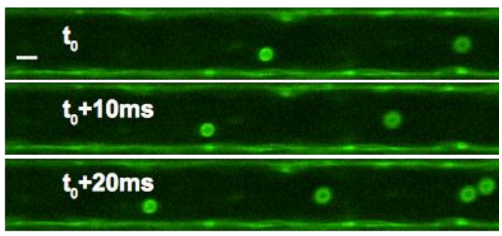
µ-fluidic network



Endothelial Cells in channel



3D image of Luminal glycocalyx




Red Blood Cells flowing in endothelialized channel