Projects developed in the “Membrane Dynamics and Mechanics of Intracellular Signaling” team are based on the new concepts and original assays developed by the team for the last ten years to investigate the Cell Biology of membrane trafficking and mechanics and its role in intracellular signaling.

The team focuses its effort on three mains directions:

1 – Molecular control of **JAK/STAT signaling** by endosomal sorting of interferon receptors (IFN-Rs). Following our pioneering studies on EGF signaling, we wish now to identify the molecular machinery that couples IFN-R endocytosis and endosomal sorting with JAK/STAT signaling.
Understanding the new mechanical role of caveolae in signaling and pathophysiology. We have recently revealed a new role for caveolae, a subset of membrane invaginations present at the cell surface and have established that their disassembly/reassembly cycle represents the primary cell response to mechanical stress (Cell, 2011; Fig. 1). We wish now to understand and identify the molecular players and signaling pathways involved in the caveolae-dependent mechanical response in cancer cell proliferation, muscle dystrophies and atherosclerosis.
Membrane Dynamics and Mechanics of Intracellular Signaling

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Fig.2 | Cells respond to acute mechanical stresses by rapid disassembly and reassembly of caveolae. In resting conditions, caveolae at the plasma membrane are mostly budded. Upon acute mechanical stress (hypo-osmotic shock or stretching), caveolae flatten out in the plasma membrane to provide additional membrane and buffer membrane tension. This leads also to a loss of Cav1 and Cavin-1 interaction. We hypothesize that the mechanical release of caveolae main constituents is key step in mechanosignaling. Return to resting conditions allows the reassembly of the caveolar structure (Sinha et al., 2011 Cell; Nassoy and Lamaze, Trends Cell Biol 2012).

3 - Investigating the role of membrane trafficking in cholesterol transcriptional homeostasis. In particular, we are investigating the role of caveolae and shear stress in cholesterol homeostasis in human endothelial cells.
Key publications

Year of publication 2016

Glycosylation-Dependent IFN-γR Partitioning in Lipid and Actin Nanodomains Is Critical for JAK Activation. 

Spatiotemporal control of interferon-induced JAK/STAT signalling and gene transcription by the retromer complex. 
*Nature communications* : 13476 : [DOI: 10.1038/ncomms13476]

Glycosylation-Dependent IFN-γR Partitioning in Lipid and Actin Nanodomains Is Critical for JAK Activation. 
*Cell* : 920-34 : [DOI: 10.1016/j.cell.2016.07.003]

Year of publication 2015

Endophilin-A2 functions in membrane scission in clathrin-independent endocytosis. 

Year of publication 2013

Emmanuelle Girard, Daniela Chmiest, Natalie Fournier, Ludger Johannes, Jean-Louis Paul, Benoît Vedie, Christophe Lamaze (2013 Sep 17) 
Rab7 is functionally required for selective cargo sorting at the early endosome. 
*Traffic (Copenhagen, Denmark)* : 309-26 : [DOI: 10.1111/tra.12143]