Biomechanics and architecture of unsupported and biomimetic lipid membranes: insights on geometrical constrains and lipid chemistry

Alessandra Griffo*[1], Carola Sparn[2], Fabio Lolicato[2], Friederike Nolle[1], Navid Kangholi[1], J. Baptiste Fleury[1], Ralf Seemann[1], Walter Nickel[2], Hendrik Hähl[1]*

[1]*Department of Experimental Physics, Saarland University, Saarbrücken, Germany*
[2]*Heidelberg University Biochemistry Center, Heidelberg, Germany*

The creation of model lipid membranes as free-standing platforms to study processes occurring across the cellular membrane has been so far a field of remarkable interest [1]. Such a design enables studies without drastically modifying the physico-chemical properties and the dynamic nature of lipid bilayers compared to cells. Starting from the pore spanning membrane technology to produce unsupported membranes, we developed a platform for atomic force microscopy and spectroscopy investigation and propose this platform as model setup for systematic studies. The mechanical parameters Young's modulus, packing density and bilayer tension are assessed and morphological features are imaged with regard to the influence of cholesterol and sphingomyelin for lipids of natural origin in a composition mimicking the plasma membrane. In addition, preliminary investigations in presence of proteins are also reported.

[1] Janshoff, A. & Steinem, C. Biochim. Biophys. Acta BBA - Mol. Cell Res. 1853, 2977–2983 (2015)