Optogenetically regulated biomaterials: novel microenvironments for studies in mechanotransduction

Shrikrishnan Sankaran,[1] Shifang Zhao,[1] Christina Muth,[1] Julieta Paez,[1] Aranzazu del Campo[1,2]

[1]*Dynamic Biomaterials, INM – Leibniz Institute for New Materials, Campus D2 2, 66123 Saarbrücken, Germany*

[2]*Chemistry Department, Saarland University, 66123 Saarbrücken, Germany*

Cells sense, translate and react to mechanical stimuli from their microenvironment by linking specific membrane receptors and cytoskeletal structures to the extracellular matrix and neighboring cells. To study such phenomena, artificial interfaces displaying receptor-specific ligands have been developed.[1] A recent unique approach explores the concept of "living biointerfaces" involving genetically programmed prokaryotes to dynamically display relevant ligands involved in mechanotransductive cellular processes. Seminal studies have successfully demonstrated this principle using non-pathogenic *L. lactis* bacteria.[2] I will present a novel optogenetically regulated living biomaterials platform that enables to control, *in situ*, the presentation of receptor-specific ligands on a living biointerface using light. It is based on a special endotoxin-free strain of the most extensively engineered prokaryote, *E. coli.,* genetically engineered to display a mammalian cell-adhesive ligand on its surface upon mild illumination. This platform is developed as a powerful academic tool to activate and regulate mechanotransduction processes.

[1] Lee, T.T. et al. Nature Materials, 14, 352–360 (2015).
[2] Hay, J.J. et al. Scientific Reports, 6, 21809 (2016).