JOHANNES KEPLER
UNIVERSITÄT LINZ

PHYSIKKOLLOQUIUM
Fachbereich für Physik

Im Rahmen des Physikkolloquiums spricht

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über

Protein dynamics at the membrane interface

Biological membranes provide a protective barrier around cells and regulate the flux of materials that may pass into the cell interior from the extracellular space or vice versa. Many biological processes occur at these interfaces, as their reduced dimensionality compared to the 3-dimensional space makes them ideal platforms for the interaction of lipids, integral/peripheral membrane proteins and soluble proteins. I have dedicated my research of the past few years to the exploration of the molecular origins of important biological processes that occur at these interfaces, by utilizing a set of biophysical methods, in particular high-speed atomic force microscopy, quartz crystal microbalance, surface plasmon resonance, single molecule force spectroscopy, and computational modelling. The combination of these methods allowed us to gain novel insights into multivalent molecular interactions that initiate processes such as protein translocation through the bacterial plasma membrane[1], and the dynamic interplay of antibodies and complement proteins on antigenic membranes that lead to pathogen opsonization[2], and antibody-mediated complement activation[3]. Along the way, my group developed a method to determine the flexibility of individual membrane protein moieties[4], a novel support strategy for studying membrane proteins[5], and a tunable model system for studying antibody mediated effector functions compatible with various surfaces analytical techniques[6].
In this colloquium, I will give an overview on these achievements as well as a brief outlook on ongoing and future projects conducted in my research group.

1. Winkler, K. *et al.* Interaction of the motor protein SecA and the bacterial protein translocation channel SecYEG in the absence of ATP. *Nanoscale Adv.* **2**, 3431–3443 (2020).
2. Preiner, J. *et al.* IgGs are made for walking on bacterial and viral surfaces. *Nat. Commun.* **5**, (2014).
3. Strasser, J. *et al.* Unraveling the Macromolecular Pathways of IgG Oligomerization and Complement Activation on Antigenic Surfaces. *Nano Lett.* **19**, 4787–4796 (2019).
4. Preiner, J. *et al.* High-speed AFM images of thermal motion provide stiffness map of interfacial membrane protein moieties. *Nano Lett* **15**, 759–763 (2014).
5. Karner, A. *et al.* Tuning membrane protein mobility by confinement into nanodomains. *Nat. Nanotechnol.* **12**, 260–266 (2017).
6. Strasser, J. *et al.* Weak Fragment Crystalizable (Fc) Domain Interactions Drive the Dynamic Assembly of IgG Oligomers upon Antigen Recognition. *ACS Nano* **14**, 2739–2750 (2020).

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