

EINLADUNG

zum Vortrag
von

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Single molecular force spectroscopy and recognition imaging: applications in biology and medicine

am Dienstag, 14. Mai 2019, um 17:30 Uhr

Ort: Lise-Meitner-Hörsaal, Fakultät für Physik, Universität Wien,
1090 Wien, Strudlhofgasse 4 / Boltzmannngasse 5, 1. Stock

Barrierefreier Zugang: Boltzmannngasse 5, Lift, 1. Stock rechts über den Gang zum Hintereingang des Hörsaals

Abstract

In molecular recognition force microscopy (MRFM), ligands are covalently attached to atomic force microscopy tips for the molecular recognition of their cognitive receptors on probe surfaces¹. Interaction forces between single receptor-ligand pairs are measured in force-distance cycles. The dynamics of the experiment is varied², which gives insight into the molecular dynamics of the receptor-ligand recognition process and yields information about the binding pocket, binding energy barriers, and kinetic reaction rates³. Combination of high-resolution atomic force microscope topography imaging with single molecule force spectroscopy provides a unique possibility for the localization of specific molecular recognition events⁴. The identification and visualization of receptor binding sites on complex heterogeneous bio-surfaces such as cells and membranes are of particular interest in this context⁴. Considered as the paradigm for molecular recognition are antibodies. They are key molecules for the immune system of vertebrates. The Y-shaped antibody type IgG exhibits C2-symmetry; its Fc stem is connected to two identical Fab arms, binding antigens by acting as molecular callipers. Bivalent binding of the two Fab arms to adjacent antigens can only occur within a distance of roughly 6 to 12 nm. AFM cantilevers adorned with an antibody can measure the distances between 5-methylcytidine bases in individual DNA strands with a resolution of 4Å, thereby revealing the DNA methylation pattern⁶, which has an important role in the epigenetic control of gene expression. Moreover, due to their nano-mechanical properties antibodies exhibit "bipedal" walking on antigenic surfaces⁷. The walking speed depends on the lateral spacing and symmetry of the antigens. Importantly, the collision between randomly walking antibodies was seen to reduce their motional freedom. It leads to formation of transient assemblies, which are known to be nucleation sites for docking of the complement system and/or phagocytes as an important initial step in the immune cascade.

1.Hinterdorfer, P. *et al.* Proc. Natl. Acad. Sci. USA 93, 3477 (1996)

2.Hinterdorfer, P. *et al.* Nature Methods 5, 347 (2006)

3.Kienberger, F. *et al.* Acc. Chem. Res. 39, 29 (2006)

4.Preiner, J. *et al.* Nanotechnology 20, 215103 (2009)

5.Chtcheglova, L.A. *et al.* Biophys J. 93, L11 (2007)

6.Zhu, R. *et al.* Nature Nanotech. 5, 788 (2010)

7.Preiner, J. *et al.* Nature Communications 5:4394 | DOI: 10.1038/ncomms5394 (2014)

Kaffee und Getränke werden bereitgestellt

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