CeMI (Center for Meso-Bio Single-Molecule Imaging @ iCeMS)

The 46th iCeMS SEMINAR

CeMI Seminar Series 14

Wed 3 Mar 2010

10:30-11:30

Lecturer: **Yoko Yamakoshi, Ph.D**

Assistant Professor

Department of Radiology / Department of Chemistry

University of Pennsylvania, U. S. A.

Synthetic Chemistry for AFM Tip Modification and Biological Applications

Venue: 2nd floor Seminar Room (#A207)
Main Building iCeMS Complex 1
Kyoto University

Contact: iCeMS Harada Lab at harada-g@icems.kyoto-u.ac.jp
Hosted by: iCeMS (Institute for Integrated Cell-Material Sciences), Kyoto University

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Abstract of the seminar by Dr. Yamakoshi on Mar. 3.

Tripod-shaped molecules were designed for chemical modification of the surface of probes used for atomic force microscopy (AFM). These chemically functionalized tips were used for chemical force spectroscopy (CFS) measurements of the ligand-protein receptor interaction in a biotin-NeutrAvidin model system. We demonstrate that by using this unique tripodal system, we can achieve significantly lower density of ligand on the AFM tip apex, which is optimal for true single molecule measurements. Furthermore, the molecular tripods form highly stable bonds to the AFM probes, leading to more robust and reproducible unbinding force data, thereby addressing one of the challenges in CFS studies. Histogram analysis of the hundreds of collected unbinding forces showed a specific distribution with a peak force maximum at ~165 pN, in good agreement with the previously reported data of single rupture events of biotin-avidin. We compared these molecular tripod tips with molecular monopod. The results showed that the molecular tripods are more robust for repeated measurements. The distinct biotin-avidin force maximum was not observed in the control experiments. This indicated that the force distribution observed for molecular tripods corresponds to the specific rupture force between biotin and avidin. The improved robustness of molecular tripods for CFS will provide benefits in other ligand-receptor unbinding studies, including those of transmembrane receptor systems, which require high resolution, sensitivity, and reproducibility in force spectroscopy measurements.

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