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3-Arm Recognition Head for Linking Affinity Molecules

Atomic force microscopy is a surface imaging technique which has evolved into a unique molecular tool for a host of nanobiotechnology applications. The ability of AFM to sense proteins and other chemical entities is continually being improved by the advancement of new and superior functionalized tips. Often, biochemical research requires the simultaneous identification of colocated factors, which isn't possible with current AFM systems. Unlike other imaging and microscopy platforms, AFM based imaging lacks multiplexing capacity for detecting multiple targets in a single test. The biggest challenge is in attaching two different affinity molecules to the AFM tip such that they interact with their respective targets with an equal probability.

Researchers at the Biodesign Institute of Arizona State University have developed a novel 3-arm linker/recognition head for linking affinity molecules. This linker can be connected to AFM tips to enable multiplex recognition imaging of multiple protein biomarkers. It can also be used as a chemical scaffold for peptide aptamers. Another potential use is as a chemical mimic of bi-specific antibodies for targeting and drug delivery. These linkers when tested, required only 2-3 μ l of protein solution with a concentration of \sim 2 ng/mL for detection.

This new linker enables the use of AFM for multiplex recognition imaging for detection of multiple proteins in a single test.

Potential Applications

- Linker for AFM tips
 - o Diagnostics
 - o Mapping antigen molecules
 - o Epigenomics for determination of DNA methylation patterns
 - o Detecting low-abundance proteins in a biological sample
 - o Analysis of proteins in multisubunit complexes, such as nucleosomes
- Chemical scaffold for peptide aptamers

- Chemical mimic of bi-specific antibodies for targeting and drug delivery

Benefits and Advantages

- Sensitive detection –single molecule level
- One step synthesis
- High yield conjugation reactions
- Easy to scale up for manufacture

Benefits and Advantages

- Streamlining microarray spotting and detection into a single instrument
- Simpler, faster and more accurate results Ultra-low volume nanodroplet-based analysis of high density microarrays
- Flexible and multiplexed M x N label-free protein interaction kinetic analysis in real time
- Cell-based microarray analyses with single cell resolution
- Low consumption of sample volume
- Enables measurement of membrane protein interaction kinetics in their native cellular environment
- Affinity index between 0.02 and 1, so as to have a balanced influence of the linker effect

For more information about the inventor(s) and their research, please see Dr. Lindsay's directory webpage