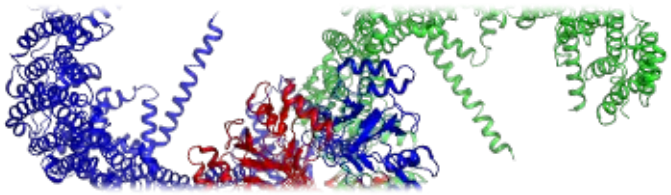

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67th Biophysical Society Annual Meeting
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SAN DIEGO
CALIFORNIA, USA

Monday, February 20
11:30 AM – 1:00 PM
Room 9
axiVEND – iRiS Kinetics

Accurate Binding Kinetics For Biological Nanoparticle Analytes

Accurate characterization of kinetic interactions between biological ligands and analytes is crucial for research in diagnostics and therapeutics. Application areas of label-free kinetics are broad – ranging from drug and antibody screening to characterization of viral carriers for gene therapy and vaccine development. For these diverse applications, the size of biological analytes has a size range spanning many orders of magnitude. Label-free sensing platforms and sensor chips are often optimized for the type of analyte target, for example, Surface Plasmon Resonance (SPR) sensors have thickness and density of the surface hydrogel chemistry optimized for detection of analytes based on their molecular weights. Here, we present a sensor platform that provides accurate binding characterization of broad range of analytes and combines label-free detection of ensembles and single particles on a single reader instrument.

Interferometric reflectance imaging sensor (IRIS) technology is based on interference of light from an optically transparent thin film—the same phenomenon that gives rainbow colors to a soap film when illuminated by white light. IRIS has two modalities: (i) low-magnification (ensemble biomolecular mass measurements) allowing for multiplexed affinity measurements and (ii) high-magnification (digital detection of individual nanoparticles). Single particle IRIS has been demonstrated for multiplexed detection and characterization of individual biological nanoparticles (BNP) such as extra-cellular vesicles and virions in complex samples using disposable cartridges. Low magnification IRIS offers large field of view and ability to simultaneously quantify binding of analytes to highly multiplexed probe molecules arrayed on the sensor surface. However, accurate characterization of large analytes (50-150nm size) presents challenges due to non-linearity of the optical interference signal with surface binding of sparse BNP analytes. We have recently demonstrated that the affinity of large analytes (extracellular vesicles) can be characterized, qualitatively, on IRIS chips benefiting from IRIS' capability of uniform illumination at different wavelengths.

In this presentation, we will discuss how the improved IRIS platform can bridge the gap between single-particle detection ('digital' configuration) and ensemble reflectance measurements ('analog' configuration), creating a new 'hybrid' system (h-IRIS), providing a substantial improvement in sensitivity, improving the limit of detection by nearly three orders of magnitude. This new hybrid configuration of IRIS combines the advantageous features of high-magnification and low-magnifications modalities. Unique capability of the IRIS platform to conduct kinetic binding measurements of individual analytes has been also demonstrated for antibody characterization and a novel competition assay for therapeutic antibodies for viral infections. We believe that the scientific community will greatly benefit from our approach of combining SP-IRIS platform and use of whole virus particles for obtaining competition information for monoclonal antibodies.

Speaker

Selim Unlu, Distinguished Professor, Boston University