UNIVERSITY OF CENTRAL FLORIDA

NANOSCIENCE TECHNOLOGY CENTER
ADVANCED MATERIALS PROCESSING & ANALYSIS CENTER

GRADUATE RESEARCH SEMINAR SERIES

Friday
November 4, 2016

12:15 PM

Research Pavilion
NSTC
Room 169

Pizza and drinks will be provided

D2Dx-From Diameter to Diagnostics: Gold Nanoparticle-Enabled Dynamic Light Scattering Assay for Early Stage Prostate Cancer Detection

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Gold nanoparticles (AuNPs) have been increasingly attracting substantial attention due to their unique optical properties and surface chemistry. Dynamic light scattering (DLS) is a routine analytical technique for measuring the hydrodynamic sizes of particles with diameters in the nanometer region. By combining the strong light scattering properties of gold nanoparticle probes with the size measurement capability of DLS, a new technique termed D2Dx (from diameter to diagnostics) for chemical and biological target detection and analysis was developed. Since D2Dx can provide rather low detection limit (pM-fM range) and excellent reproducibility, it has been so far successfully applied to quantitatively detect and analyze a wide range of chemical and biological targets, including proteins, DNAs, viruses, carbohydrates, small chemicals, toxic metal ions, food and environmental toxins. Prostate cancer (PCa) is the most common cancer and the second leading cause of cancer-related death in American men. Traditional screening tools like PSA (prostate specific antigen) test in combination with DRE (digital rectal exam) can be used to detect early stage prostate cancer. However, this test tends to cause over-diagnosis and over-treatment due to the inability of PSA to differentiate aggressive tumors from low -risk ones, further resulting in unnecessarily invasive biopsies and additional adverse complications. In the current work, we are aiming to develop a novel D2Dx-based screening tool for early stage prostate cancer detection. By analyzing the molecular composition of the protein corona adsorbed from blood serum to the AuNPs surface, we discovered that the amount of human immunoglobulin G (IgG) adsorbed to the AuNP surface is higher for cancer patients compared to non-cancer controls during early stage prostate cancer. Preliminary studies conducted on blood serum samples collected at Florida Hospital and obtained from Prostate Cancer Biorespository Network (PCBN) suggested that the test has a 90−95% specificity and 50% sensitivity in detecting early stage prostate cancer, representing a significant improvement over the current PSA test (21% sensitivity). In this talk, I will first explain the principle of D2Dx and its versatility for biomolecular detection and analysis. Subsequently, I will present the data on prostate cancer study and how D2Dx can be utilized for early stage cancer detection.