Nano Gap Sensor using Magnetic Beads for Tau protein to diagnose Neurodegenerative Disease such as Alzheimer's Disease in Blood

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Abstract

Enzyme-Linked Immunosorbent Assay (ELISA) is a prevalent immunoassay method, and most of the ELISA assays have a detection limit above the range of a few tens of pg/mL. However, some target biomolecules exist in a sample with very lower concentration range, the ELISA fails to detect these targets and cannot report meaningful information. Therefore, it is important to provide a highly-sensitive, reliable, low-cost detection method for early diagnosis and precise monitoring of a disease in blood. Many researchers have developed various types of bio sensors for use as immunoassay devices based on several principles, i.e., electrochemical principles, optical principles, and the principles of mechanical transducers. Electrochemical sensors are advantageous due to their inherent simplicity, low cost of fabrication, and reliability in detecting biomarkers. The electrochemical impedance spectroscopy (EIS) sensors measure changes in the electrical impedance spectrum generated by the interactions between biomarkers and receptors. The region for receptor immobilization is mostly on the surfaces of the electrodes or in the gaps between electrodes, and the changes in the electrical properties that are caused by the interactions between antibodies and antigen can be measured. In this seminar, new concept of electrochemical impedance spectroscopy (EIS) sensor is introduced and then, ultra-high sensitive magnetic beads based nanogap sensor to diagnose tau protein and tau post-translational modification (PTM) in blood as specific biomarkers for neurodegenerative diseases (NDD) such as Alzheimer's diseases will be presented.