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Microfluidic-based multiplexed optical biosensor for the detection of prostate cancer biomarkers using gold nanomaterials

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Prostate Cancer (PCa) is the third most common cancer in men worldwide. In the US, it is the most frequently diagnosed cancer and the second leading cause of death in men. In clinic, PCa could be diagnosed by digital rectal inspection, computed tomography (CT) scan, magnetic resonance imaging (MRI), and biomarkers assay. To date, prostate-specific antigen (PSA) is the best serum marker available in blood for the clinical detection of PCa, and serum values above 4.0 ng/mL are considered abnormal. Furthermore, the vascular endothelial growth factor (VEGF) also plays an important role in the progressed cancers. The VEGF will be also over expressed in the blood of patients who suffered PCa. At present, most assays for PSA and VEGF detection are based on conventional immunodetection methods, including the enzyme-linked immunosorbent assay (ELISA) and electrochemical immunoassays. ELISA involves sequential binding of two antibodies to each specific antigen epitope and repeated washing steps to measure the concentration of PSA and VEGF; this makes it prone to error, relatively time-consuming, and expensive. Thus, there is an urgent need to develop the simultaneous multi-markers assay for the early and accurate detection of PCa. In this study, we developed one-chip multiplexed microfluidic-based optical biosensor, which can detect the concentrations of PSA and VEGF simultaneously with faster detection rate and higher accuracy. In this design, different shapes of gold nanomaterials were used to label with anti-PSA and anti-VEGF as bio-recognizers in two working spaces, respectively, for sensitive optical bio-sensing. Our preliminary data showed that the microfluidic sensing device can effectively catch the PSA and VEGF in the human blood for early diagnosis of PCa with high sensitivity, specificity, low-cost, and faster rate.

Biography

Lung-Hsuan Pan is currently an MS student in Institute of Medical Science and Technology at National Sun Yat-sen University, Taiwan. He received his BS degree in Animal Science from National Pingtung University of Science and Technology, in 2014. His current research topic focuses on the design and fabrication of smart nanomaterials and microfluidic-based biosensor for cancer diagnosis.

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