Seung Yeon Park et al., J Biosens Bioelectron 2015, 6:3
http://dx.doi.org/10.4172/2155-6210.C1.025

OMICS International
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4th International Conference and Exhibition on
Biosensors & Bioelectronics
September 28-30, 2015 Atlanta, USA

Application of gold nanoparticles immobilized with antibodies for the detection of their cognate TGF-β or EGF

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Various approaches have been developed to recognize diagnostic biomarkers and subsequently transduce their detection into readouts such as an electrical or an optical signal. Antibody (Ab) can tightly bind to antigen (Ag) with specificity. Gold nanoparticle scan exert optical properties due to the Localized Surface Plasmon Resonance (LSPR), showing a SPR band around 520 nm, a band shift and a band broadening depending on the size and shape of particles. By converging molecular recognition and signal transduction, we designed a micro-cuvette coated with nanoparticle, which is immobilized with an Ab specific to TGF-β or EGF, and then evaluated their bindings by changes in color when TGF-β or EGF proteins bound to its corresponding Ab. The results showed that the increases in absorbance were proportional to the TGF-β or EGF concentrations over 0-2000 pg/ml or 0-500 pg/ml, respectively, indicating that the physical interaction of Ag-Ab can be transduced into optical changes. In contrast, the use of p53 as an irrelevant control did not affect the optical signals of nanoparticles coated with either anti-TGF or anti-EGF. This innovative detection method was very reproducible and robust. Moreover, it was more rapid, and sensitive with a lower limit of detection and a higher specificity when compared with other conventional methods. Taken together, gold nanoparticle-based colorimetric assay can provide platform technology for the direct detection of a variety of biomolecules in a micro-plate or biosensor format. Furthermore, this system can take advantage of monitoring protein-protein interaction, thereby offering a powerful tool for studying the molecular dynamics.

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