Contribution ID: **279** Type: **Oral presentation**

Free human Chorionic Gonadotropin beta (hCGβ) detection of The Triple Test for Down's syndrome screening in maternal serum using Surface Plasmon Resonance Technique (SPR)

Wednesday, 20 May 2015 16:15 (15 minutes)

It is well-known that the principle of surface plasmon resonance (SPR) based sensing is based on the detection of a small refractive index change on a thin metal film caused by complex formation between biomolecules such as antigen–antibody complexes. Therefore, the SPR-based immunoassay has often been employed to extend its application to the clinical diagnosis for the detection of biomarkers in low concentration in human blood with accurate and rapid results. In this study, SPR technique was used to detect free human Chorionic Gonadotropin beta (hCGβ) level in pregnancy serum that is one of the major markers for Down's syndrome screening. The detection limit that should be detected for Down's syndrome is at the nanogram level that it is necessary for clinical diagnosis. The platform as sandwich immunoassay used three types of antibody, monoclonal anti hCGβ antibody as primary antibody, polyclonal anti hCGβ antibody as secondary antibody and gold nanoparticles conjugated polyclonal anti IgG as third antibody for signal enhancement. Those antibodies were performed on a carboxymethyl dextran sensor chip. An optimum condition of antibody immobilization on dextran surface was obtained by using antibody with concentration of 20 μg/mL prepared in an acetate buffer solution at pH 4. Under the above condition, relatively high intensity of SPR signal was achieved in comparison to those obtained at other pH (3, 5 and 6). This SPR based sensor showed that the detection limit was at 30 ng/mL of concentration. Moreover, the hCGβ detection in maternal serum samples without non-specific absorption of other proteins in matrix was succeeded at 1/50 dilution.

References: J. Homola, Present and future of surface plasmon resonance biosensors, 2003, 377, 528–539.

Summary

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Session Classification: Biological Physics and Biomedical Engineering (Sponsored by MTEC)

Track Classification: Biological Physics and Biomedical Engineering