Efficient signal enhancement of surface plasmon resonance by using functionalized gold nanoparticles

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Surface plasmon resonance (SPR) is a general method for the detection of chemical and/or biological interactions including protein-protein interactions, occurring at the surface of a thin noble metal film. Among the various signal amplification strategies, SPR signal enhancement using gold nanoparticles (AuNPs) is a challenging yet feasible task for implementation. By using a sandwich ELISA as a model system, we analyzed the SPR signal enhancement effect of AuNPs. AuNPs are employed by streptavidin-biotin conjugation to the secondary antibody, reducing the steric hindrance. With a low density immobilization of primary antibody, we obtained a quasi-linear relationship between the resonance unit (RU) and antigen concentration. Furthermore, a direct correlation between the RU signal and the secondary antibody concentration was obtained. At the maximum binding state, AuNPs-conjugated secondary antibody signal was ca. 1.5 fold higher than the unmodified secondary antibody. This lower-than-expected enhancement was probably due to the fact the AuNPs were not effectively conjugated to the N-terminus of the antibody, which might have been shielded inside the lipid layer surrounding the antibody.