291e Designing Silver-Enhnaced Nanoparticle Based Immunoassays for Antigen/Antibody Detection

Shalini Gupta, Sabil Huda, Orlin D. Velev, and Peter K. Kilpatrick

Silver enhanced immunoassays provide a simple, low-cost and effective way of detecting antigens in dilute solutions, and could be directly interfaced to on-chip electrodes for electrical readout of the result. We developed and characterized bioassays for low concentrations of antigens and antibodies using gold nanoparticle tagging and silver-enhancement technique. Goat-anti-mouse immunoglobulin (GAM IgG) was immobilized on two different substrates and incubated consecutively with mouse (M) IgG and gold-conjugated-GAM (GAMg) IgG to form a selective GAM-M-GAMg sandwich assembly. Silver ionic solutions were then added to enhance the bound gold colloids. The silver solutions deposit a layer of metal on the bound nanoparticles by reduction. The darkness of the positive spots was measured quantitatively by densitometry. The lower limit of detection was found to be 0.1 μg/mL. Negative and positive control experiments indicated that only sandwich assays possess high selectivity, while false positives may occur in direct assays. The role of mass-transfer was investigated, and a model was developed to optimize the bioassay by correlating the silver spot intensities to the concentration of mouse IgG and gold nanoparticle incubation times. The results could allow the development of more rapid and reliable immunoassays.