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Synthesis and Characterization of Antibody Conjugated Gold Nanoparticles for Medical Applications

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Abstract – Gold nanoparticles exhibits suitable optical, electronic and bonding properties for the development of nanobiomaterials exhibiting higher sensibility and selectivity for diagnostics and therapeutic than conventional methods. Accordingly, gold nanoparticles (AuNP) were labeled with monoclonal antibody immunoglobulin G (IgG), characterized by DLS, UV-Vis spectroscopy and scanning electron microscopy, and the interaction properties, stability and reactivity were studied.

In the last 15 years the field of molecular diagnostics[1] has witnessed an explosion of interest in the use of nanomaterials in different assays for many diseases. Intense research has been fueled by the need for practical, robust, and highly sensitive and selective detection agents that can address the deficiencies of conventional technologies.

The integration of nanoparticles, which exhibit unique optical, electronic and photonic, such as size-controlled plasmon absorbance, with biomaterials[2], which display unique recognition, catalytic, and inhibition properties, yields novel hybrid nanobiomaterials with synergetic properties and functions.

AuNPs were synthesized by reducing tetrachloroauric acid with trisodium citrate, a method pioneered by Turkevich et al[3]. Briefly, 100 mL of 0.01% $HAuCl_4$ solution was boiled under vigorous stirring, and 3 mL of a trisodium citrate solution (1%) was rapidly added to the boiling solution. When the solution turned deep red, indicating the formation of AuNps, the solution was left stirring and cooling until room temperature.

Monoclonal antibodies were obtained by the fusion of P3U1 myeloma cell line with spleen cells removed from mice immunized with a recombinant protein from *Trypanosoma cruzi* (Tc-85). IgG was purified from cultured cells by affinity chromatography (protein A-Sepharose).

The nanocomposite was prepared by spontaneous adsorption of protein on AuNP surface and its interaction, stability and reactivity was examined by UV-Vis spectroscopy, dynamic light scattering (DLS) (**Figure 3**)and scanning electron microscopy (SEM) (**Figure 1** and **2**). Bovine serum albumin (BSA) was used for initial tests, being manipulated just later the IgG, when were already clear the system conditions and proportions among reagents of nanocomposite.

The nanobiocomposite is being exploited for the preparation of immunonanosensors and diagnostics, targeting and therapeutic use of plasmon induced heating of AuNPs, and development of immunoassays systems with high sensibility and specificity.

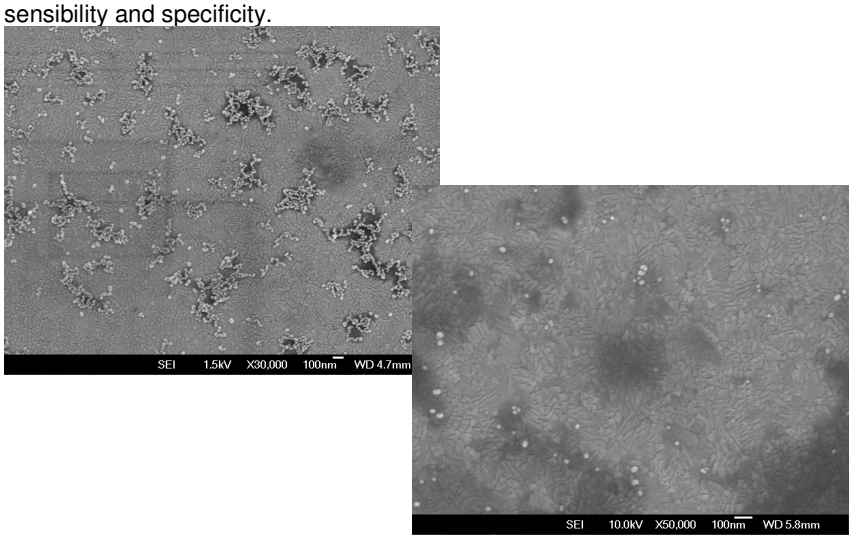

Figure 1. Scanning electron microscopy (SEM) of albumin (BSA) conjugated gold nanoparticle (AuNP) synthesized by 1mL of AuNP suspension and 0,15mL of 10ug/mL BSA aqueous solution.

Figure 2. SEM of antibody (IgG) conjugated gold nanoparticle (AuNP) synthesized by 1mL of AuNP suspension and 0,15mL of 10ug/mL IgG aqueous solution.

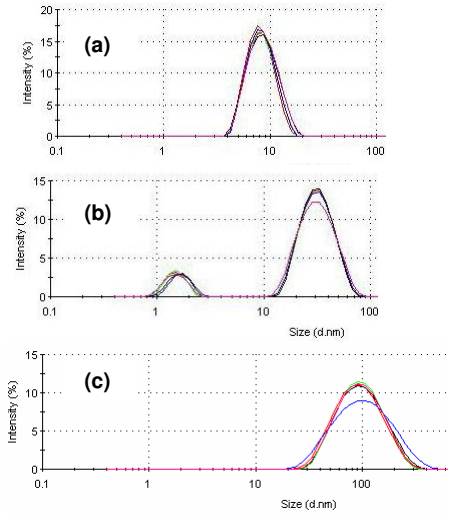

Figure 3. Size intensity distribution by dynamic light scattering of (a) bovine serum albumin (BSA), (b) gold nanoparticle (AuNP), and (c) AuNP-BSA nanobiocomposite.

References

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