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Abstract

Comparative Assessment of Gold Nanoparticle–Antibody Conjugates with Two Differently Shaped Particles for Multimodal Colorimetric Lateral Flow Assay †

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† Presented at the XXXV EUROSENSORS Conference, Lecce, Italy, 10–13 September 2023.

Keywords: point-of-care testing; LSPR; immunochromatography; bioconjugation

Novel detection strategies that exploit the unique properties of gold nanoparticles (AuNPs) hold great potential for the advancement of point-of-care (POC) diagnostics, such as lateral flow and dipstick immunoassay [1–3]. Owing to its biocompatibility and convenient surface modifications, gold nanoparticles with enhanced sensitivity reduce the sample-to-answer times to less than 5 min (Figure 1). Methods like covalent conjugation and electrostatic adsorption are explored for antibody immobilization to develop a gold nanoparticle-based biosensor for fast and sensitive localized surface plasmon resonance (LSPR) for both basic research and clinical diagnostics. The mounting of antibodies on the gold nanoparticle surface requires selective binding conditions such as pH, a concentration of gold nanoparticles, an antibody-to-gold nanoparticle ratio, and the surface chemistry of AuNPs [2,3]. Gold nanostars and spherical gold nanoparticles were taken to develop the probe. Herein, we investigated all the possible optimizations by varying the pH and concentration of antibody and gold nanoparticles to prepare a stable conjugate of Ab-AuNP. The stability of gold nanoparticles was examined in an alkaline environment with a salt concentration from 20 to 400 mM. The pH ranges for conjugation of antibodies—AuNP was evaluated from 7, 7.5, 8, 8.5, and 9 with different concentrations of antibodies, i.e., from 4 to 100 µg/mL. DLS and UV-Vis's spectroscopy were employed to optimize the change in hydrodynamic size, zeta potential, and spectra of conjugated AuNPs [1]. The gold nanoparticle antibody conjugates were around 50–80 nm in size. Detailed morphological analysis of the conjugates was performed using a TEM microscope. The results provide additional insight into antibody–nanoparticle interactions and give a mechanism to regulate the interface that could improve conjugate function.

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Citation: Sharma, V.; Javed, B.; Tian, F. Comparative Assessment of Gold Nanoparticle–Antibody Conjugates with Two Differently Shaped Particles for Multimodal Colorimetric Lateral Flow Assay. *Proceedings* **2024**, *97*, 78. https://doi.org/proceedings2024097078

Academic Editors: Pietro Siciliano and Luca Francioso

Published: 21 March 2024

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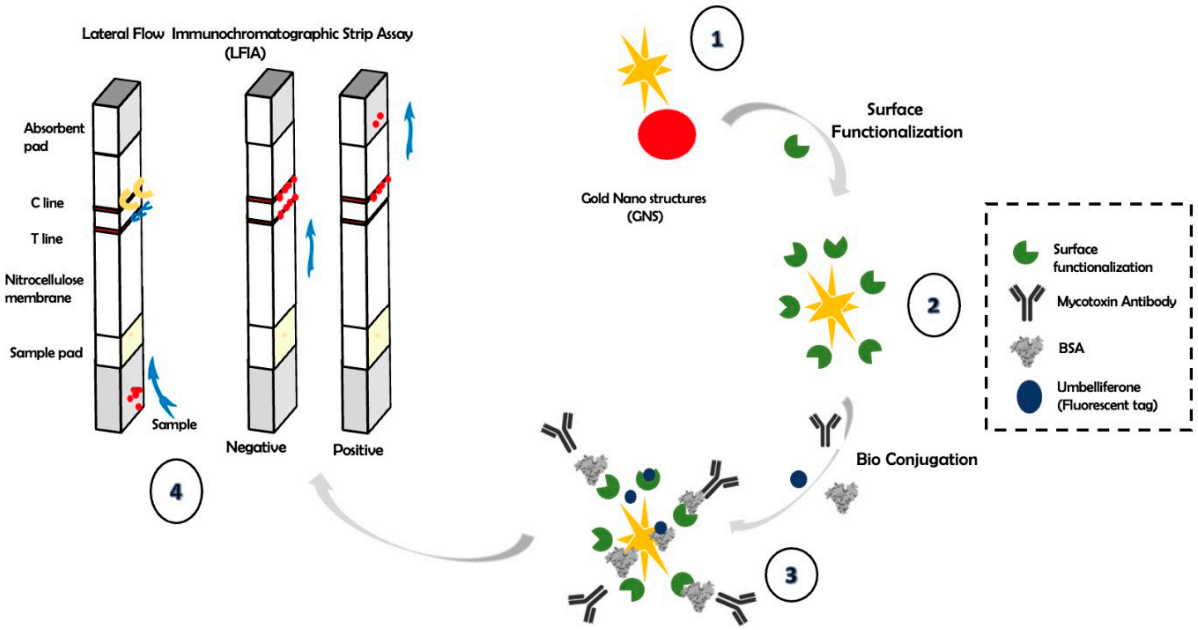

Figure 1. Gold nanoparticle based lateral flow assay for the detection of mycotoxins in food samples.

Author Contributions: Conceptualization, V.S. and F.T.; methodology, V.S. and F.T.; software, V.S.; validation, V.S., B.J. and F.T.; formal analysis, V.S.; investigation, V.S. and B.J.; resources, F.T.; data curation, V.S.; writing—original draft preparation, V.S.; writing—review and editing, V.S., B.J. and F.T.; visualization, V.S.; supervision, F.T.; project administration, F.T.; funding acquisition, F.T. All authors have read and agreed to the published version of the manuscript.

Funding: Irish Research Council (IRC) SCHOLARSHIP.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Data are unavailable.

Conflicts of Interest: The authors declare no conflicts of interest.

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