

## Electrochemical Biosensor Based on Chitosan-Gold Nanoparticles, Carbon Nanotubes for Detection of Ovarian Cancer Biomarker

**Authors :** Parvin Samadi Pakchin, Reza Saber, Hossein Ghanbari, Yadollah Omid

**Abstract :** Ovarian cancer is one of the leading cause of mortality among the gynecological malignancies, and it remains the one of the most prevalent cancer in females worldwide. Tumor markers are biochemical molecules in blood or tissues which can indicates cancers occurrence in the human body. So, the sensitive and specific detection of cancer markers typically recruited for diagnosing and evaluating cancers. Recently extensive research efforts are underway to achieve a simple, inexpensive and accurate device for detection of cancer biomarkers. Compared with conventional immunoassay techniques, electrochemical immunosensors are of great interest, because they are specific, simple, inexpensive, easy to handling and miniaturization. Moreover, in the past decade nanotechnology has played a crucial role in the development of biosensors. In this study, a signal-off electrochemical immunosensor for the detection of CA125 antigen has been developed using chitosan-gold nanoparticles (CS-AuNP) and multi-wall carbon nanotubes (MWCNT) composites. Toluidine blue (TB) is used as redox probe which is immobilized on the electrode surface. CS-AuNP is synthesized by a simple one step method that HAuCl<sub>4</sub> is reduced by NH<sub>2</sub> groups of chitosan. The CS-AuNP-MWCNT modified electrode has shown excellent electrochemical performance compared with bare Au electrode. MWCNTs and AuNPs increased electrochemical conductivity and accelerate electrons transfer between solution and electrode surface while excessive amine groups on chitosan lead to the effective loading of the biological material (CA125 antibody) and TB on the electrode surface. The electrochemical, immobilization and sensing properties CS-AuNP-MWCNT-TB modified electrodes are characterized by cyclic voltammetry, electrochemical impedance spectroscopy, differential pulse voltammetry and square wave voltammetry with Fe(CN)<sub>6</sub><sup>3-/4-</sup> as an electrochemical redox indicator.

**Keywords :** signal-off electrochemical biosensor, CA125, ovarian cancer, chitosan-gold nanoparticles

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