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Ultrasensitive immunosensor platform for TNF- α cytokine detection using magnetic nanoparticles film electrodes in human saliva

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We report in this work, the synthesis and characterization of a novel immunosensor based a screen-printed gold electrode (SPEAu) modified with a new structure of iron magnetic nanoparticles coated with poly (pyrrole-co-pyrrole-2-carboxylic acid, Py-Py-COOH) (Py/Py-COOH/MNP) particles to increase the immunosensor sensitivity of Tumor Necrosis Factor- α (TNF- α). TNF- α antibodies were covalently bonded to Py/Py-COOH/MNP modified SPEAu. A sandwich-type detection strategy was then employed for antigen (Ag-TNF- α) detection through the labeled conjugate antibody (Ab-TNF- α -HRP) activity in a TMB solution. Finally, the chronoamperometry technique was applied to characterize the modified SPEAu. The use of a conjugate antibody anti-TNF- α labeled with horseradish peroxidase (Ab-TNF- α -HRP) was investigated using tetramethylbenzidine (TMB) substrate as an electrochemical substrate. The modified screen-printed gold electrode (SPEAu) was characterized for the first time, using atomic force microscopic (AFM) and scanning electron microscopy (SEM). The specificity of the immunosensor was then investigated under the optimal experimental conditions by analyzing aqueous solutions containing possible interferences represented by other salivary cytokines secreted in the acute stage of inflammation, such as interleukin-6 (IL-6) and interleukin-10 (IL-10). As there is a correlation between TNF- α and the severity of heart failure (HF), this new Immunosensor may represent a promising bioanalytical tool for the HF monitoring by saliva analysis. Moreover, the CA technique provides analyze in 10s for each concentration, which saves time and provides rapid data to doctors and clinicians.

Biography

Barhoumi Lassaad is a PhD student in Nanomaterials and Microsystems for Healthcare, Environment Monitoring and Energy (NANOMISENE) Laboratory, Centre for Research on Microelectronics and Nanotechnology CRMN, Technopark of Sousse, University of Sousse. He is engaged in the characterization of metal nanostructures and its application in sensing.

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