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A novel chronoamperometric immunosensor for rapid detection of cytokine TNF-α 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 (SPAuE) 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 immune-sensor 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). The developed immune-sensor showed good performances for Ag-TNF-α detection within the range of 1 pg mL-1 to 15 pg mL-1 of antigen TNF-α was determined at 1 pg mL-1. The present immune-sensor is this very promising for sensitive and rapid detection of antigen Ag-TNF-α in the clinical sample.

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