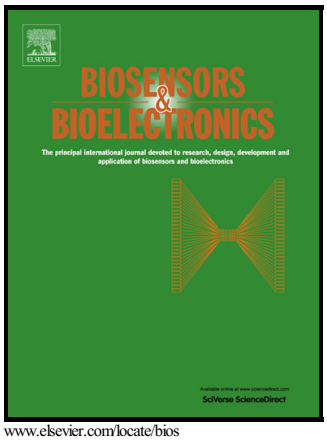

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Enzyme-triggered tyramine-enzyme repeats on prussian blue- gold hybrid nanostructures for highly sensitive electrochemical immunoassay of tissue polypeptide antigen

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ABSTRACT

A novel sandwich-type electrochemical immunoassay with sensitivity enhancement was developed for quantitative detection of tissue polypeptide antigen (TPA) by coupling with target-induced tyramine signal amplification on prussian blue-gold hybrid nanostructures. The immunosensor was prepared through immobilizing anti-TPA capture antibody on a cleaned screen-printed carbon electrode (SPCE). Prussian blue-gold hybrid nanostructures (PBGNS) labeled with horseradish peroxidase (HRP) and detection antibody were utilized as the signal-transduction tags. Upon target TPA introduction, the sandwiched immunocomplex was formed between capture antibody and detection antibody on the electrode. The carried HRP could trigger the formation of tyramine-HRP repeats on the PBGNS in the presence of H_2O_2. Using the doped prussian blue as the electron mediator, the conjugated HRP could catalyze the reduction of H_2O_2. Under the optimal conditions, the catalytic currents increased with the increasing target TPA in the dynamic range from 1.0 pg mL^{-1} to 100 ng mL^{-1} with a detection limit of 0.3 pg mL^{-1}. The reproducibility and specificity of the electrochemical immunoassay were acceptable. In addition, the contents of target TPA in nine human serum specimens were evaluated by using the developed electrochemical immunosensor, and the obtained results correlated well with those from commercially enzyme-linked immunosorbent assay (ELISA) method with a correlation coefficient of 0.9975.

Keywords: Tissue polypeptide antigen; Electrochemical immunoassay; Prussian blue-gold hybrid nanostructures; Tyramine signal amplification; Signal amplification

1. Introduction

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