Sarcosine oxidase composite screen-printed electrode for sarcosine determination in biological samples

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Prostate Cancer (PCa) is the most common form of cancer in men in Europe with a 61.4 % incidence among all cancer cases and a 12.1 % mortality [1] and, therefore, its early detection is fundamental for increasing the survival rate. Currently, diagnosis and management of patients with PCa is only based on the determination of the biomarker Prostate Specific Antigen (PSA). However, the method used for PCa detection has poor sensitivity and specificity, leading to false negative and false positive test results and many patients are sent to unnecessary biopsy procedures [2]. Therefore, there is a need to seek for new biomarkers and more effective screening. In this work, a biosensor device was developed for the quantification of sarcosine via electrochemical detection of H_2O_2 (at 0.6 V) generated from the catalyzed oxidation of sarcosine. The detection was carried out after the modification of carbon screen printed electrodes (SPEs) by immobilization of sarcosine oxidase (SOX) on the electrode surface. The strategies used herein included the activation of the carbon films by an electrochemical step and the formation of an NHS/EDAC layer to bond the enzyme to the electrode, the use of metallic or semiconductor nanoparticles layer previously or during the enzyme immobilization. In order to improve the sensor stability and selectivity a polymeric layer with extra enzyme content was further added. The proposed methodology for the detection of sarcosine allowed obtaining a limit of detection (LOD) of 1.6×10^{-5} mM, using a linear concentration range between 1×10^{-5} and 1×10^{-4} mM. The biosensor was successfully applied to the analysis of sarcosine in urine samples.

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