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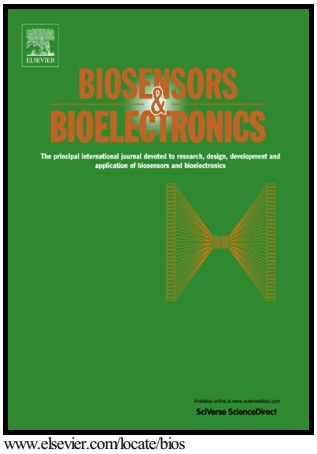

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Tear glucose detection combining microfluidic thread based device, amperometric biosensor and micro flow injection analysis

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Abstract

The tear glucose analysis is an important alternative for the indirect, simple and less invasive monitoring of blood glucose levels. However, the high cost and complex manufacturing process of tear glucose analyzers combined with the need to exchange the sensor after each analysis in the disposable tests prevent widespread application of the tear in glucose monitoring. Here, we present the integration of a biosensor made by the electropolymerization of poly(toluidine blue O) (PTB) and glucose oxidase (GOx) with an electroanalytical microfluidic device of easy assembly based on cotton threads, low cost materials and measurements by micro flow injection analysis (μFIA) through passive pumping for performing tear glucose analyses in a simple, rapid and inexpensive way. A high stability between the analyses (RSD = 2.54%) and among the different systems (RSD = 3.13%) was obtained for the determination of glucose, in addition to a wide linear range between 0.075 and 7.5 mmol L^{-1} and a limit of detection of 22.2 μmol L^{-1}. The proposed method was efficiently employed in the determination of tear glucose in non-diabetic volunteers, obtaining a close correlation with their blood glucose levels, simplifying and reducing the costs of the analyses, making the tear glucose monitoring more accessible for the population.

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