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Development of an electrochemical aptasensor for protein detection

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The development of aptamer-based electrochemical biosensors as an emerging technology has made the detection of small and macromolecular analytes easier, faster, and more suited for early detection of protein biomarkers. Biomarkers are produced by body organs or tumors and measure antigens on cell surfaces. When detected in high amounts in blood, they can be suggestive of tumor activity [1,2]. These markers are more often used to evaluate treatment effects or to assess the potential for metastatic disease in patients with established disease. Osteopontin (OPN) is a protein found in all body fluids, and constitutes a possible biomarker because its overexpression has been related with breast cancer evolution and metastasis [3–5]. Currently, biomarkers are commonly used for the development of diagnostic methods, allowing the detection of the disease in its initial stages. An electrochemical aptasensor for the detection of OPN was developed using an RNA aptamer immobilized on a gold screen-printed electrode (Au/SPE). The immobilized biotin-modified aptamer on Au/SPE constitutes the biorecognition element for the target protein and the electrochemical signal generated from the interaction aptamer-target protein was evaluated by cyclic voltammetry (CV). A decrease in the current as a consequence of protein binding to the aptamer was observed through the analysis of the electron flow produced by a redox reaction between ferri- and ferrocyanide. The electrochemical aptasensor herein developed presents a high specificity for OPN as compared with other proteins commonly found in the biological fluids.

Keywords: Osteopontin; aptamer; aptasensor; screen-printed electrode; cyclic voltammetry

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