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Development of an Electrochemical Aptasensor for the Detection of Human Osteopontin Protein

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Abstract : The emerging development of electrochemical aptasen sors has enabled the easy and fast detection of protein biomarkers in standard and real samples. Biomarkers are produced by body organs or tumours and provide a measure of antigens on cell surfaces. When detected in high amounts in blood, they can be suggestive of tumour activity. These biomarkers 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. Currently, biomarkers are commonly used for the development of diagnostic methods, allowing the detection of the disease in its initial stages. A previously described RNA aptamer was used in the current work to develop a simple and sensitive electrochemical aptasensor with high affinity for human OPN. The RNA aptamer was biotinylated and immobilized on a gold electrode by avidin-biotin interaction. The electrochemical signal generated from the aptamer–target molecule interaction was monitored electrochemically using cyclic voltammetry in the presence of [Fe (CN) 6]−3/− as a redox probe. The signal observed showed a current decrease due to the binding of OPN. The preliminary results showed that this aptasensor enables the detection of OPN in standard solutions, showing good selectivity towards the target in the presence of others interfering proteins such as bovine OPN and bovine serum albumin. The results gathered in the current work suggest that the proposed electrochemical aptasensor is a simple and sensitive detection tool for human OPN and so, may have future applications in cancer disease monitoring.

Keywords : osteopontin, aptamer, aptasensor, screen-printed electrode, cyclic voltammetry
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