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Dual Electrochemical Immunosensor for IL-13Rα2 and E-Cadherin Determination in Cell, Serum and Tissues from Cancer Patients

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Abstract : This work describes the development of a dual electrochemical immunosensing platform for accurate determination of two target proteins, IL-13 Receptor α2 (IL-13Rα2) and E-cadherin (E-cad). The proposed methodology is based on the use of sandwich immunosensing approaches (involving horseradish peroxidase-labeled detector antibodies) implemented onto magnetic microbeads (MBs) and amperometric transduction at screen-printed dual carbon electrodes (SPdCEs). The magnetic bioconjugates were captured onto SPdCEs and the amperometric transduction was performed using the H2O2/hydroquinone (HQ) system. Under optimal experimental conditions, the developed bio platform demonstrates linear concentration ranges of 1.0–25 and 5.0-100 ng mL-1, detection limits of 0.28 and 1.04 ng mL-1 for E-cad and IL-13Rα2, respectively, and excellent selectivity against other non-target proteins. The developed immuno-platform also offers a good reproducibility among amperometric responses provided by nine different sensors constructed in the same manner (Relative Standard Deviation values of 3.1% for E-cad and 4.3% for IL-13Rα2). Moreover, obtained results confirm the practical applicability of this bio-platform for the accurate determination of the endogenous levels of both extracellular receptors in colon cancer cells (both intact and lysed) with different metastatic potential and serum and tissues from patients diagnosed with colorectal cancer at different grades. Interesting features in terms of, simplicity, speed, portability and sample amount required to provide quantitative results, make this immuno-platform more compatible than conventional methodologies with the clinical diagnosis and prognosis at the point of care.

Keywords : electrochemistry, mmunosensors, biosensors, E-cadherin, IL-13 receptor α2, cancer colorectal
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