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# The Fabrication of Stress Sensing Based on Artificial Antibodies to Cortisol by Molecular Imprinted Polymer

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**Abstract :** Cortisol has been used as a well-known commercial stress biomarker. A homeostasis response to psychological stress is indicated by an increased level of cortisol produced in hypothalamus-pituitary-adrenal (HPA) axis. Chronic psychological stress contributing to the high level of cortisol relates to several health problems. In this study, the cortisol biosensor was fabricated that mimicked the natural receptors. The artificial antibodies were prepared using molecular imprinted polymer technique that can imitate the performance of natural anti-cortisol antibody with high stability. Cortisol-molecular imprinted polymer (cortisol-MIP) was obtained using the multi-step swelling and polymerization protocol with cortisol as a target molecule combining methacrylic acid:acrylamide (2:1) with bisacryloyl-1,2-dihydroxy-1,2-ethylenediamine and ethylenedioxy-N-methylamphetamine as cross-linkers. Cortisol-MIP was integrated to the sensor. It was coated on the disposable screen-printed carbon electrode (SPCE) for portable electrochemical analysis. The physical properties of Cortisol-MIP were characterized by means of electron microscope techniques. The binding characteristics were evaluated via covalent patterns changing in FTIR spectra which were related to voltammetry response. The performance of cortisol-MIP modified SPCE was investigated in terms of detection range, high selectivity with a detection limit of 1.28 ng/ml. The disposable cortisol biosensor represented an application of MIP technique to recognize steroids according to their structures with feasibility and cost-effectiveness that can be developed to use in point-of-care.

**Keywords :** stress biomarker, cortisol, molecular imprinted polymer, screen-printed carbon electrode
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