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*Abstract*

# An Ultrasensitive Aptamer-Antibody Sandwich Cortisol Sensor for The Noninvasive Monitoring of Stress State in Saliva †

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**Abstract:** Cortisol is a major glucocorticoid that can affect physiological activities in the human body. Besides, it is also a biomarker that can reflect the stress state of the body. Therefore, inorder to monitor stress states in a sensitive and non-invasive manner, an ultra-sensitive aptamer-antibody sandwich sensor modified with multi-walled carbon nanotubes, ordered mesoporous carbon CMK-3, and silver nanoparticles (MWCNTs/CMK-3/AgNPs) was proposed for noninvasive monitoring of cortisol in saliva. The MWCNTs/CMK-3/AgNPs nanocomposite was fixed on the surface of the glassy carbon electrodes (GCEs) as the material for the first signal amplification, and secondary signal amplification was realized by conjugating cortisol antibodies with gold nanoparticles (AuNPs). Finally, the aptamer-antibody sandwich pattern was used to specifically recognize and bind cortisol. The concentration response range for this aptamer-antibody sandwich sensor is 0.1 pg/mL-10 ng/mL, and the limit of detection (LOD) is 0.09 pg/mL. Heretofore, the LOD of this sensor has been relatively low, showing its good sensitivity, selectivity, stability, and reproducibility. Furthermore, it has been successfully applied to detect cortisol in saliva samples to compare the stress states of postgraduates and undergraduates.

Keywords: Cortisol; Aptamer-antibody sandwich pattern; Sensor; Antibody-AuNPs conjugate; Saliva; Postgraduate/undergraduate

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