

รูปแบบ Abstract (บทคัดย่อ)

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(รหัสโครงการ)

Project Title : Paper-based competitive immunoassay with silver enhancement for determination of salivary cortisol

(ชื่อโครงการ) อิมมูโนแอสเซย์แบบแข่งขันบนกระดาษร่วมกับซิลเวอร์ขยายสัญญาณสำหรับตรวจวัดคอร์ติซอลในน้ำลาย

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Abstract

Cortisol is known as a stress biomarker. The measurement of cortisol levels is an early warning indicator for health conditions and diagnosis of stress-related diseases. Herein, we developed a paper-based sensor for the measuring of cortisol. First, a lateral flow immunoassay using a gold nanoparticle label with a silver enhancement system was designed for the simple, sensitive and rapid detection of cortisol. The developed assay was based on a competitive platform of which BSA-cortisol conjugate was immobilized at the test zone to compete with an analyte. The quantitative analysis was performed using gold nanoparticles (AuNPs) as signal labeling. Sequentially, the silver enhancement solution was applied in order to enhance the sensitivity of the assay with the results easily seen by the naked eye. Using this system, the limit of detection (LOD) was found to be 0.5 ng/mL with a 3.6 fold more sensitive detection than

without the enhancement system (LOD = 1.8 ng/mL). The salivary cortisol analysis was in the range of 0.5 -150 ng/mL ($R^2 = 0.9984$), which is in the clinically acceptable range. For the semi-quantitative analysis, the color intensity of the results was analyzed using an image processing program. The proposed method was successfully applied to detect cortisol in saliva. In addition, the results from our method also complied with the ones of those obtained by using the commercial enzyme-linked immunosorbent assay (ELISA). This developed assay offers great promise for a non-invasive screening test of salivary cortisol. Secondary, paper-based device with a competitive immunoassay was developed for a quick and easy screening of cortisol levels. The paper-based device was fabricated, then cortisol conjugated-BSA was immobilized on paper's surface at the detection zone. Anti-cortisol mAbs conjugated-gold nanoparticles, as a signal indicator was used to detect cortisol level in the sample. The results showed that the device has the ability to measure cortisol levels into two ranges: < 25 µg/dL and > 25 µg/dL which can be distinguished by naked eye. The limit of detection (LOD) by calculated was 21.5 µg/dL. Moreover, this developed assay was successfully applied to detect cortisol in serum. The data correlated well with the data obtained using ELISA. The paper-based devices developed herein are low-cost, requires minimal reagents and is easy to handle. Therefore, the developed method could be applied for rapid screening of cortisol.

Keywords: cortisol; lateral flow immunoassay; silver enhancement; gold nanoparticles