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Immuno-probed multiwalled carbon nanotube surface for abdominal aortic aneurysm biomarker analysis

Abstract

Abdominal aortic aneurysm (AAA), a medical complication, occurs when the aortic area becomes swollen and very large. It is mandatory to identify AAA to avoid the breakdown of aneurysms. C-reactive protein (CRP) has been recognized as one of the biomarkers for identifying AAA due to the possibility of CRP produced in vascular tissue, which contributes to the formation of an aneurysm, and it is elevated in patients with a ruptured AAA. This research work was designed to develop an immunosensor on a multiwalled carbon nanotube (MWCNT)-modified surface to quantify the CRP level. Anti-CRP specificity was constructed on the MWCNT surface through a silane linker to interact with CRP. The detection limit of CRP was calculated as 100 pM with an R2 (determination coefficient) value of 0.9855 (y = 2.3446x – 1.9922) on a linear regression graph. The dose-dependent linear pattern was registered from 200 to 3000 pM and attained the saturation level during binding at 3000 pM. Furthermore, serum-spiked CRP showed a clear increase in the current response, proving the specific recognition of CRP in biological samples. This designed biosensor identifies CRP at a lower level and can help diagnose AAA.

Keywords

Aortic Swelling; Biomarker; Biosensor; C-reactive protein; Immunoassay