

Labelfree detection of carcinogenic aflatoxin b1 by electrochemical piezoelectric immunosensor based on self assembled thin film

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Aflatoxin B1 (AFB1), a potent carcinogenic mycotoxin, is of great concern due to their frequent occurrence in foods and their severe health effects on animals and humans[1,2]. The immunosensors is a tremendous potential tool for a real time, smart and reliable detection of AFB1. AFB1 being a small and neutral molecule, label free detection of AFB1 in the desired range is a challenge[3,4]. A simple, label free electrochemical piezoelectric immunosensor based on monoclonal Aflatoxin B1 antibody (aAFB1) realized on self assembled of 4-amino thio phenolmonolayer on gold coated quartz crystal was developed for the detection of AFB1 with a LOD of 0.012ngmL⁻¹. The label free detection of AFB1 may perhaps be achieved due to perfect orientation of aAFB1 on the surface and aromatic Π electron structure of 4-ATP providing a direct contact between the electrode and AFB1 [5]. Further attempt is made to enhance immuno response by employing two strategies (i) enhancement of electron transfer rate by inclusion of gold nanoparticles (AuNP) into the matrix and (ii) to follow a competitive sandwich protocol via metal nano particle-secondary antibody hybrid system. In the first approach, a multi layered immunoelectrode was designed by successive deposition of hexane dithiol(HDT), AuNP 3d network, cysteamine(cys) monolayer and finally covalently linked aAFB1 to fabricate BSA/aAFB1/Cys/AuNP/HDT/Au immunoelectrode with LOD of 8 pg mL⁻¹. A wide linear range coupled with LOD of 8 pgmL⁻¹ may be attributed to AuNP 3D network and perfect orientation of AFB1[6]. In the second approach, an Au coated iron oxide core shell nanostructure- poly clonal antibody conjugate(r-IgG-Au-Fe₃O₄) was synthesized and a competitive sandwich mode was followed[7]. The linear range of AFB1/BSA/aAFB1/4-ATP/Au immunosensor

lay within from 0.05-5 ngmL⁻¹. The unique feature of the immunosensor is its regeneration up to 15-16 times with 2-3% loss in activity using a strong external magnet(Figure 1). The BSA/aAFB1/4-ATP/Au immunoelectrode has been successfully utilized to detect AFB1 in contaminated groundnuts extract with the minimum error. The results as obtained by the electrode is in agreement with the LC-MS/MS results.

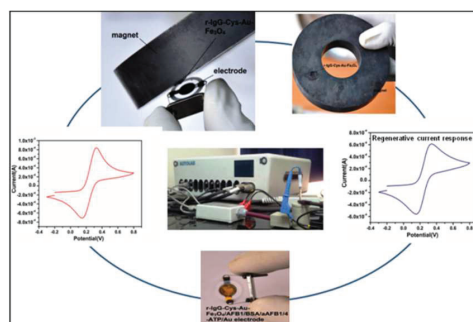


Figure 1: Scheme showing reusability of AFB1 sensor through magnet

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