

A Nanosensor System Based on Disuccinimydyl - CYP2E1 for Amperometric Detection of the Anti-Tuberculosis Drug, Pyrazinamide

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Abstract : Pyrazinamide (PZA) is among the first-line pro-drugs in the tuberculosis (TB) combination chemotherapy used to treat Mycobacterium tuberculosis. Numerous reports have suggested that hepatotoxicity due to pyrazinamide in patients is due to inappropriate dosing. It is therefore necessary to develop sensitive and reliable techniques for determining the PZA metabolic profile of diagnosed patients promptly and at point-of-care. This study reports the determination of PZA based on nanobiosensor systems developed from disuccinimidyl octanedioate modified Cytochrome P450-2E1 (CYP2E1) electrodeposited on gold substrates derivatised with (poly(8-anilino-1-naphthalene sulphonic acid) PANSA/PVP-AgNPs nanocomposites. The rapid and sensitive amperometric PZA detection gave a dynamic linear range of 2 μM to 16 μM revealing a limit of detection of 0.044 μM and a sensitivity of 1.38 $\mu\text{A}/\mu\text{M}$. The Michaelis-Menten parameters; K_M , K_{Mapp} and $IMAX$ were also calculated and found to be 6.0 μM , 1.41 μM and 1.51 μA respectively indicating a nanobiosensor suitable for use in serum.

Keywords : tuberculosis, cytochrome P450-2E1, disuccinimidyl octanedioate, pyrazinamide

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