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Cytochrome c reductase induced nitrite oxidase activity for sensitive detection of nitric oxide metabolite

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Abstract

Nitrite supplementation limits hypoxia-induced oxidative stress and activates the alternate NO pathway which may partially account for the nitrite-mediated cardioprotection. So, sensitive and selective biosensors need to be explored to detect the physiological nitrite level due to its important role in Parkinson's, Huntington's, and Alzheimer's diseases as well as myocardial infarction and ischemia-reperfusion injury. Here, we investigate the mechanism and performance of cytochrome c reductase (CcR) biofunctionalized self-assembled monolayer (SAM) functionalized on gold nanoparticles (GNPs) and polypyrrole (PPy) nano composite onto the screen printed carbon electrode (SPCE) as a biosensor for the detection of nitrite based on the electrochemical technique. Cytochrome c reductase was covalently coupled with SAM layers on GNPs by using EDC and NHS. Direct electrochemical response of CcR biofunctionalized electrodes showed a couple of well-defined and nearly reversible cyclic voltammetric peaks at -0.34 and -0.45 vs. Ag/AgCl. Under optimal conditions, the biosensor could be used for the determination of NO_2^- with a linear range from 0.1 to 1600 μM and a detection limit of 60 nM with a sensitivity of 72.57 nA μM^{-1} . Further, the nitric oxide metabolites present in the cardiac cells under hypoxia also investigated and presented.

Research at its Best!!!