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Cholesterol biosensor based on cholesterol oxidase immobilized onto o-phenylenediamine polymer film

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The detection of total cholesterol concentration in blood has become essential for a number of diseases, including CVD, familial and polygenic hyperlipoproteinemia. Various methods have been used for the analysis of cholesterol including spectrophotometric, HPLC and electrochemical methods. Indeed, many electrochemical biosensors have been proposed to detect cholesterol and offer advantages such as high sensitivity, fast response, low cost, small size, continuous on-line detection and reproducible results. In these studies, we aimed to analyse the presence of total cholesterol with biosensor. In this study, gold electrodes were coated by polymer films from acetonitrile-water media containing o-phenylenediamine (oPD) and benzoquinone (BQ) with the cyclic voltammetry technique. Cholesterol oxidase enzyme were immobilized onto the surface of Au electrodes. It was observed that Au/oPD-BQ/COx electrode were appropriate for determination of cholesterol and this electrode were used for optimization studies. The determination of cholesterol was performed via monitoring oxidation current of enzymatically produced H_2O_2 at +0.70 V vs. Ag/AgCl. Optimum biosensor conditions were determined for phosphate buffer, pH 7.0 and 30°C, for Au/oPD-BQ/COx enzyme electrode. The linear working range is 9.8×10-6-1.1×10-2 mM. The effects of possible interference species present in real samples on cholesterol oxidase enzyme electrode were examined. Analysis of total cholesterol in serum samples were performed by using proposed Au/oPD-BQ/COx enzyme electrode. This provided one of the cheapest and simplest approaches to prepare matrix for enzyme immobilization for cholesterol sensing and it could be extended to develop other sensors for detecting many biologically and clinically important materials.

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