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Fabrication of an Electrochemical Biosensor for early detection of Colorectal cancer based on miRNA hybridyzation method

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ABSTRACT

For the detection of DNA hybridization, a new electrochemical biosensor was developed on the basis of the interaction of Doxirubicine (DOX) with 22-mer oligonucleotides (from human Colorectal cancer) a simple biosensing design to yield an ultrasensitive electrochemical biosensor for cancer biomarker detection on Screen Printed Gold Electrodes (SPGE) without use of any modification on electrode surface perhaps direct detection with the help of electroactive label (DOX) and MicroRNA92a (miRNA) as an biomarker selected for being up-regulated in Colorectal cancer. The biosensor was assembled in two stages the immobilization of the probe that was modified on an SPGE and second stage of target hybridization of completely match strand electroactive label DOX has been used after hybridization process which is an intercalator with our miRNA strands as an redox indicator for amplifying the electrochemical signal of miRNA 92a. For conformation electrochemical techniques including Cyclic Voltammetery (CV) and Differential Pulse Voltammetery (DPV). were used and hybridization was observed successfully .The final biosensor provided a sensitive detection of miRNA 92a with good selectivity.

Keywords*:* miRNA92a, Colorectal Cancer, Electrochemical biosensor

1. INTRODUCTION

Cancer is a public health concern worldwide one in three women and one in two men will develop cancer during life time in developed countries. Colorectal cancer (CRC) is the third most common malignancy in the world, accounting for more than 1 million cases and 500,000 deaths per year (1). Because of its slow development from premalignant lesions, perspectives to reduce the burden of disease by early detection and treatments are particularly promising for this malignancy(2). Although colonoscopy is the most reliable method for early detection of CRC and its precursors available to date, the invasive nature and the cost incurred have hampered its widespread application(3). The fecal occult blood test (FOBT), which is the most widely used noninvasive screening tool so far, is limited by its low sensitivity, especially with respect to detection of preneoplastic lesions (4), but widespread application is so far limited by labor-intensive handling and high costs(5). miRNA deficiencies or up-regulations have been correlated with a number of clinically important diseases such as cancers (6,7). Early detection is the only known approach that may improve these indicators. Thus there is a urgent need to develop non-invasive simple and low risk methods for screening an prediction of such cancer. The major function of miRNA biosensors is to measure the signals of hybridization process(8,9). The hybridization of the probe to the target sequence can be detected using appropriate hybridization indicators(10). Oracet blue (OB) is an anthraquinone derivative elecroactive label previously studied by Nasirizadeh and collagues (11,12,13). In other studies the electrochemical properties of OB modified electrodes and their application as sensors to detect hydroxylamine and simultaneous determination of