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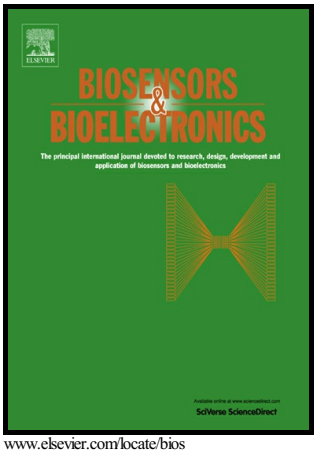

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Signal Amplification Strategies for DNA-based Surface Plasmon Resonance Biosensors

Chen Zhou[a], Haimin Zou[a,b], Chengjun Su[a,c], Dongxia Ren[b], Jing Chen[b], Yongxin Li[a,c,*]

a West China School of Public Health, Sichuan University, Chengdu 610041, China

b Chengdu Center for Disease Control and Prevention, Chengdu, Sichuan 610047, China

c Provincial Key Laboratory for Food Safety Monitoring and Risk Assessment of Sichuan, Chengdu 610041, China

Abstract: DNA has well-defined ability to recognize a wide variety of targets, such as small biological molecules, proteins, inorganic ions and small organic molecules. As molecular recognition elements, DNA can be used to build simple, rapid and sensitive biosensors for detection of these targets. DNA-based SPR sensors are considered to be a real-time and label-free tool. We present a systematical and critical review on DNA-based SPR biosensors and their signal amplification via various strategies, focusing on recent advances in nanomaterials, novel DNA amplifications, redox reactions on surface, enzyme amplifications, as well as promising multiplex amplification strategies.

Keywords: Surface plasmon resonance biosensor; Nanomaterial; Electrically neutral DNA probe; DNA amplification; Redox reactions; Enzyme amplification

1. Introduction

Deoxyribonucleic acids (DNA) has well-defined ability to recognize many targets, such as small biological molecules, proteins, inorganic ions and some small organic molecules. Therefore, DNA, as a molecular recognition element, can be utilized to build DNA-based biosensor for detection of a specific target. Aptamers, collectively referred to as functional nucleic acids, are RNA or DNA fragments. They have sequence-specific folds that achieve their tertiary structures and activities through a combination of different molecular interactions and motifs. Specific properties of artificial nucleosides have contributed to the development of more efficient tools for biosensors. In fact, artificial DNA probes have been utilized together with a number of different transduction platforms in order to achieve more sensitive and selective detection of nucleic acids, proteins and other compounds. The currently available transduction platforms mainly include colorimetric assay (Xia et al. 2017), surface plasmon resonance (SPR) (Yuan et al. 2017a) and electrochemical analysis (Zhang et al. 2017b). Other techniques, such as fluorescence sensors

* Corresponding author. Tel.: +86 28 85501301; Fax: +86 28 85501301.
E-mail address:lyxlee008@hotmail.com, liyongxin@scu.edu.cn (Y. Li)