Electrochemiluminescence imaging for the detection of multiple AMI biomarkers

Xiaolin Yang[1], Ying Zhao[1], Lijuan Sun[1], Honglan Qi[1], Qiang Gao[1], and Chengxiao Zhang*†[1]

[1]Shaanxi Normal University (SNNU) – China

Abstract

Design and development of simple, sensitive, and selective biosensing methods for the detection of a group of specific protein biomarkers have received more and more attention in clinical tests since the information of a group of specific biomarkers can provide more efficient clinical diagnosis index. In this work, an electrochemi- luminescence (ECL) biosensor array for the individual and simultaneous detection of multiple biomarkers has been developed at first time on the basis of the aptamer-based biosensor incorporating a versatile signal probe. As principle-of-proof, the acute myocardial infarction (AMI) biomarkers, myoglobin(Myo), cardiac troponin I(cTnI) and cardiac troponin T(cTnT) were chosen as model analytes. The biosensor array was fabricated by self-assembling thiolated specific aptamers on the surface of gold electrodes, respectively. After each target analyte was bound to the capture probes and then to each corresponding biotinylated antibody, and finally to the versatile ECL signal probe, ECL signals were recorded using PMT or CCD as a detector. For PMT model, the developed method showed extremely low detection limits for 0.30 ng/mL cTnT, 31 pg/mL Myo, 0.79 pg/mL cTnI. For ECL image model, a biosensor array containing three target biosensors and a control biosensor was found to be highly sensitive, no cross-talking, and accurate towards simultaneous detection of the AMI biomarkers. The developed method has been successfully applied to detect the multiple AMI biomarkers in human serum samples. This work demonstrates that the aptamer-based biosensor array with a versatile signal probe is a promising for ECL imaging detection of multi-biomarkers.

Keywords: Electrochemiluminescence imaging, biosensor array, myoglobin, cardiac troponin I, cardiac troponin T.

*Speaker

†Corresponding author: cxzhang@snnu.edu.cn