Impedimetric Point-of-Care Cardiac Marker System

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The requirement for fast identification, with accurate and reliable diagnostics for acute myocardial infarction has generated what can be called Point-of-Care (POC) devices. POC is a developed technology; providing diagnosis and analysis of clinical measurement at the patients bedside [1]. Using just a few drops of blood in such a device can lead to an accurate diagnosis [2] within minutes. Additionally, it may avoid a fatal situation [3]. This work describes the development and characterisation of a novel electrical impedance spectroscopy (EIS) immunosensor for application in point-of-care cardiac marker detection. EIS is a sensitive, label-free, real time technique however, the underlying source of the observed EIS response is poorly characterised. A full understanding of the relationship between target binding and impedance response could significantly improve both detection limits and sensitivity. The development of micro-structured interdigitated electrodes (IDEs) for multi-frequency EIS offers advantages over traditional macro-structured systems leading to the generation of knowledge on similar length scales to that of the bio-recognition components. Figure 1. Real-time detection of Ab-Ag interaction at 130 Hz. (50 ng/mL of antigen was injected each 2 minutes) In this work, we use interdigitated electrodes (IDEs) as EIS platform for monitoring the cardiac enzyme in real-time, our results showed evidences of detection within less than 2 minutes . This detection based on antibody-antigen interaction onto the IDEs surface. Immunosensors were constructed by immobilising myoglobin antibodies onto the surface of the IDEs via alkanethiol SAM. The response related to antigen binding was monitored at a fixed frequency 130 Hz. As a result, improved signal-to-noise ratios were obtained affording greater sensitivity, low detection limits (ng.mL-1) and fast detection times. Ongoing research aims to develop EIS IDE arrays to achieve point-of-care cardiac enzyme detection within less than 5 minutes. We anticipate this will have high impact in the diagnosis of cardiac events and allow faster delivery of emergency medical care.