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Optical biosensing of mycobacterium tuberculosis for point-of-care diagnosis

Abstract:
An optical biosensor is a compact analytical device formed by a bio-recognition sensing element integrated to an optical transducer system which translates a signal into a readable outcome that is measured by the detector. The target analyte interacts with an immobile bio-recognition element giving rise to a signal proportionate to the concentration of a measured analyte. Optical biosensors offer great advantages over conventional analytical techniques. Specifically, they can provide multiple capabilities such as user-friendly operation, real-time analysis, rapid response, high sensitivity and specificity, portability, label-free detection and cost-effectiveness. As a result, they possess suitable features critical for point-of-care diagnostics. In this study, a home-build surface plasmon resonance (SPR) optical biosensor device was used to analyse interactions between the bio-recognition sensing element and an analyte on the biosensing layer. The transducer consisted of silica dioxide (SiO2) substrate layer where a thin layer of gold was deposited. Mycolic acid antigens from mycobacterium tuberculosis (bovine strain) were immobilised on the biosensing layer and used as biorecognition sensing elements to capture tuberculosis (TB) antibodies (analyte). From our findings, it was realised that the mycolic acid successfully captured TB antibodies resulting in a detectable signal which paves a way for the development of the point-of-care device.