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Photonic-biosensing towards drug-resistant Tuberculosis diagnosis

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Early detection and treatment of TB remain key strategies to reduce transmission and disease progression. However, this is hampered by time-consuming, insensitive diagnostic methods, particularly for the detection of drug-resistant forms and in patients with human immunodeficiency virus infection (HIV). Several genes, such as RNA polymerase β subunit (rpoB) and enoyl reductase (InhA) genes, contain mutations that are responsible for drug resistance. One objective of this study is to use a surface plasmon resonance (SPR)-based biosensor platform to detect rpoB and inhA genes. Deoxyribonucleic acid (DNA) probes, specific for rpoB and inhA, were used as biorecognition elements to capture rpoB and inhA target DNA. The rpoB and inhA gene-specific thiolated DNA probes were immobilized on a gold-coated glass substrate before the target DNA was introduced for detection. As a negative control, mis-matched DNA, unspecific to both genes were used for confirmation of binding of the target DNA in the SPR experimental setup. The SPR optical setup was used for the analysis of the binding interactions occurring on the coated glass substrate. The total reflected intensity indicated the kinetics associated with DNA hybridization occurring between the target DNA and the capture probe. This is the initial step towards potentially detecting drug-resistant mutations using SPR-based biosensors for a point-of-care setting.

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