

## Lateral flow immunoassay for naked eye detection of *Mycobacterium tuberculosis*

### ABSTRACT

Tuberculosis (TB) is an infectious disease caused by *Mycobacterium tuberculosis*. Detection and control of infectious diseases is a major problem, especially in developing countries. Lateral flow immunoassay (LFIA) has been introduced as a handheld immunoassay-based point-of-care platform for an automated detection of TB. The CFP10-ESAT6 antigen of *M. tuberculosis* was used as the target in early detection of TB using LFIA strip-based POC strategy. An interesting platform based on optical signals is implemented as a colour change in the detection area that is visible to the naked eye. The gold nanoparticles (AuNPs) were used as the colour probe for the detection of a target of interest. The high-resolution transmission electron microscopy (HRTEM) image and ultraviolet-visible spectrophotometer (UV-Vis) analysis confirmed that the synthesized AuNPs were appropriate for the immunoassay designed. The platform consists of AuNPs conjugated with specific antibodies (Ab) to capture the antigen of *M. tuberculosis*. Under the capillary effect, sandwich immunoreactions of AuNP-Ab-antigen were performed on the test pad of the immunostrip, which can be observed by the colour signal on the test line of the strip with a short assay time. Furthermore, the newly developed biosensor was utilized in CFP10-ESAT6 antigen detection in human sputum specimens with satisfactory results. The characteristic coloured bands enable visual detection (naked eye) of target analyte without instrumentation. This noninvasive diagnose system which is sputum-based detection could provide user-friendly and affordable diagnostic tests in developing countries.