

# Portable graphene-based electrochemical genosensor for rapid *Mycobacterium tuberculosis* detection

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## Abstract

This work presents a novel integrated point-of-care platform to detect *Mycobacterium tuberculosis* (Mtb). Our approach employs loop-mediated isothermal amplification (LAMP) to amplify Mtb-DNA and the screen-printed graphene electrode (SPGE) for a label-free electrochemical analysis of DNA amplicons. When used with a portable potentiostat device developed in-house, the system (LAMP-EC) can simultaneously analyze and report the results in qualitative analysis. Under optimized conditions, LAMP-EC showed a comparable detection limit to the previously developed LAMP assay with a lateral flow readout. This highly specific technique could also determine the presence of TB in 104 blinded clinical samples with 100% accuracy. Besides these merits, our technique can be easily adopted due to its affordability (~USD2.5/test) and rapidity (<65 min turnaround time), a practical incentive that appeals to users in both high- and low-resource settings.

*Mycobacterium tuberculosis; mini-potentiostat; graphene; screen-printed electrode; LAMP-EC*