

Integrated Lateral Flow Electrochemical Strip for Leptospirosis Diagnosis

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Abstract : LipL32 is an outer membrane protein present only on pathogenic *Leptospira* species, which are the causative agent of leptospirosis. Leptospirosis symptoms are often misdiagnosed with other febrile illnesses as the clinical manifestations are non-specific. Therefore, an accurate diagnostic tool for leptospirosis is indeed critical for proper and prompt treatment. Typical diagnosis via serological assays is generally performed to assess the antibodies produced against *Leptospira*. However, their delayed antibody response and complicated procedure are undoubtedly limited the practical utilization especially in primary care setting. Here, we demonstrate for the first time an early-stage detection of LipL32 by an integrated lateral-flow immunoassay with electrochemical readout (eLFIA). A ferrocene trace tag was monitored via differential pulse voltammetry operated on a smartphone-based device, thus allowing for on-field testing. Superior performance in terms of the lowest detectable limit of detection (LOD) of 8.53 pg/mL and broad linear dynamic range (5 orders of magnitude) among other sensors available thus far was established. Additionally, the developed test strip provided a straightforward yet sensitive approach for diagnosis of leptospirosis using the collected human sera from patients, in which the results were comparable to the real-time polymerase chain reaction technique.

Keywords : leptospirosis, electrochemical detection, lateral flow immunosensor, point-of-care testing, early-stage detection

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