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A vertical flow paper-microarray assay with isothermal DNA amplification for detection of *Neisseria meningitidis*

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Abstract

Paper-based biosensors offer a promising technology to be used at the point of care, enabled by good performance, convenience and low-cost. In this article, we describe a colorimetric vertical-flow DNA microarray (DNA-VFM) that takes advantage of the screening capability of DNA microarrays in a paper format together with isothermal amplification by means of Recombinase Polymerase Amplification (RPA). Different assay parameters such as hybridization buffer, flow rate, printing buffer and capture probe concentration were optimized. A limit of detection (LOD) of 4.4 nM was achieved as determined by tabletop scanning. The DNA-VFM was applied as a proof of concept for detection of *Neisseria meningitidis*, a primary cause of bacterial meningitis. The LOD was determined to be between 38 and 2.1×10^6 copies/VFM_{assay}, depending on the choice of DNA capture probes. The presented approach provides multiplex capabilities of DNA microarrays in a paper-based format for future point-of-care applications.

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