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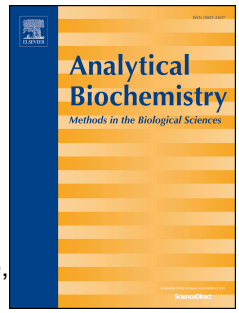

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A microfluidic enrichment platform with a recombinase polymerase amplification sensor for pathogen diagnosis

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ABSTRACT

Rapid and sensitive detection of low amounts of pathogen in large samples is needed for early diagnosis and treatment of patients and surveillance of pathogen. In this study, we report a microfluidic platform for detection of low pathogen levels in a large sample volume that couples an Magainin 1 based microfluidic platform for pathogen enrichment and a recombinase polymerase amplification (RPA) sensor for simultaneous pathogenic DNA amplification and detection in a label-free and real-time manner. Magainin 1 is used as a pathogen enrichment agent with a herringbone microfluidic chip. Using this enrichment platform, the detection limit was found to be 20 times more sensitive in 10 ml urine with *Salmonella* and 10 times more sensitive in 10 ml urine with *Brucella* than that of real-time PCR without the enrichment process. Furthermore, the combination system of the enrichment platform and an RPA sensor that based on an isothermal DNA amplification method with rapidity and sensitivity for detection can detect a pathogen at down to 50 CFU in 10 ml urine for *Salmonella* and 10^2 CFU in 10 ml urine for *Brucella* within 60 min. This system will be useful as it has the potential for better diagnosis of pathogens by increasing the capture efficiency of the pathogen in large samples, subsequently enhancing the detection limit of pathogenic DNA.

Key words: infectious disease, silicon biophotonic sensor, antimicrobial peptides, microfluidics, DNA amplification/detection