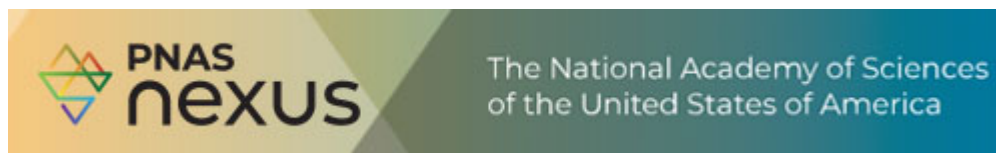


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Multiplexed detection of bacterial nucleic acids using Cas13 in droplet microarrays

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Bruce Levine, Editor

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Abstract

Rapid and accurate diagnosis of infections is fundamental to individual patient care and public health management. Nucleic acid detection methods are critical to this effort, but are limited either in the breadth of pathogens targeted or by the expertise and infrastructure required. We present here a high-throughput system that enables rapid identification of bacterial pathogens, bCARMEN, which utilizes: (1) modular CRISPR-Cas13-based nucleic acid detection with enhanced sensitivity and specificity; and (2) a droplet microfluidic system that enables thousands of simultaneous, spatially multiplexed detection reactions at nanoliter volumes; and (3) a novel preamplification strategy that further enhances sensitivity and specificity. We demonstrate bCARMEN is capable of detecting and discriminating 52 clinically relevant bacterial species and several key antibiotic resistance genes. We further develop a simple proof of principle workflow using stabilized reagents and cell phone camera optical readout, opening up the possibility of a rapid point-of-care multiplexed bacterial pathogen identification and antibiotic susceptibility testing.



Significance Statement

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