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3D Hierarchical Nanotopography for On-Site Rapid Capture and Sensitive Detection of Infectious Microbial Pathogens

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Abstract

Effective capture and rapid detection of pathogenic bacteria causing pandemic/epidemic diseases is an important task for global surveillance and prevention of human health threats. Here, we present an advanced approach for the on-site capture and detection of pathogenic bacteria through the combination of hierarchical nanostructures and a nuclease-responsive DNA probe. The specially designed hierarchical nanocilia and network structures on the pillar arrays, termed 3D bacterial capturing nanotopographical trap, exhibit excellent mechanical reliability and rapid (<30 s) and irreversible bacterial capturability. Moreover, the nuclease-responsive DNA probe enables the highly sensitive and extremely fast (<1 min) detection of bacteria. The bacterial capturing nanotopographical trap (b-CNT) facilitates the on-site capture and detection of notorious infectious pathogens (*Escherichia coli* O157:H7, *Salmonella enteritidis*, *Staphylococcus aureus*, and *Bacillus cereus*) from kitchen tools and food samples. Accordingly, the usefulness of the b-CNT is confirmed as a simple, fast, sensitive, portable, and robust on-site capture and detection tool for point-of-care testing.

KEYWORDS: nanotopography, polyaniline, nanopillar, pathogen, on-site

논문정보

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