RNA-based, Amplification-free, Microbial Identification using Nano-Enabled Electronic Detection

Tech ID: 22780 / UC Case 2013-028-0

ABSTRACT

An electrical sensor platform to detect bacteria and viruses by using nanotechnology to electrically detect RNA-based interactions for identification of microbes that cause plant, animal and human diseases.

FULL DESCRIPTION

Rapid, efficient, and low cost detection and identification of microorganisms including pathogenic bacteria, viruses, and fungi is a challenge facing plant and animal health. Current technologies such as Q-PCR rely on multiple assays and amplification methods to identify bacteria and viruses. Traditional optical detection methods also require fluorescent markers. These multiple independent steps and tests increase the processing time and cost for detection and identification.

Researchers at the University of California, Davis have developed a technique that uses nanotechnology to electrically detect and identify bacterial and viral RNA sequences without the necessity of using enzymatic amplification methods or fluorescent markers. In cases where microbe densities are particularly low, the technique provides additional sensitivity that allows for the target molecules to be detected in small quantities. Furthermore, the technique may be scaled into large multiplexed arrays for high-throughput and rapid screening. The implementation is further able to differentiate closely related variants of a given bacterial or viral species or strain. This technique addresses the need for a quick, efficient, and inexpensive bacterial and viral detection and identification system.

APPLICATIONS

- Method of precise and highly sensitive detection and identification of bacteria and viruses in agricultural, medical, epidemiological, biosecurity and public health applications

FEATURES/BENEFITS

- Electrically detects genetic information (RNA) at the molecular level without the use of fluorescent markers
- Removes the need for enzymatic amplification (PCR)
- Detection and identification of specific species and strains
- Amenable to multiplexing and facile integration with electronics for field-deployable devices and high-throughput applications

RELATED MATERIALS

- Biofouling-Resilient Nanoporous Gold Electrodes for DNA Sensing - 08/14/2015

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	10,400,270	09/03/2019	2013-028
United States Of America	Issued Patent	9,803,234	10/31/2017	2013-028

CONTACT

Ediz O. Yonter
eoyonter@ucdavis.edu
tel: .



INVENTORS

- Falk, Bryce W.
- Feldstein, Paul A.
- Hihath, Joshua L.
- Knoesen, Andre
- Marco, Maria L.
- Seker, Erkin

OTHER INFORMATION

KEYWORDS

Epidemiology, Biosecurity, Public health

CATEGORIZED AS

- **Agriculture & Animal Science**
  - Devices
  - Food
  - Genomics
  - Health
- **Environment**
  - Sensing
- **Materials & Chemicals**
  - Biological
  - Nanomaterials
  - Thin Films
- **Medical**
  - Diagnostics
  - Research Tools
  - Screening
- **Nanotechnology**
  - Materials
  - NanoBio
  - Tools and Devices

- **Research Tools**
  - Nucleic Acids/DNA/RNA
- **Security and Defense**
  - Food and Environment
  - Screening/Imaging
- **Sensors & Instrumentation**
  - Analytical
  - Biosensors
  - Medical
  - Scientific/Research
- **Veterinary**
  - Diagnostics

RELATED CASES

2013-028-0

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Cucumber Mosaic Virus Inducible Viral Amplicon (CMViva) Expression System
- On-Chip Platform for Single-Molecule Electrical Conductance Measurements
- A Combined Raman/Single-Molecule Junction System For Chemical/Biological Analysis
- Rapid and Sensitive Detection of Microbial RNA directly from Blood Samples by Electrical Biosensors
- Broadband Light Emission with Hyperbolic Material
- DNA-based, Read-Only Memory (ROM) for Data Storage Applications
- Hybrid Electromechanical Metamaterials for Optical and Electrical Devices

University of California, Davis
Technology Transfer Office
1 Shields Avenue, Mrak Hall 4th Floor,
Davis,CA 95616

Tel: 530.754.8649
techtransfer@ucdavis.edu
https://research.ucdavis.edu/technology-transfer/
Fax: 530.754.7620

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