Method and System for Ultra High Dynamic Range Nucleic Acid Quantification

Tech ID: 27420 / UC Case 2012-322-0

BRIEF DESCRIPTION

Researchers at UC Irvine developed a device and method that combines the high dynamic range and high accuracy of digital PCR (dPCR) with the real-time analysis of quantitative PCR (qPCR) to achieve a ultra-high dynamic range PCR over 10 to 12 orders of magnitude. The present method is accomplished by a highly integrated design that optimally packs, thermocycles, and images as many as 1 million reaction vessels.

FULL DESCRIPTION

Polymerase chain reaction (PCR) is a common and often indispensable technique for nucleic acid detection in medical and biological research labs for a variety of applications This technique generates millions of copies of a target DNA sequence that can be purified and quantified after the reaction is completed. The amplification of a genetic sequence provides valuable information about biochemical processes in a single cell to the entire body.

Several improvements of this technique include real-time or quantitative PCR (RT- or qPCR) and digital PCR (dPCR) that overcome difficulties associated with conventional PCR processes. qPCR allows for simultaneous, or real-time, amplification and quantification of DNA samples. In dPCR samples are partitioned into multiple individual, parallel amplification cycles allowing for high levels of amplification and end-point quantification of complex samples. While these methods save time, reduce effort, increase accuracy, and conserve valuable sample, they still suffer from a low dynamic range (i.e., between 5-7 orders of magnitude).

Researchers at UC Irvine developed device and method that combines real-time imaging of qPCR and high-throughput processing of dPCR, thereby dramatically increasing the upper end of the dynamic range by 100 orders of magnitude, and enabling both real-time and end-point quantification. This method and microfluidic design optimally packs, thermocycles, and images as many as 1 million reaction vessels in a single chamber in real-time. .

STATE OF DEVELOPMENT

Completed preliminary dPCR and qPCR combination studies in droplet reactors, and continuing development of the device.

ADVANTAGES

§ Method accurately detects nucleic acids over an extremely high dynamic range (1010 to 1012) from a sample volume of 50 µL or less.

§ Method allows both real-time and end-point quantification of DNA samples.

PATENT STATUS

CONTACT

Alvin Viray
aviray@uci.edu
tel: 949-824-3104.

OTHER INFORMATION

CATEGORIZED AS

- **Biotechnology**
  - Genomics
  - Health
  - Industrial/ Energy
- **Imaging**
  - Molecular
- **Medical**
  - Devices
  - Diagnostics
- **Nanotechnology**
  - NanoBio
  - Tools and Devices
- **Research Tools**
  - Nucleic Acids/DNA/RNA
  - Screening Assays

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	10,081,017	09/25/2018	2012-322

RELATED CASES

2012-322-0

RELATED MATERIALS

» Hatch, A.C., et al., 1-Million droplet array with wide-field fluorescence imaging for digital PCR, Lab Chip. 2011, 11:3838-45. - 09/29/2011

UCI Beall Applied Innovation

5270 California Avenue / Irvine,CA
92697-7700 / Tel: 949.824.2683