Microfluidic Device for Mitochondrial Membrane Potential Measurement

Tech ID: 20988 / UC Case 2010-851-0

BRIEF DESCRIPTION

A microfluidic device that measures mitochondrial membrane potential that may be used as a clinical diagnostic or a research tool.

FULL DESCRIPTION

The mitochondrial membrane potential is used to generate and regulate energy in living systems, driving the conversion of ADP to ATP, regulating ion homeostasis and controlling apoptosis, all central to human health and disease. Therefore, there is a need for tools to study its regulation in a controlled environment for potential clinical and scientific research applications.

To date, to measure mitochondrial membrane potential, researchers and technicians must use fluorescent probes or electrochemical methods such as patch clamping which has proven to be challenging. Researchers at the University of California, Irvine have developed a tetraphenylphosphonium (TPP+) selective electrode that measures the membrane potential of mitochondria and this TPP+ selective electrode may be integrated onto a microfluidic device.

ADVANTAGES

This microfluidic device may be used to analyze mitochondrial bioenergetics in sample concentrations as low as 0.3 ng/µL which is four orders of magnitude smaller than the concentration used in conventional assays which use 3 µg/µL. In addition, the volume of the chamber (which is at 85 µl) is 2 orders of magnitude smaller than the volume used currently in conventional assays.

STATE OF DEVELOPMENT

A number of prototype microfluidic devices with the unique TPP+ selective electrode have been fabricated. Mitochondrial membranes and different chemical compounds to modulate the mitochodrial membrane potential have been tested in these microfluidic devices and these microfluidic devices have shown to be sensitive and accurate in detecting the change in the mitochondrial membrane potential.

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	8,961,759	02/24/2015	2010-851

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OTHER INFORMATION

CATEGORIZED AS

- **Biotechnology**
  - Other
- **Medical**
  - Devices
  - Diagnostics
  - Disease: Metabolic/Endocrinology
  - Research Tools
- **Nanotechnology**

- NanoBio
- **Research Tools**
- Other

RELATED CASES

2010-851-0

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- In Vivo RFID Chip

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