Integrated Electrowetting Nanoinjector and Aspirator

Tech ID: 28776 / UC Case 2017-810-0

CONTACT

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

OTHER INFORMATION

CATEGORIZED AS

- **Biotechnology**
  - Genomics
- **Medical**
  - Gene Therapy
  - Other
  - Research Tools
- **Research Tools**
  - Nucleic Acids/DNA/RNA
  - Other
- **Engineering**
  - Other

RELATED CASES

2017-810-0

BRIEF DESCRIPTION

Gene therapy applications necessitate cell transfection techniques for delivering biomaterial into multiple or a single cell(s). The global market for transfection technologies can be worth more than half a billion by 2017. Current viral and chemical transfection techniques have limited ease of fabrication, transfection efficiency, dosage control, and cell viability. The invention discloses a simple yet efficient technique for nanoinjection of material into a single cell with high transfection efficiency, controlled dosage delivery, and full cell viability.

FULL DESCRIPTION

Advancement of gene therapy application pushed the needs for novel and more efficient techniques to deliver DNA as well as macromolecules into cells. Accordingly, several methods were developed at both the bulk cell and the single cell levels. Viral and chemical transfections are the most common techniques recently used, however, they lack dosage control and ability to deliver to single cell. Moreover, available solutions have low transfection efficiency, inflammatory side effects and are highly expensive. Increased cell damage with decreased pipette aperture (nanoscale) due to high pressure to eject from pipette is also anther concerned to be addressed. Researchers at UCI developed a simple integrated electrowetting nano-injector that injects material into single cell with high transfection efficiency, controlled dosage delivery and most importantly with full cell viability. With transfection efficiency reaching 100% and very little disruption caused to the nuclear membrane, this novel method is definitely offering an efficient and safe alternative for the now emerging gene therapy applications, expanding the boundaries and possibilities for them.

SUGGESTED USES

· Nanoinjection of plasmids, antibodies, dyes into single cells

· Nuclear injection to transfect single cells

· Wide field fluorescence viewing

· Single cell mRNA/protein analysis and drug interaction studies

· Genetic manipulation of small model organisms for developmental cell biology studies

ADVANTAGES

- Only technique capable of direct transfection or extraction from within cell nucleus
- 100% transfection efficiency
- Capable of tracking protein expression in response to external stimuli (e.g., drugs)
- Can inject DNA vectors into nucleus/ cytoplasm of living cells
- Cell remains viable after injection/ extraction
- Works in mouse fibroblasts and fruit fly body fat cells
- Controlled volume delivery via applied differential voltage between the two solutions

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	10,843,148	11/24/2020	2017-810

STATE OF DEVELOPMENT

Demonstrated a working prototype , plans to further develop as part of an existing spin-off from UCI on genetic quantification.

RELATED MATERIALS

» Shekaramiz E, Varadarajalu G, Day PJ, Wickramasinghe HK. Integrated Electrowetting Nanoinjector for Single Cell Transfection. Scientific Reports. 2016;6:29051. doi:10.1038/srep29051. - 07/04/2016

UCI Beall Applied Innovation

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