# Scalable Lipid Bilayer Microfluidics for High-Throughput Gene Editing

Tech ID: 29497 / UC Case 2018-437-0

## SUMMARY

Researchers led by Paul Weiss from the Department of Chemistry and Pediatrics at UCLA have created a new microfluidic device for high-throughput gene editing of cells.

## BACKGROUND

Gene editing has many potential applications, allowing for the modification of immune cells to target cancers and the modification of stem cells to treat various diseases. Current gene-editing techniques use viruses to modify DNA; however, a new technique known as CRISPR/Cas9 has gained popularity in genetic engineering due to its efficiency and precision. To introduce CRISPR/Cas9 into cells, electroporation is used to create tiny pores in the cells for the genetic modifiers to enter through. Unfortunately, electroporation is inefficient, expensive, and creates problems with cell toxicity. Microfluidics present a more efficient option to create these pores for entry by squeezing cells through tiny channels that temporarily introduces pores due to cell stress, but these techniques suffer from short shelf lives due to clogging and biofouling.

## INNOVATION

Researchers led by Paul Weiss from the Departments of Chemistry & Biochemistry and Pediatrics have created a new microfluidic device for high-throughput gene editing of cells. Typical microfluidic devices have a throughput of 20,000 cells per second, but they break after passing 1 million cells due to clogging. These researchers have found a way to line the microfluidic device with a lipid bilayer to prevent cell adhesion to the fluidic device and circumvent the issue of clogging. Furthermore, this method is compatible with many different materials from which microfluidic devices are made and allows for chemical modification of the bilayer to influence cell behavior. Compared to conventional electroporation, these microfluidic devices can introduce larger DNA fragments (e.g., bacterial DNA) into cells and use less processing steps, with higher throughput, which would save hours on certain medical procedures.

## APPLICATIONS

- Gene editing (stem cells, immunotherapy, research tools)
- Introducing large biomolecules into cells

## ADVANTAGES

- Efficient
- High-throughput
- No clogging or biofouling
- Long-term use

## PATENT STATUS

| Country | Type | Number | Dated | Case |
|---|---|---|---|---|
| Patent Cooperation Treaty | Reference for National Filings | WO 2020/041480 | 02/27/2020 | 2018-437 |

Patent Pending

## ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

## CONTACT

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## INVENTORS

- Weiss, Paul S.

## OTHER INFORMATION

### KEYWORDS

Microfluidics, gene editing, gene therapy, genetic engineering, electroporation, immunotherapy, stem cells, CRISPR, Cas9, plasmids

### CATEGORIZED AS

- **Biotechnology**
  - Genomics
- **Medical**
  - Disease: Cancer
  - Other
  - Stem Cell
- **Research Tools**
  - Nucleic Acids/DNA/RNA
- **Engineering**
  - Other

### RELATED CASES

2018-437-0

- Determining Oil Well Connectivity Using Nanoparticles
- Multiple-Patterning Nanosphere Lithography
- High-Throughput Intracellular Delivery of Biomolecular Cargos via Vibrational Cell Deformability within Microchannels
- Guided Magnetic Nanospears For Targeted And High-Throughput Intracellular Delivery
- High-Throughput Microfluidic Gene-Editing via Cell Deformability within Microchannels



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