# High-throughput Microfluidic Research Platform for Performing Versatile Single-Cell Molecular Timed-Release Assays within Droplets

Tech ID: 32503 / UC Case 2020-321-0

## BRIEF DESCRIPTION

Researchers at UCI have designed a high-throughput, cost-effective microfluidic platform as a research tool for performing genomic, proteomic, single-cell, pharmacological, and agricultural studies across multiple cell types.

## SUGGESTED USES

·High throughput screening of compounds

·To control the microenvironment in single-cell studies for genomic or proteomic assays

·To determine effect of toxicity levels of potential drug targets on cells in pharmacology assays

·To assess new methods of compound delivery and seed trait optimization in agricultural biotechnology assays

## FEATURES/BENEFITS

·Cost-effective

·High-efficiency generation of droplets

·Versatile platform allows for different types of cells and molecules to be studied

·Has multiplexing capabilities

·Allows for study of cell-level biological mechanisms and fundamentals of emulsion microfluidics in real time

## TECHNOLOGY DESCRIPTION

Screening large libraries of compounds (e.g. medicines and foods) for genomics, proteomics, pharmaceuticals, or agricultural biotechnology assays is commonly done in large facilities with the aid of complex robotic liquid handlers. Microfluidic devices have become a popular research platform to increase the level of automation and multiplexing of these assays. In particular, droplet-based microfluidics create thousands of monodisperse droplets or microreactors that can encapsulate both solid and liquid contents such as cells, nucleic acids, proteins and beads. This allows single-cell analysis to be performed within a single droplet. However, some studies are seeking to evaluate the effects of a compound on the microenvironment of a specific cell is not yet demonstrated within a droplet.

Utilizing a droplet, researchers at UCI have designed a microfluidic device capable of simulating an active, controlled mechanism in a cell type by monitoring its microenvironment.Utilizing microfluidic droplets that can encapsulate a cell and a molecular release particle in conjunction with a hydrogel bead, embedded with a

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## INVENTORS

» Lee, Abraham P.

## OTHER INFORMATION

## CATEGORIZED AS

» **Agriculture & Animal Science**
» Other
» **Biotechnology**
» Genomics
» Proteomics
» **Research Tools**
» Screening Assays

## RELATED CASES

2020-321-0

compound of interest for a given cell type. Over time, the embedded compound within the hydrogel is released and the manifestations on the cell can be monitored/sorted via fluorescence lifetime imaging microscopy (FLIM) implemented into the microfluidic device. This unique platform gives scientists a way to effectively screen compounds that may have a time-sensitive effect on the cell in vitro and help make informative decisions as to the microenvironmental effect on the cell.

## STATE OF DEVELOPMENT

Prototype in development

## PATENT STATUS

Patent Pending

**ADDITIONAL TECHNOLOGIES BY THESE INVENTORS**

- New Microwell Plate Configurations to Increase Microwell Density
- Multi Layered Microfluidic Devices For In Vitro Large Scale Perfused Capillary Networks
- Controlled 'One-Cell-One-Bead' Encapsulation in Droplets
- Microfluidic Flow Transducer Based on the Measurement of Electrical Admittance
- Microfluidic device for multiplex diagnostics / Microfluidic devices and methods
- Microfluidic Device for Cell Separation Using Dielectrophoresis and/or Magnetohydrodynamics
- On-Demand Cell Encapsulation Using On-Demand Droplet Generation and Impedance-based Detection
- High throughput and precision cell sorting

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