Cell Encapsulation on a Microfluidic Platform

Tech ID: 18839 / UC Case 2004-547-0

BACKGROUND

Cell encapsulation is a highly useful tool in cell culturing, assay, and cell-based therapy applications. Encapsulation has traditionally been accomplished by extrusion through a nozzle, forming an air/water emulsion, into a bath containing a polymerizing agent. However, this batch processing technique is characterized by its inability to trap cell droplets before or without polymerization and non-uniform polymerization times across droplet population. Furthermore, minimum droplet size is limited to 400um and size dispersion is pronounced for small droplet geometries.

TECHNOLOGY DESCRIPTION

Univeristy of California researchers have developed a novel microfluidic platform for encapsulation of cells in droplets. Cells can be loaded at low or high densities to achieve droplets of 1-5 cells or up to 20-50 cells. Droplet size can be manipulated by channel geometries and flow rates.

In contrast with prior batch techniques, this device allows for a smaller minimum droplet size of 100 ?m or less and droplet trapping before or without polymerization. The continuous nature of the encapsulation process successfully achieves mono-dispersity of droplet size and uniform polymerization times across the droplet population. The platform also allows flexibility in creating tailored local environments, combinatorial biochemistry, or heterogeneous cell populations to enhance cell differentiation or proliferation. The method also provides for both permanent and temporary encapsulation by forming either a polymerized capsule or a simple, immiscible fluid separation, respectively.

APPLICATIONS

The present invention can be used in cell culture applications for isolating and distributing small groups of cells for further culturing. Single cell droplets can be replated at clonal density and processed in an automated and complex fashion, while multiple cell droplets can be fused and cultured to produce cell populations from precisely defined, heterogeneous initial conditions. For cell assay applications, cell droplets can be used for sorting similar to fluorescence-activated cell sorting (FACS) on a much smaller, precise, and less expensive platform. The invention can be further utilized in cell-based therapies to encapsulate stem cells or other regenerative cells in polymerized capsules, serving as an improvement over existing encapsulation-based therapies by providing smaller capsule size, improved structural properties, more uniform mixing and reaction times, and the possibility of incorporating further microfluidic processing upstream and downstream of the encapsulation area.

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	7,759,111	07/20/2010	2004-547

CONTACT

Doug Crawford
doug.crawford@uci.edu
tel: 949-824-2405.

OTHER INFORMATION

CATEGORIZED AS

- » **Medical**
  - » Devices
- » **Nanotechnology**
  - » Electronics
  - » Other
- » **Research Tools**
  - » Other
  - » Screening Assays

RELATED CASES

2004-547-0

UCI Beall
Applied Innovation

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