TECHNOLOGY

A Microdevice for the Enrichment of Tumor-Initiating Breast Cancer Stem Cells

OVERVIEW

Background

Despite the numerous advances in cancer treatment, there is frequent relapse and metastasis of cancer. The cancer stem cell hypothesis argues that a small minority of cancer stem cells (CSCs) in a heterogeneous tumor population drives the tumor growth and has drug resistant properties. One of the techniques in isolation and enrichment of the CSCs is mammosphere culture. This technique enables the enrichment of highly tumorigenic cells from samples taken from patients or from propagated cell lines. Isolating and enriching CSCs from cultured cell lines can aid researchers in determining whether particular cells have been transformed to be highly tumorigenic; this enables them to study the triggers involved in tumor growth, relapse, and metastasis.

Integrating the mammosphere technique into a microsystem has the potential to advance this field of study as the technique can be automated and directly integrated with other microfluidic functions- including tumor cell enrichment and purification, in-situ immunofluorescence, drug screens with concentration gradients, and reverse-transcription polymerase chain reaction (RT-PCR).

Innovative Technology

Researchers at the University of Maryland have developed an enclosed microchamber for the isolation and enrichment of breast tumor initiating cells which enables exchange and removal of reagents in the culture chamber (that contains suspension colonies) in a zero velocity manner. The versatility of the device and ease of fabrication makes it amenable for integration with other functional assays such as cell separation, sorting, and recovery, as well as molecular assays, to enable new discoveries in the biology of cancer stem cells.

Advantages

The design attributes that make it superior to other microdevices:

· Tubeless and completely enclosed,
· Easy exchange and removal of reagents in the culture chamber (free of pumping devices),
· Fluidic reservoir prevents media evaporation,
· Supports both 2D monolayer attachment and 3D suspension culture, and
· Visually supports the study of 3D to 2D morphing of the culture for studying metastatic events such as mesenchymal to epithelial transition.

Applications

This device can be used for:

· Drug screening on 3D cancer cell entities that are better representatives of the tumor construct,
· Simultaneous culture of normal and cancer stem cells for drug screening,
· Simultaneous culture and study of two different cells for drug screening and other applications,
· Simultaneous drug screening on differentiated cells and less mature cells (or stem cells), and
· Integration with other functional assays such as cell separation, sorting, and recovery, as well as molecular assays,

to enable new discoveries in the biology of cancer stem cells.

CONTACT INFO

UM Ventures
0134 Lee Building
7809 Regents Drive
College Park, MD 20742
Email: umdtechtransfer@umd.edu
Phone: (301) 405-3947 | Fax: (301) 314-9502

Additional Information

INSTITUTION

University of Maryland, College Park

PATENT STATUS

Patent(s) pending

LICENSE STATUS

Contact OTC for licensing information

EXTERNAL RESOURCES

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