



TECHNOLOGY

A Tunable 2- and 3-Dimensional Cell Culture Substrate for the Isolation, Enrichment, and Study of Breast Cancer Stem Cells

OVERVIEW

Background

The cancer stem cell hypothesis argues that a small minority of cancer cells in a heterogeneous tumor population drives the tumor growth and is responsible for the relapse and metastasis of the disease. This minority cell population, referred to as cancer stem cells (CSC) due to its stem-cell-like characteristic, has drug-resistant properties. Among several techniques that are used to isolate CSCs, only one technique is label free and therefore has a high yield and repeatability. This technique, referred to as mammosphere culture, not only isolates CSCs, it is also used to enrich cancer stem cells in the form of 3D suspension colonies and is performed on low-attachment plates. However, for subsequent differentiation studies, the mammospheres must be manually removed and transferred to high-attachment surfaces in serum-rich media. This tedious procedure results in loss of cells, which may already be in low numbers. Commercial plates support only one type of culture, i.e. they either encourage cell attachment (as in tissue culture treated plates) or inhibit cell attachment (as in low attachment plates). An ideal solution for studying CSCs would be a tunable surface that enables the culture of 3-dimensional spheroids for CSC enrichment and then 2-dimensional attachment-based culture for subsequent studies of the enriched cells in which these two cultures are carried out on one single device.

Innovative Technology

Researchers at the University of Maryland have developed a novel method and device for the enrichment and isolation of CSCs in 3D culture and subsequent manipulation of CSCs using 2-dimensional attachment-based culture, all in the same device. The material used for the culture can be molded in the lab to conform to different shapes which, unlike existing technologies, makes it possible to focus on one colony at a time for studying CSCs responses to different stimuli such as drugs. Alternatively, it can be used for studying other behaviors such as cell rolling, which is attributed to metastasis. Furthermore, the physical characteristics of the substrate can easily be modulated for studying pluripotent characteristics of cancer stem cells as well as normal stem cells.

Advantages

The novel culture system has several advantages over existing technologies:

- Cost effective and simple to fabricate,
- Supports both 2D and 3D culture, and
- The culture plate can be used for CSC isolation and enrichment and subsequently for attachment-based assays without the need to transfer cells.

Applications

- The study of tumorigenic events such as the mechanism of mesenchymal to epithelial transition (MET), cell rolling, etc. believed to be responsible for tumor metastasis,
- Can be integrated with other on-chip functions, such as cell enrichment, immunofluorescence, drug screening, and molecular analysis, for studying the biology of cancer stem cells, and

· The study of pluripotent characteristics of CSCs as well as normal 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

Available for exclusive or non-exclusive license

CATEGORIES

- Bioengineering

EXTERNAL RESOURCES

PS-2012-091