Metastasis Mimetic Device

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Technology description

The invention serves as a platform to simultaneously measure cancer cell proliferation, survival, migration and invasion, and would lead to a more accurate evaluation of drug toxicity, efficacy or biomarker function and also reduce the time for characterizing the biological activity of potential drug compounds or molecules 3-4 fold.

Overview

Metastasis is a multistep process which involves carcinoma cells invading from the primary tumor into the bloodstream and exiting the bloodstream to other tissues where cancer cells eventually grow and survive. Metastasis remains a leading cause of death among cancer patients for several reasons. One is a failure to detect early metastatic events and the second is a failure to effectively treat and eliminate metastatic cancer cells. Currently, investigating the metastasis process has been limited to following the dissemination of cancer cells (cell migration) injected in rodent models. Also, the inherent differences between the mouse and human biological systems make it challenging to understand the cellular mechanisms of the metastatic process in the context of human disease.
Although there are devices that are capable of measuring cellular migration and invasion in vitro, such devices cannot be used to observe cellular migration to tissues over a given distance or time. For example, "Transwell Assay" contains a device in which cells are plated on top of a porous membrane and allowed to migrate to the underside of the membrane in response to a stimulus. Because the membrane is very thin and cells migrate from top to bottom, this device does not allow for measurement of migration across a distance or allow researchers to analyze migration continuously over time. While the Ibidi, Inc. device is capable of measuring migration of cells in response to a stimulus over time using time lapse micrography, the smaller chamber, open ended channels, and the channel length are not advantageous to analyze the metastatic process. Thus, the current experimental approaches and devices do not adequately mimic the metastatic process.

Why it is better

KU Medical Center's Metastasis Mimetic device overcomes current challenges and has several unique advantages including the ability to mimic multi steps of the metastatic process. It serves as a platform to simultaneously measure cancer cell proliferation, survival, migration and invasion, and would lead to

a more accurate evaluation of drug toxicity, efficacy or biomarker function and also reduce the time for characterizing the biological activity of potential drug compounds or molecules 3-4 fold. The proposed device would be easy to fabricate and test, and would function without the use of highly specialized equipment, making the costs for manufacturing comparable to current devices marketed for migration only such as the transwell device. The advantages of this device are larger chamber size, shorter channel length, and a novel design of the channel for examining cells in the metastatic process, as this step will allow researchers to examine how tumor cells can migrate through a wall of endothelial cells to enter into circulation and exit out of circulation. Being able to examine this step is important for determining how drugs will affect metastatic tumor cells.

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