Fabrication of Microfluidic Devices to Study Confined Collective Migration of Breast Cancer Cells

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The submission's title

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A list of keywords (10 maximum)

Microfluidic device, cell mechanics, cell migration, cancer metastasis, breast cancer cell, confined environment, vertical confinement chambers

The abstract (up to 250 words)

Cells in our body mostly exist in confined environments. They are surrounded by neighboring cells, tissues, and the extracellular matrix. The changes in these surrounding environments influence cell behaviors. Therefore, studying cell mechanics plays a significant role to understand how cancer cells migrate and what primary factors that control cancer metastasis. Many studies have been developed to study how cancer cells migrate in the body. However, these experiments in vivo are complicated and incredibly challenging. Another approach is to perform experiments in vitro instead. However, to obtain relevant results, a specific experimental apparatus must be designed to confine cells. Glass slides and Petri dishes have been used in the traditional cell biology experiments, but these experiments are limited to being performed on only two-dimensional open surfaces. In recent decades, microfluidic devices have been developed and widely used in cell biology for studying single-cell migration in confinement. Here, we develop a microfluidic device to study breast cancer cells. Various degrees of vertical confinement chambers are in progress to be designed in SOLIDWORKS. These chambers are connected at a common center where all the inlets meet. We expect more than one experiment to be done at once by using our design. Hence, we will be able to collect data and compare how breast cancer cells migrate differently under various degrees of vertical confinement at the same time. The results will have the potential to provide clinical implications such as aggressive cancer phenotype, poor prognosis, and high tendency to metastasis.