Fluid Shear Stress Causes Resistance to Chemotherapy Drugs Doxorubicin and Paclitaxel in Breast Cancer

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Cancer is the second leading cause of death in the United States. Over 90% of these deaths occur due to cancer metastasis. Metastasis is challenging to treat due to the general lack of specified treatment and detection. Metastasis is typically only detected once the secondary tumor has already formed to a palpable size. Emerging technology is starting to facilitate liquid biopsy of blood samples for an earlier detection of metastatic cells known as circulating tumor cells (CTCs). Much research has been dedicated to improving CTC isolation and detection from the blood, but the treatment on CTCs has not been fully studied. Finding treatment for CTCs, however, is challenging as typical in vitro high-throughput drug screening methods rely on cells that are typically grown adherently and do not experience fluid shear stress (FSS) as CTCs do. Furthermore, there is emerging evidence that CTCs behave like cancer stem cells (CSCs) and are resistant to existing chemotherapy. Therefore in this project, we have developed an in vitro model to test for CTC drug sensitivity and have focused on elucidating how FSS affects CTCs during drug treatment.