Quantification of the Effects of Fluid Shear Stress on Circulating Tumor Cells

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In this research, MDA-MB-231 cells were placed in a microfluidic device in order to determine the effects of fluid flow on breast cancer circulating tumor cells. The cells were trapped in the microfluidic device and then hit with different pressures for different time limits. For data analysis, the cells were split into their categories and changes in area, horizontal and vertical lengths, and circularity were marked. Migration analyses were also performed on the cells after they were hit with their respective pressure. Results show that shear stress does increase random motility. Additionally, cellular phenotype combined with the exposure time is linked to the biophysical response to fluid shear stress. Also discovered was that neither fluid shear stress magnitude nor duration affects the cellular retention; however, cellular deformation rate is affected by the original cell size and fluid shear stress magnitude. This research is important to the scientific field because it shows that the differences between the subpopulations of cells were caused by cytoskeleton rigidity, cell deformation limits, and gene expression. This is also important for the entrepreneurial potential it possesses: the device constructed for this research is effective, has a low cost, has easy-to-find components, and has parameter controls.

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