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Stiffness Dependent Separation of Cells in a Microfluidic Device
TODD SULCHEK, GONGHAO WANG, WENBIN MAO, ALEXANDER ALEXEEV, Georgia Tech — Abnormal cell mechanical stiffness can point to the development of various diseases including cancers and infections. We report a high-throughput technique for continuous cell separation utilizing variation in cell stiffness. We use a microfluidic channel that is decorated by periodic diagonal ridges to force cells of different stiffness values to follow different trajectories. The ridges within the microfluidic flow channel compress and deform the cells in rapid succession to translate each cell perpendicular to the channel axis in proportion to its stiffness. We report the experimental demonstration of separation as well as computational validation of the mechanism of separation. Atomic force microscopy (AFM) was used to independently measure cell stiffness. By flowing cells through the microfluidic device, we can quickly and efficiently separate mixtures into subpopulations of stiff cells and soft cells. We then summarize how we expect this technology may produce new biomedical diagnostic capabilities.

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