Abstract Submitted
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Experimental and numerical study of microfluidic label-free viability cell sorting[1] FATIMA EZAHRA CHRIT, Georgia Inst of Tech, ABHISHEK RAJ, Indian Institute of Technology, KATHERINE YOUNG, NICHOLAS STONE, PETER SHANKLES, ALEXANDER ALEXEEV, TODD SULCHEK, Georgia Institute of Technology — Cell biomechanical properties often change in predictable ways with important cell phenotypes changes, such as cell loss of viability. We propose a biophysical approach for cell viability sensing, enumeration, and purification that is label-free and continuous. Experimentally using microfluidics with periodic cell-compressing constrictions, we show that we can separate viable cells from nonviable cells based on the difference in their stiffness with an enrichment factor of >5 and an overall recovery of 95%. We numerically study the effect of cell elasticity and adhesion on cell motion in the microchannel using lattice Boltzmann and lattice spring models. The sorting technology consists of a microfluidic channel with diagonal ridges that direct cells along different paths in a manner dependent on cell biomechanical properties. As a result, the sorted viable and nonviable cells are collected at different microchannel outlets. The platform can be used for cell characterization and purification either in-line with cell bioreactors or after cell manufacture and prior to administration to improve outcomes.

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Fatima Ezahra Chrit
Georgia Inst of Tech

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