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Passage times of confined cancer cells and deformable particles flowing through a microfluidic channel ZEINA KHAN, NABIOLLAH KAMYABI, FAZLE HUSSAIN, SIVA VANAPALLI, Texas Tech University — Circulating tumor cells, the primary cause of cancer metastasis, have to navigate through tight extracellular matrix and capillaries. Unfortunately, understanding of the hydrodynamic interactions between cells and narrow vessel walls is lacking. Using a microfluidic channel of rectangular cross-section, we investigate cell hydrodynamic behavior by measuring cell confinement, passage time through the microchannel, and excess pressure drop. Testing with highly and lowly aggressive cancer cells shows that passage time may not always be indicative of cancer cell aggressiveness as the relationship among passage time, friction and rheology is complex. Transport of deformable particles including droplets of varying viscosity and interfacial tension, as well as elastic particles of different elastic moduli, reveals that passage times depend on particle size and, contrary to prior claims, on viscosity but not on elastic modulus. We also find that particle viscosity and not modulus controls the friction force and lubrication film thickness, suggesting that cancer cell viscosity rather than elasticity controls cell transport on short time-scales.

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