Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

A contact line pinning based microfluidic device for modeling intramural and interstitial flows[1] CHIH-KUAN TUNG, Dept of Biological & Environmental Engineering, Cornell University, OLEH KRUPA, Dept of Biomedical Eng., Cornell Univ, ELIF APAYDIN, BEE, Cornell, JR-JIUN LIOU, BME, Cornell, ANTHONY DIAZ-SANTANA, School of Chemical and Biomolecular Eng., Cornell Univ, ABRAHAM D. STROOCK, ChemE, Cornell, MINGMING WU, BEE, Cornell — Fluid flows critically regulate a number of important physiological processes in living systems such as vascular tissue development, immune cell and tumor cell trafficking. However, tools for creating well defined intramural (flow within a vascular tube) and interstitial (flow within a tissue) flows in a physiologically realistic, 3D setting are limited. We will present a contact line pinning based microfluidic platform that is able to create a spatially uniform interstitial flow within a cell embedded biomatrix (type I collagen); and an intramural flow within an engineered vascular tube lined with HUVECs. The created interstitial flow were characterized using a Fluorescence Recovery after Photobleaching (FRAP), to be in the range of 1.2 - 16 μm/s. The intramural flow was measured using a particle tracking method, to be in the range of 6 - 30 μm/s. We further demonstrate that interstitial fluid flows modulate breast tumor cell (MDA-MD-231) morphology heterogeneity and plasticity. We will also discuss the influence of fluid flow on cancer cell migration.

[1]Support for this work is provided by National Health Institute R21CA138366. This work was performed in part at the Cornell NanoScale Facility and Nanobiotechnology Center.

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Date submitted: 11 Nov 2012 Electronic form version 1.4