Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Hydrodynamic behavior of tumor cells in a confined model microvessel ZEINA S. KHAN, SIVA A. VANAPALLI, Department of Chemical Engineering, Texas Tech University — An important step in cancer metastasis is the hydrodynamic transport of circulating tumor cells (CTCs) through microvasculature. In vivo imaging studies in mice models show episodes of confined motion and trapping of tumor cells at microvessel bifurcations, suggesting that hydrodynamic phenomena are important processes regulating CTC dissemination. Our goal is to use microfluidics to understand the interplay between tumor cell rheology, confinement and fluid forces that may help to identify physical factors determining CTC transport. We use leukemia cells as model CTCs and mimic the in vivo setting by investigating their motion in a confined microchannel with an integrated microfluidic manometer to measure time variations in the excess pressure drop during cell motion. Using image analysis, variations in excess pressure drop, cell shape and cell velocity are simultaneously quantified. We find that the throughput of the technique is high enough (100 cells/min) to assess tumor cell heterogeneity. Therefore, in addition to measuring the hydrodynamic response of tumor cells in confined channels, our results indicate that the microfluidic manometer device could be used for rapid mechanical phenotyping of tumor cells.

Zeina Khan
Department of Chemical Engineering, Texas Tech University

Date submitted: 11 Nov 2011 Electronic form version 1.4