CANCER PREVENTION & RESEARCH INSTITUTE OF TEXAS

Award ID:
RP100756

Project Title:
Integrated Microfluidic Technology for High Throughput Screening of the Metastatic Potential of Tumor Cells

Award Mechanism:
High Impact/High Risk

Principal Investigator:
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Entity:
Texas Tech University

Lay Summary:

The advent of high throughput gene sequencing technologies has fuelled the search for cancer biomarkers with the ultimate goal of developing cancer diagnostic, cure and prevention strategies. However, cancer is a complex phenomenon with a multitude of genetic alterations and therefore it is unlikely that a single or few genetic biomarkers are the drivers of the hundred or so diseases comprising cancer. In this work, we seek to establish an alternative paradigm by exploiting cell stiffness as a “universal marker” for cancer diagnostics and prognosis. This paradigm rests on the basic physical tenet that all cells modulate energy flows through mechanical forces, and subtle changes in energy flows perturbs the homeostasis of cells, resulting in diseased states. Exploiting this physical hallmark of all living matter, we propose to engineer a “microfluidic cell squeezer” for quantifying the stiffness of single cells at rates exceeding 1000 cells/min. This high throughput method overcomes the tediousness associated with current approaches such as atomic force microscopy to measuring cell mechanical properties. Moreover, our method’s ability to characterize each and every cell is crucial for quantifying the wide variability found in the metastatic potential of tumor cells. Thus the proposed work moves beyond current approaches to rapidly screen individual cells for their metastatic potential opening up new opportunities in cancer diagnostics and personalized medicine.