CANCER PREVENTION & RESEARCH INSTITUTE OF TEXAS

Award ID:
RP150711

Project Title:
Biomechanical profiling of migrating brain cancer genotypes in tightly-confined space for drug screening

Award Mechanism:
High Impact/High Risk

Principal Investigator:
Kim, Young-tae

Entity:
The University of Texas at Arlington

Lay Summary:

Infiltrating brain cancer cells pose the single greatest challenge to improving the prognosis for primary brain tumor patients; and treatment that can inhibit migration of brain cancer cells has potential to confine this lethal cancer into a local area, which can be effectively removed by focal radiation and/or surgical methods. Accumulative evidence in recent studies has reported that the biomechanical properties of cancer cells regulate migration characteristics of different types of cancers. Conventional tissue-level techniques measure average elasticity behavior of cells and extra-cellular matrix, causing a loss of pertinent information on heterogeneity. However, significant challenges exist in determining elastic properties of single cells since the manipulation methods are complex to operate, invasive, and have low throughput. To address existing limitations in dynamically mapping elasticity properties of migrating brain cancer cells inside tightly-confined space, we are developing wide-field quantitative phase imaging to measure deformation of migrating brain cancer cells in 3D under influence of weakly-focused low power laser microbeams with high spatial and temporal resolution in a non-contact manner. The proposal aims to utilize multiple weakly-focused beams (holographic stretcher) for high throughput stretching of genetically-defined brain cancer cells (having different degrees of invasiveness) with or without various types of clinically-utilized anti-brain cancer drugs in tightly-confined spaces, and high resolution deformation measurements using holographic imaging. Once the correlation between migratory properties, genetic modifications, and elasticity map of migrating brain cancer cells under different physical (tightly-confined space) and chemical (chemotherapeutic drugs) environment is established, it will enable screening of drugs for effective therapeutics of invading brain cancer.