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Using Microfluidics and Nanotechnology in Search of Biophysical Cues for Cancer Progression

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According to World Health Organization, cancer claimed about 7.6 million lives in 2008 and continues to be the leading cause of death worldwide. If cancer is detected early and if treatment is delivered in a timely, effective manner, survival rates increase significantly. An estimated one-third of all cancers could be cured if detected and treated early. In many human tumor types, including breast cancer, the dissemination of cancer cells throughout the body has already occurred by the time a primary tumor is typically detected.A sufficiently accurate means for diagnosing cancer at the single cell level in order to find this disease at its earliest and most manageable stage is a great challenge. Use of micro- and nano-scale technologies has enabled us to develop tools to probe biophysical properties of normal and cancer cells even at a single cell. In this talk, it is demonstrated how biomechanical properties of cells characterized at a single cell level using atomic force microscopy and microfluidcs technology alter as cells progress from a normal state to a malignant stage. We will show cells become softer and less viscous as their cytoskeleton architecture becomes less organized. This study is extended to include the potential use of cell biomechanical properties as a possible biomarker for cancer treatment assessment and for determining tumor-initiating cells. Thesemechanical biomarkers combined with cellimpedance spectroscopy will lead to the development of automated lab-on-chip sensor for labeling the health status of cells.

Biography

Professor Masoud Agah has completed his Ph.Dfrom the University of Michigan in 2005. He is the director of Virginia Tech MEMS Laboratory and has focused his research on the environmental and biomedical applications of micro- and nanotechnologies. He is the author and co-author of more than 120 papers in refereed journals and conference proceedings.

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