

**Research Seminar Series**

**University of Nebraska-Lincoln**

**Department of Chemical and Biomolecular Engineering**

**Cancer on a chip: From new technologies and basic science to translational medicine**

**Dr. Nitin Agarwal**

*Department of Bioengineering,*

*George Mason University*

**Friday, November 10, 2017**

4:00-5:00 p.m.

Othmer Hall, Room 106

*\*Refreshments provided*

**Abstract**

Despite the medical advancements of the 21st century, cancer has remained a formidable disease exceeding 8 million annual deaths worldwide. Due to heterogeneity of cancer cells from patient to patient, and their adaptability to hostile microenvironments (e.g. low oxygen or ‘hypoxic’ conditions), it is incredibly difficult to develop a universal anticancer approach for a broad population. These challenges highlight the need to better understand cell functions and develop new technologies for personalized medicine.

Hypoxia alters cellular metabolism and leads to acquisition of drug resistance and metastatic progression. In most solid tumors, these hypoxic conditions exist as gradients of oxygen with the tumor core being most hypoxic due lack of vascularization. In the μ-SCALE (Microfluidic Single Cell Analysis Laboratory in Engineering) group, we have developed a novel lab-on-a-chip strategy to establish linear gradients of dissolved oxygen and study cancer cell behavior under biomimetic conditions. We have also identified a novel molecular mechanism, that regulates transformation of breast epithelial cells to stem-like phenotypes, necessary for metastasis. The focus of our research revolves around breast and brain cancers as model disease systems. In addition to the above projects, we are also concentrating our efforts towards developing liposome based immunological techniques to engineer cytotoxic T lymphocytes for increased efficacy against cancer.

In this seminar, development and functionality of the microfluidic hypoxia platform as well as its utility to explore cellular responses in real-time will be demonstrated. In addition, the unique capability to establish overlapping hypoxia and drug gradients and the potential for personalized diagnostics and treatments will be discussed.

**Biography**

Dr. Nitin Agrawal is an Assistant Professor in the Department of Bioengineering at George Mason University. He received his PhD in Chemical Engineering from Texas A&M University in 2006 and Postdoctoral training from Harvard Medical School and Massachusetts General Hospital in the field of Bioengineering in 2009. He worked at the Pacific Northwest National Laboratory for 2.5 years before joining GMU. Dr. Agrawal’s research spans across three critical scientific areas: i) Development of chip based technologies for disease diagnostics and therapies, (ii) Fundamental understanding of the molecular mechanisms of cancer, and (iii) Translation of lab-on-a-chip technologies for clinical and personalized medicine. His research is supported by multiple NSF awards in the areas of nanobiosensing, and biomanufacturing of therapeutic cells. He has authored/co-authored 20 peer reviewed journal articles and several refereed conference articles.

Besides research, Dr. Agrawal has served on multiple NSF review panels. He is also actively involved in student mentoring at all levels and was nominated for the OSCAR mentoring excellence award in 2017 at GMU.