Dr. Yuan Tang recently joined the Bioengineering Department at the University of Toledo. Prior to joining UToledo, he was a Research Assistant Professor in the Department of Mechanical Engineering at Temple University. During his Ph.D. study at Florida International University and postdoctoral training at Widener University, Dr. Tang gained substantial expertise in the applications of nanotechnology in designing targeted drug delivery systems for the treatment of breast cancer and heart disease. His current research focuses on the applications of nanotechnology for developing vascularized microfluidics-based biomimetic systems for drug screening as well as studying the role of endothelial cell inflammation in a variety of different pathological conditions. He is also developing targeted drug delivery systems utilizing natural or induced inflammatory responses in human endothelium, which includes the identification and selection of upregulated adhesion molecules in endothelial cells, synthesis and characterization of nano- or micro-sized drug carriers, drug payload internalization and controlled release, and characterization of various drug delivery routes under different disease conditions. The work of Dr. Yuan Tang has applications in the fields of nanotechnology, molecular imaging, drug delivery and radiation oncology.

**Microvascular Network on a Chip for Understanding the Role of Endothelial Cells in Inflammation**

Almost all drugs recently developed in animal models to treat inflammatory disease have failed in clinical trials. There is therefore a critical need for rapid screening of anti-inflammatory drugs before they are tested in expensive and time-consuming animal models and human trials. We have developed a novel microfluidic based assay platform incorporating 3D dynamic cell culture and circulation/vasculature on a chip for understanding inflammatory response and rapid screening of therapeutics. In this presentation, the design and development of this vascularized biomimetic microfluidic system will be presented and the application of this unique platform for studying the role of innate immunity in blood-brain barrier (BBB) breakdown during sepsis, functional changes of endothelial cells in tumor microenvironment, and transport of antibody conjugated drug carriers across physiological barrier will be discussed. Our studies have allowed us to delineate a number of basic mechanisms of the inflammatory response with a focus on the more complex human conditions rather than relying on mouse models to study human inflammatory disease. This has allowed us to develop and screen a novel therapy for treatment of sepsis taking into account the significant differences between human and murine neutrophil-endothelial interactions in response to cytokine activation. This novel system will advance our understanding of the impact of endothelial cell phenotype and signaling events that regulate endothelial and neutrophil activation and will lead to the development of other enabling technologies for basic science and applied studies of other systems in the body that may be difficult to study in animal models.