Dr. Mahendra Kavdia is an Associate Professor of Biomedical Engineering at Wayne State University, Detroit. He received his Ph.D. in chemical engineering from Oklahoma State University and postdoctoral training in biomedical engineering at Johns Hopkins University. Dr. Kavdia’s research focuses on computational modeling and vascular systems biology. His research is to better understand the role of oxidative stress in physiological conditions, and cardiovascular and neurovascular diseases. He is a recipient of the Arthur C. Guyton award for excellence in integrative physiology and medicine. His research has been supported by the American Heart Association national scientist development grant and the National Institutes of Health R01 and R15 grants.

**ABSTRACT:** Oxidative stress causes cell damage and is associated with the initiation and progression of many cardiovascular and neurovascular diseases. The cellular oxidative stress system is composed of interconnected components including enzymes, metabolites, free radicals, redox couples, and transcription factors. The interactions between and among these components are regulated in time and space. These components are observed to disturb in oxidative stress leading to the cellular dysfunctions. Although many aspects of these components have exhibited therapeutic potential in various diseases, clinical trial results have been disappointing. I will review our research on the molecular mechanisms and relationships between these interconnected components in the endothelial cell dysfunction, which is observed in vascular diseases. The mechanisms and effectiveness of antioxidant defense systems in oxidative stress are discussed. Systems biology approaches may provide an effective tool to the characterization of the cellular oxidative stress and to provide insights into mechanisms of diseases and therapeutic opportunities.

Through the generous support of the Wallace H. Coulter Foundation, the Department of Biomedical Engineering facilitates weekly lectures each year during academic terms. Experts in all areas of Biomedical Engineering are invited to provide a research seminar and to meet with faculty and students to discuss the latest developments and research in Biomedical Engineering.