Role of Redox active nanoparticles in controlling pathways in Angiogenesis

Abstract: Angiogenesis is the formation of new blood vessels from existing blood vessels and is critical for many physiological and pathophysiological processes. In this study we have shown the unique property of redox active nanoparticles (Re-NPs) to induce angiogenesis, observed using both in vitro and in vivo model systems. In particular, Re-NPs trigger angiogenesis by modulating the intracellular oxygen environment and stabilizing hypoxia inducing factor 1alpha endogenously. Furthermore, correlations between angiogenesis induction and Re-NPs physiochemical properties including: surface valence state ratio, surface charge, size, and shape were also explored. High surface area and mixed valence states make these nanoparticles more catalytically active towards regulating intracellular oxygen, which in turn led to more robust induction of angiogenesis. Atomistic simulation was also used, in partnership with citro and vivo experimentation, to reveal that the surface reactivity of NPs and facile oxygen transport promotes pro-angiogenesis. (This research is funded by National Science Foundation and National Institute of Health) At the end, I will conclude the talk describing our research activities at Materials Eng and Nano Center at UCF.

Sudipta Seal, Ph.D.

Sudipta Seal, University Distinguished Professor and UCF Pegasus Professor, joined the Advanced Materials Processing and Analysis Center (AMPAC) and Mechanical Materials Aerospace Engineering at the University of Central Florida in Fall 1997 after a brief postdoctoral work at Lawrence Berkeley National Laboratory, University of California Berkeley. During his postdoctoral research, he was instrumental in the development of Scanning transmission X-ray microscopy and spectroscopy and Scanning photoemission spectroscopy for materials science applications. At UCF, he pioneered nanostructured cerium oxide and other metal/oxide platforms (micro to nano) and discovered its antioxidant properties and applied in various biomedical problems led to various patents in the area of regenerative nanostructures. His group is currently studying the biochemical interfaces of nanostructures and composites using various surface and electrochemical techniques to understand the redox properties responsible for its regenerative properties at nanoscale.