UCLA Engineering
HENRY SAMUELI SCHOOL OF
ENGINEERING AND APPLIED SCIENCE

BIOENGINEERING

PRESENTS

Cells as Bio-Factories to Heal Wounds

THURSDAY, March 14, 2019
12:00 – 1:00 PM
2101 ENGINEERING V

Ronke Olabisi, Ph.D.

Rutgers

Assistant Professor, Department of Engineering, Institute of Advanced Materials, Devices, and Nanotechnology

ABSTRACT:

Chronic wounds are skin injuries that recur or fail to heal by 6 weeks. These wounds affect 6.5 million patients in the US and this number is growing rapidly due to a drastic increase in the number of diabetics, the obese, and the elderly, all populations in which wound healing is impaired. Mesenchymal stem cells and topically applied insulin have each shown promise in healing otherwise intractable wounds. Mesenchymal stem cells assist wound healing by secreting a host of growth factors that promote actions critical to wound healing, such as angiogenic and anti-inflammatory effects, increased collagen synthesis, and macrophage and fibroblast migration. Insulin assists wound healing by activating the PI3k/Akt metabolic pathway that recruits mesenchymal stem cells and skin cells. A major limitation of these therapies is that following transplantation, mesenchymal stem cells often apoptose, migrate, or do not release sufficient levels of growth factor, mitigating their efficacy. Although topical insulin treatments are available, the short half-life of insulin necessitates daily applications, exposing wounds to potential infection. Work from my laboratory and others have shown that combining mesenchymal stem cells and insulin secreting cells improves the viability and function of the insulin secreting cells. Our lab further showed that the viability and function of the mesenchymal stem cells was improved by the presence of insulin. This symbiotic relationship enabled the transplantation of mesenchymal stem cells to wounds with high viability and the use of insulin secreting cells as "bio-factories" delivering a steady and fresh supply of insulin. Chronic wounds treated with the combination of cells: 1) healed without intermediate scab or scar formation; 2) healed at faster rates than normal non-diabetic wounds; and 3) healed 3x faster than controls and 2x faster than wounds healed by either cell type alone. Although therapies using only mesenchymal stem cells have shown promise, the gains in healing have been too modest to justify widespread use beyond the most difficult wounds. Our discovery that the combination of these cells heal wounds faster than normal and without scar opens the door to potential widespread use of cell-based strategies to accelerate wound healing. Current research efforts are investigating the cause of this synergistic effect, and whether it is applicable to other wounds such as burns and hypertrophic scar.

BIOGRAPHY:

Ronke Olabisi is an Assistant Professor at Rutgers University, with an appointment in the Department of Biomedical Engineering and an affiliation with the Institute of Advanced Materials, Devices, and Nanotechnology. She is a member of 100YSS and a committee member on the National Academies of Sciences, Engineering, and Medicine's study session: *Promising Practices for Addressing the Underrepresentation of Women in STEM.* Dr. Olabisi's research interests encompass biomechanics, biomaterials, tissue engineering, and regenerative medicine to repair or build *de novo* tissues for treating defects due to injury, disease, aging, or spaceflight. Specifically, her approach is through the development of biosynthetic materials, which combine the best

aspects of synthetic and biological materials to attain reproducible biomaterials that can drive or direct cell and tissue function. Dr. Olabisi is the recipient of the Frontiers in Bioengineering Best Poster Award (2014), the Charles and Johanna Busch Memorial Grant Award (2014), an Engineering Information Foundation Award (2016), the National Science Foundation CAREER Award (2018), the TechAdvance Commercializing Innovative Technologies Award (2018), and has a current invitation has a current invitation to submit to the Biomedical Engineering Society's Young Innovators in Cellular and Molecular Bioengineering (2019). Dr. Olabisi's research on the symbiotic relationship between coencapsulated cells has laid the groundwork for improving the outcomes of cell-based therapies, which have yet to achieve their potential. Dr. Olabisi's research group is supported by the National Science Foundation, the Engineering Information Foundation, TechAdvance, Johnson & Johnson, Condé Nast, and several other foundations and agencies.