BME Seminar Series
The Department of Biomedical Engineering and The Institute for Neural Engineering present

Dr. Tatiana Segura:
Looks Matter: How VEGF Presentation Impacts Endogenous Regeneration in the Brain

About the Speaker
Professor Tatiana Segura received her BS degree in Bioengineering from the University of California Berkeley and her doctorate in Chemical Engineering from Northwestern University. Her graduate work in designing and understanding non-viral gene delivery from hydrogel scaffolds was supervised by Prof. Lonnie Shea. She pursued post-doctoral training at the Swiss Federal Institute of Technology, Lausanne under the guidance of Prof. Jeffrey Hubbell, where her focus was self-assembled polymer systems for gene and drug delivery. Professor Segura’s Laboratory studies the use of materials for minimally invasive in situ tissue repair. These materials are designed to directly interact with the local tissue to harness their endogenous pro-repair ability to promote repair. On this topic, she has published over 70 peer reviewed publications. She has been recognized with the Outstanding Young Investigator Award from the American Society of Gene and Cell Therapy, the American Heart Association National Scientist Development Grant, and the CAREER award from National Science Foundation. She was elected to the College of Fellows at the American Institute for Medical and Biological Engineers (AIMBE) in 2017. She spent the first 11 years of her career at UCLA department of Chemical and Biomolecular Engineering and has recently relocated to Duke University, where she holds appointments in Biomedical Engineering, Neurology, and Dermatology.

About the Lecture
While blocking vascular endothelial growth factor A (VEGF) activity is an FDA approved strategy to limit diseases caused by over vascularization, the therapeutic delivery of VEGF promote vascularization in tissues that lack blood flow has failed in clinical trials. While over expression or delivery of VEGF in the target tissue has shown effective in animal models, the high doses used cause unwanted side effects in humans. Further, over expression or delivery of VEGF result in vessels that are often dilated, which can cause rupture or leakiness. During development and in adulthood, VEGF is expressed in different isoforms that result in different vessel architectures, long and dilated or thin and branched. One of the ways in which the different VEGF isoforms differ, is their ability to bind to the extra cellular matrix (ECM). Our work has demonstrated binding of VEGF to the ECM cause differential activation of endothelial cells, which lead to either proliferation or branching of endothelial cells in angiogenic vessels and result in the different vessel architectures mentioned. We believe that the lack of success of VEGF delivery in clinical trials is the delivery of VEGF in an unfavorable presentation for effective revascularization to occur. In the context promoting endogenous brain repair after stroke, we find that delivering VEGF as clusters results in activation of angiogenic vessel branching and improved revascularization of the stroke core. However, this also leads to increased inflammation and limited endogenous brain regeneration. When VEGF clusters are delivered along side heparin nanoparticles, an anti-inflammatory agent, we find that we can preserve effective revascularization, while lowering inflammation. This combination leads to effective endogenous brain regeneration of the stroke core, a location that is typically necrotic and does not spontaneously regenerate. Thus, the “looks” of VEGF matter to the cells and these looks can be engineered to promote endogenous repair.

Wednesday, March 20
@ 9:30 am
Diabetes Research Institute,
1st Floor Conference Room

Light refreshments
will be provided

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