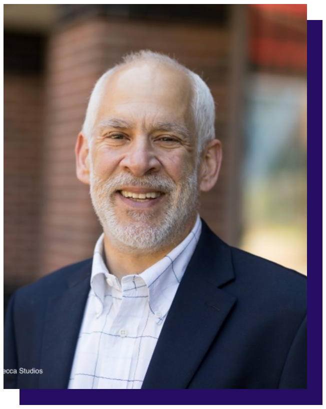
Joint Department of

BIOMEDICAL ENGINEERING

UNC CHAPEL HILL | NC STATE UNIVERSITY

Coulter Seminar Series Presents

"Imagine Engineered Heart Valves that Grow"



Robert T. Tranquillo, PhD
Professor
Departments of Biomedical Engineering and
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Prof. Tranquillo received his Ph.D. in Chemical Engineering in 1986 from the University of Pennsylvania. He was a NATO Postdoctoral Fellow at the Center for Mathematical Biology at Oxford for one year before beginning his appointment in the Department of Chemical Engineering & Materials Science at the University of Minnesota in 1987. He served as the head of the Department of Biomedical Engineering from its inception in 2000 until 2019. Prof. Tranquillo has used a combined modeling and experimental approach to understand cell behavior, in particular, directed cell migration, and cell-matrix mechanical interactions. More recently, his research program has focused on the role of these cell behaviors in cardiovascular and neural tissue engineering applications with a focus on clinical translation. His research program has resulted in over 120 peer-reviewed original research publications as first or senior author, being recognized with his selection for the TERMIS-AM Senior Scientist Award in 2015. Resulting intellectual property for a cardiovascular regenerative material platform technology was licensed by Vascudyne, Inc in 2017. His research has been continuously funded by NHLBI R01 grants since 1998 and major funding also currently includes a DoD CDMRP TTDA grant and Regenerative Medicine Minnesota grant. He currently also co-directs an NHLBI T32 cardiovascular engineering training program. Prof. Tranquillo is a Fellow of the American Institute of Medical and Biological Engineering, International Academy of Medical and Biological Engineering, and the Biomedical Engineering Society, and he is also a Distinguished McKnight University Professor.

ABSTRACT

We have developed a biologically-engineered tube of cell-produced collagenous matrix, which is allogeneic upon a decellularization performed prior to implantation and thus "off-the-shelf." It is grown from dermal fibroblasts entrapped in a sacrificial fibrin hydrogel tube that is then decellularized using sequential detergent treatments. The resulting cell-produced matrix tube possesses physiological strength, compliance, and alignment (circumferential). Using the concept of a tubular heart valve, where the tube collapses inward with back-pressure between 3 equi-spaced constraints placed around the periphery to create one-way valve action, we have created a set of novel heart valves for adults and children that offer indefinite durability and growth potential because the matrix becomes a living tissue with the recipient's cells post-implantation. Contact guidance by the cells is key to achieving the circumferential alignment. Recent studies are also presented that demonstrate the cells can sense the aligned fibrin fibrils via anisotropy of mechanical resistance presented by the fibrillar network.

Friday, November 18th
12:00 Noon

Presented From: 321 MacNider Hall (UNC)
Videoconferenced to: 4142 Engineering Building III (NC State)
& East Carolina University (ECU)