

Application Title: Enabling Technologies for Advanced Biofabrication

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Departments: Biomedical Engineering, Cellular and Molecular Medicine

Key Participating Units: CoE/TEES, CoM, CoS and VMBS

Requested Amount: \$2M

Summary: A multidisciplinary team of PIs representing four colleges at Texas A&M University, namely, Engineering, Science, Medicine and Veterinary Medicine & Biomedical Sciences, as well as the Institute for Regenerative Medicine (IRM), Center for Cell and Organ Biotechnology (CCOB) and National Center for Therapeutics Manufacturing (NCTM), request research development funds to establish a shared interdisciplinary **Regenerative Engineering Foundry (REF)**. Regenerative Engineering refers to biofabrication of engineered tissues for use as replacement tissues or as organoids for drug discovery. As a member of the newly established \$280M Advanced Tissue Biofabrication National Manufacturing Innovation Institute (ATB-NMII), TAMU will have the opportunity to compete for project calls to develop enabling technologies for tissue fabrication. To enhance TAMU's competitive edge, funds are requested to equip the REF with instrumentation providing a range of imaging modalities for non-destructive characterization of living biofabricated scaffolds. The microscopy system will allow fluorescence, fluorescence life-time imaging, Raman, nonlinear Raman (both stimulated Raman scattering (SRS) and coherent anti-Stokes Raman scattering (CARS)), infrared spectroscopy/microscopy, nonlinear Brillouin spectroscopy and microscopy, polarization spectroscopy and microscopy, harmonics microscopy, optical coherence tomography, and digital holographic tomography to assess a wide variety of materials and cellular properties. This versatile system will also have the unique capability to interface with robotic sample handling necessary for high-throughput monitoring of tissues growing in an array of form factors, including culture plates, tissue chips and bioreactors.

With the establishment of the REF, existing and new equipment for cell expansion, biofabrication, construct incubation/maturation and product monitoring will be available within a centralized location in the Emerging Technologies Building (ETB). The REF will be the bio-component of the TEES Institute for Manufacturing Systems co-located in the ETB. Scale-up of successful products and processes developed within the REF testbed will be supported by the ATB-NMII and related commercialization opportunities. As such, the proposed facility and services will impart TAMU with the capability to create and commercialize bio-devices involving human cells within one or more steps of a manufacturing process for fabricating engineered tissues for implantation and organ-on-a-chip technologies for drug discovery and toxicology. The proposed REF is closely aligned with TAMU's strategic interdisciplinary thrusts, especially related to Healthcare Technologies and Materials & Manufacturing. The facility will fill a significant gap on campus in coordinating research activities related to biomanufacturing, attract collaborations with industry and provide international visibility to the university. Through natural interactions with the NCTM and ATB-NMII, the REF will provide an excellent environment for the training of undergraduate and graduate students to meet the anticipated need of a workforce trained in advanced techniques unique to the upcoming biofabrication industry.