

RESEARCH PROJECTS*Culturing Platforms for Therapeutic Mesenchymal Stromal Cell Expansion*

The work of my research group focuses on the following general areas: (1) design and evaluation of biomaterials for therapeutic purposes; (2) application of materials for engineering tissue systems; and (3) advanced engineering strategies for developing *in vitro* models and culture systems. Central to these areas is an emerging area of research within my group focused on (4) integration of biomedical and engineering education research with a specific focus on evaluating classroom innovations for improving biomedical engineering student learning and exploring factors that facilitate success for diverse graduate students. The ongoing research efforts in my lab are diverse and interdisciplinary, with a number of collaborations being built through our work.

Of specific relevance for this FFIRE opportunity, key projects for the postdoc from this program could focus on advanced engineering strategies for developing *in vitro* models and culture systems, for which our work in this realm focuses on bioprinting, bioelectronic assays, and bioreactors. More specifically, our lab is affiliated with an engineering research center (ERC) supported by the National Science Foundation known as CMaT, which focuses on cell manufacturing technologies. This center aims to develop strategies for developing robust and scalable processes for production of therapeutic cells. In addition to the technical research mission, another essential component of CMaT's overall mission is workforce development and engagement in diversity and inclusion initiatives.

My lab's affiliation with CMaT is based on supporting the need for cells for biomedical applications. Central to the success of tissue engineering and regenerative medicine approaches is the availability of reliable cells for therapeutic purposes. In particular, mesenchymal stromal cells (MSCs) are widely used for regeneration of multiple tissues and are advantageous because of their potential to differentiate to multiple cell types and immunomodulatory properties. Methods for rapidly producing these cells, while maintaining these properties are essential. A bioreactor culture system was developed in our lab, and is being evaluated and optimized for MSC expansion and conditioning. Work by the FFIRE postdoc would be relevant towards our project goals, which are to optimize the bioreactor system and demonstrate its feasibility for improved MSC culture and cell conditioning for therapeutic applications. In addition, educational efforts for our CMaT affiliation have been focused on applying different strategies, such as virtual labs for teaching the needed workforce about cell manufacturing. The FFIRE postdoc could work on both the technical and educational aspects of this work, which are aligned with the mission of CMaT.