NSF Awards $3M Stem Cell Bio-Manufacturing Program to Georgia Tech

Georgia Tech Institute of Technology

The National Science Foundation (NSF) has awarded $3 million to the Georgia Institute of Technology to fund a unique research program on stem cell bio-manufacturing. The program is specifically focused on developing engineering methods for stem cell production, in order to meet the anticipated demand for stem cells. The award comes through the NSF's Integrative Graduate Education and Research Traineeship (IGERT) Program, which supports innovation in graduate education in fields that cross academic disciplines and have broad societal impact.

While stem cell research is on the verge of broadly impacting many elements of the medical field -- regenerative medicine, drug discovery and development, cell-based diagnostics and cancer -- the bio-process engineering that will be required to manufacture sufficient quantities of functional stem cells for these diagnostic and therapeutic purposes has not been rigorously explored.

"Successfully integrating knowledge of stem cell biology with bioprocess engineering and process development into single individuals is the challenging goal of this program," said Todd McDevitt, an associate professor in the Wallace H. Coulter Department of Biomedical Engineering at Georgia Tech and Emory University and a Petit Faculty Fellow in the Parker H. Petit Institute for Bioengineering and Biosciences at Georgia Tech.

McDevitt is leading the IGERT with Robert M. Nerem, professor emeritus of the George W. Woodruff School of Mechanical Engineering at Georgia Tech. Nerem is also director of the Georgia Tech/Emory Center (GTEC) for Regenerative Medicine, which will administer this award.

Ph.D. students funded by Georgia Tech's stem cell bio-manufacturing IGERT will receive interdisciplinary educational training in the biology, engineering, enabling technologies, commercialization and public policy related to stem cells. Their research efforts will focus on developing innovative engineering approaches to bridge the gap between basic discoveries made in stem cell biology and therapeutic stem cell-based technologies.

"This program provides a unique opportunity for engineers to generate standardized and quantitative methods for stem cell isolation, characterization, propagation and differentiation," said Nerem. "These techniques must be developed in a scalable manner to efficiently produce sufficient numbers of stem cells and derivatives in accessible formats in order to yield a spectrum of novel therapeutic and diagnostic applications of stem cells."

The Georgia Tech program is centered around three main research thrusts, which

focus on several critical technologies that must be developed to enable the application and use of stem cell-based products:

Creating reproducible, controlled and scalable methods to expand and differentiate stem cells with defined phenotypes and epigenetic states.

Developing reliable, rapid and quantifiable methods to characterize the composition and function of stem cells to be generated.

Designing low-cost systems capable of producing large populations of defined stem cells and derivatives.

Students in the program will be able to take advantage of the core facilities provided by the new Stem Cell Engineering Center at Georgia Tech, which is directed by McDevitt. Technologies developed by the students supported through this IGERT will be rapidly integrated into academic and industrial stem cell practices and cell-based products.

The award will support 30 new Ph.D. students over the next five years and brings together more than two dozen faculty members from Georgia Tech, Emory University, the University of Georgia and the Morehouse School of Medicine. In addition, plans are being made for students to participate in international research collaborations with the National University of Ireland at Galway, Imperial College London, the University of Cambridge and the University of Toronto.

"We anticipate this program will produce the future leaders and innovators in the field of stem cell bio-manufacturing who will contribute significantly at the interface of stem cell engineering, biology and therapy," added McDevitt.

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