Transformative NIH Grant Will Support Development of Tissue Regeneration Therapeutics

Georgia Tech Institute of Technology

The National Institutes of Health (NIH) has awarded nearly $2 million to researchers at the Georgia Institute of Technology and Emory University to develop a new class of therapeutics for treating traumatic injuries and degenerative diseases.

The five-year project focuses on developing biomaterials capable of capturing certain molecules from embryonic stem cells and delivering them to wound sites to enhance tissue regeneration in adults. By applying these unique molecules, clinicians may be able to harness the regenerative power of stem cells while avoiding concerns of tumor formation and immune system compatibility associated with most stem cell transplantation approaches.

"Pre-clinical and clinical evidence strongly suggests that the biomolecules produced by stem cells significantly impact tissue regeneration independent of differentiation into functionally competent cells," said Todd McDevitt, director of the Stem Cell Engineering Center at Georgia Tech and an associate professor in the Wallace H. Coulter Department of Biomedical Engineering at Georgia Tech and Emory University. "We want to find out if the signaling molecules responsible for scarless wound healing and functional tissue restoration during early stages of embryological development can be used with adult wounds to produce successful tissue regeneration without scar formation."

In addition to McDevitt, Coulter Department associate professor Johnna Temenoff and Woodruff School of Mechanical Engineering professor Robert Guldberg are also investigators on the project.

Regenerative medicine seeks to restore normal structure and function to tissues compromised by degenerative diseases and traumatic injuries. The contrast between embryonic and adult wound healing suggests that molecules that facilitate tissue regeneration during embryonic development are distinctly different from those of adult tissues.

This grant includes plans for engineering biomaterials that can efficiently capture morphogens, which are molecules secreted by embryonic stem cells undergoing differentiation. The study will also evaluate the regenerative activity of molecule-filled biomaterials in animal models of dermal wound healing, hind limb ischemia and bone fractures. Examining the effects of the morphogens on a range of animal wound models will increase the likelihood of success and define any limitations of the technology, such as its use for specific tissues or injuries.

"Biomaterials have largely been used in an attempt to direct stem cell

differentiation or serve as passive cell transplantation vehicles for regenerative medicine and tissue engineering purposes," said McDevitt, who is also a Petit Faculty Fellow in the Institute for Bioengineering and Bioscience at Georgia Tech. "The idea of specifically engineering biomaterial properties to capture and deliver complex assemblies of stem cell-derived morphogens without transplanting the cells themselves represents a novel strategy to translate the potency of stem cells into a viable regenerative medicine therapy."

The award was one of 17 granted this year through the NIH Director's Transformative Research Projects Program (T-R01), which was created to challenge the status quo with innovative ideas that have the potential to advance fields and speed the translation of research into improved health for the American public.

Another T-R01 grant was awarded to Coulter Department professor Shuming Nie, associate professor May Wang and University of Pennsylvania School of Medicine Thoracic Surgery Research Laboratory director Sunil Singhal. That $7 million, five-year grant will support continuing work by the Emory-Georgia Tech Nanotechnology Center for Personalized and Predictive Oncology team on developing fluorescent nanoparticle probes that hone in on cancer cells and on creating instruments that visualize them for cancer detection during surgery.

Since its inception in 2009, the NIH Director's Award Program has funded a total of 406 high-risk research projects, including 79 T-R01 awards.

"The NIH Director's Award programs reinvigorate the biomedical work force by providing unique opportunities to conduct research that is neither incremental nor conventional," said James M. Anderson, director of the Division of Program Coordination, Planning and Strategic Initiatives, who guides the NIH Common Fund's High-Risk Research program. "The awards are intended to catalyze giant leaps forward for any area of biomedical research, allowing investigators to go in entirely new directions."

Research News & Publications Office
Georgia Institute of Technology
75 Fifth Street, N.W., Suite 314
Atlanta, Georgia 30308 USA

Media Relations Contacts: Abby Robinson (abby@innovate.gatech.edu; 404-385-3364) or John Toon (jtoon@gatech.edu; 404-894-6986)

Writer: Abby Robinson

SOURCE [1]

Links:
[1] http://www.gatech.edu/newsroom/release.html?nid=70130