Improved Differentiation of Stem Cells into Cardiac Muscle Cells for Cardiac Tissue Repair (2014-091)

New peptide identifies biological ligands and signaling pathways, promotes therapeutic angiogenesis

Market Overview

This approach advances the maturation of stem cells or progenitor cells, cells that differentiate like stem cells, to produce functional, biocompatible cardiomyocytes for the repair of damaged cardiac tissue. Cardiomyocytes are specialized cardiac muscle cells essential for cardiac muscle health. Cardiovascular disease, the leading cause of death worldwide, kills one in four Americans annually. A heart attack alone irreversibly destroys one billion cardiomyocytes, which can cause heart failure. Recent research suggests progenitor cells have the potential for regeneration; however attempts to produce functional cardiomyocytes from these cells are limited by their immature phenotype and inability to generate sufficient tissue. Clemson University researchers and their cardiac research collaborators at the Medical University of South Carolina (MUSC) have developed an approach for producing functional, mature cardiomyocytes from progenitor cells by incorporating electrically conductive nanomaterials into scaffold free spheroids. By introducing trace amounts of novel electrically conductive nanowires (e-NWs) into cardiac spheroids, the potential for regeneration of damaged tissue from progenitor cells is possible.

Technical Summary

The incorporation of trace amounts of e-NWs into scaffold-free spheroids conditions immature stem or progenitor cells into functional, mature cardiomyocytes by creating a conductive microenvironment for them to mature. These electrically conductive spheroids initiate synchronized electrical signal propagation within the microtissues to improve functional assembly of cardiomyocytes. The e-NWs are biodegradable and help facilitate the formation of an electrically conductive network, leading to synchronized and significantly enhanced contraction for more advanced cellular, structural and contractile maturation of the progenitor cells.

Application

Cardiac tissue repair, *in vitro* drug screening

Development Stage

In Vitro studies

Advantages

- Utilizes trace amounts of e-NWs, minimizing adverse effects and optimizing biocompatibility
- Demonstrates biodegradable yet electrically conductive properties, accurately replicating the in vivo microenvironment
- Enables synchronized electrical signal propagation, facilitating the development of functional issues

App Type	Country	Serial No.	Patent No.	CURF Ref. No.	Inventors
PCT	United States	PCT/ US2016/ 013647	NA	2014-091	Dr. Ying Mei Tan Yu Dylan Richards Bozhi Tian Donald Menick

About the Inventor

Dr. Ying Mei

Assistant Professor of Bioengineering at Clemson University

Dr. Ying Mei earned his Ph.D. in Material Chemistry from Polytechnic Institute of New York University. Prior to joining Clemson University, Dr. Mei was a guest researcher at the National Institute of Standards and Technology and was a postdoctoral researcher in the Langer Lab at MIT. His research interests focus on biomaterials, stem cell engineering, and tissue engineering.

For more information on this technology contact:

A. Chris Gesswein
Director of Licensing for Technology Transfer

E: agesswe@clemson.edu
P: (864) 656-0797