CLEMSON UNIVERSITY RESEARCH FOUNDATION
curf.clemson.edu

Plant-Derived Extracellular Vesicles (PDEVs) for Therapeutics' Vectors

(2022-044)

Extraction, Isolation, Purification, and Recovery of PDEVs Using Capillary-Channeled Polymer Fiber Structures.

Market Overview

This technology applies to the isolation, purification, and recovery of extracellular vesicles from plant materials, referred to as plant-derived extracellular vesicles. The exosome population of the PDEVs are employed for use as vectors for the delivery of therapeutics. Exosome vectors are a promising means for the treatment of many diseases, many of which are currently in clinical trials. Roots Analysis expects the current exosome therapeutics market to grow at a projected CAGR of more than 30% by 2035. Much of extracellular vesicles (EV) research remains restricted to human biofluid samples and cell culture media. Current exosome isolation methods can be too time-consuming, ineffective, and risk damage to the exosomes. The development of EV vector technologies from alternative, natural sources as therapeutic delivery vectors would provide a low-cost, sustainable approach for therapeutic applications. To date, the methods employed for biofluid isolation are very much challenged regarding yields and purities. To address these issues, Clemson University researchers have developed a novel isolation method to harvest PDEVs for therapeutic delivery applications. This technology has the potential to transform the breadth of sources of exosomes into more sustainable and lower-cost matrices

Technical Summary

This technology uses poly(ethylene terephthalate) (PET) capillary-channeled polymer (C-CP) fibers and hydrophobic interaction chromatography (HIC) as an isolation platform to isolate PDEVs. This process allows for exosome isolation within minutes. The versatility of the C-CP fibers allows for the addition of antibodies, surface chemistries, and other isolation modalities to transform a generic exosome isolation into a fast and effective type-specific exosome separation method. Exclusive isolation of specific exosomes and reliable miRNA and exosome surface marker protein interpretation may become an essential tool for medical diagnosis and may prove especially useful for early diagnosis of diseases.

Application

PDEVs, Isolation, Purification, Capillary-channeled polymer fibers

Development Stage

TRL 4: Validated in Lab

Advantages

- Tip isolation method, increasing higher levels of recovery
- Unique usage of plant-derived extracellular vesicles, increasing purification outcome
- Novel use of botanical systems for delivery, lowering supply costs

App Type	Country	Serial No.	Patent No.	CURF Ref. No.	Inventors
TRL 4: Validated in Lab	United States	63/350,203	NA	2022-044	Dr. Richard Kenneth Marcus Dr. Kaylan Jackson Carolina Mata

About the Inventors

Dr. Richard Kenneth "Ken" Marcus

Rodger Adger Bowel Professor in the Department of Chemistry at Clemson University

Dr. R. Kenneth Marcus is a Rodger Adger Bowen Professor in the Clemson University Department of Chemistry. He earned his Ph.D. in Analytical Chemistry from the University of West Virginia. He serves on the editorial advisory board for three international and was named the recipient of the 2001 South Carolina Governor's Award for Excellence in Science Research. In 2010, Dr. Marcus was named a Fellow of the Royal Society of Chemistry (FRSC), in 2012 a Fellow of the American Association for the Advancement of Science (AAAS), and in 2016 a Fellow of the Society for Applied Spectroscopy. Dr. Marcus is the Principal Investigator for the Marcus Research Lab that works to investigate the development of a novel atmospheric pressure glow discharge source and research protein separations using novel capillary-channeled polymer fibers as high-performance liquid chromatography stationary phases.

Dr. Kaylan Jackson

Scientific Consultant for Johnson & Johnson

Dr. Kaylan Jackson is a Scientific Consultant for Johnson & Johnson and Clemson alumna. She earned her Ph.D. in Analytical Chemistry from Clemson University, where she worked with Dr. Marcus to develop novel methods for isolation and characterization of nanovesicles. While at Clemson University, Dr. Marcus received many awards, including the 2022 Graduate Faculty Award, the 2020 Young Investigator Award from the International Society for Extracellular Vesicles, and the 2018 Dr. Earl C. Ray '38 Student Endowment Award. She is a Clemson University Mandel Fellow and was named an Honorary CDC Biochemical Markers ORISE Fellow by the Centers for Disease Control (CDC).