

Mechano-Therapeutics

Company Overview

Mechano-Therapeutics LLC is developing a tunable drug delivery platform that responds to mechanical forces within the human body to deliver therapeutics. Our mechanically-activated microcapsules (MAMCs) can be programmed to release biofactors 'on-demand' in order to optimize and accelerate the repair and regeneration of musculoskeletal tissues.

Problem

Musculoskeletal injuries, such as cartilage damage and ligament or meniscal tears, lead to debilitating joint pain and the need for surgical intervention to provide relief and restore function. While artificial joint replacements are the gold standard to treat end-stage degeneration, this technique is invasive, costly, involves the removal of healthy tissue, and there are associated comorbidities secondary problems including infections and revision arthroplasty. Recently, biologic strategies using a regenerative cellular approach and biomaterials have been explored to treat local defects and early degeneration. However, current delivery technologies are less than optimal as a result of lack of sustained release, uncontrolled concentration issues, and off-target joint. As a result, patients treated using a biologic approach heal slowly and only return to full activity and weight bearing at least one year after surgery. Therefore, a strong clinical need exists to develop a novel drug delivery platform that optimizes the local and temporal therapeutic release profile in order to accelerate and augment musculoskeletal tissue repair.

Solution

Mechano-Therapeutics LLC developed a novel drug delivery platform that is self-regulated by the mechanically loaded environment within musculoskeletal tissues. While conventional drug delivery systems utilize passive release of an encapsulated therapeutic, our MAMCs require an active signal from mechanical input, to trigger drug release in a localized and tunable fashion. Our technology alleviates the need for multiple needle sticks due to the extended lifetime of delivery and can be used in combination with existing biological repair strategies. As a platform, the MAMC technology allows for release of a variety of therapeutics at different times based on MAMC shell properties. Potential applications include the delivery of biofactors to improve biological repair as well as drugs to alleviate pain, control infection, and reduce inflammation.

Founder Information

Dr. George R. Dodge, Associate Professor of Orthopaedic Surgery and Otorhinolaryngology, and Director of the VA Translational Musculoskeletal Research Center, is an expert in developing tissue engineering approaches in articulating joints.

Dr. Robert L. Mauck, the Mary Black Ralston Professor of Orthopaedic Surgery and Bioengineering, and Director of the McKay Orthopaedic Research Laboratory, is an expert in developing novel approaches to repair damaged musculoskeletal tissues.

Dr. Daeyeon Lee, Professor of Chemical and Biomolecular Engineering, specializes in the development of soft matter systems based on emulsion encapsulation techniques.

Dr. Bhavana Mohanraj, is a recent PhD graduate and an expert on developing the MAMC drug delivery platform and its ongoing testing in physiologically relevant models.