Team #: Title of Project should take up no more than 2-3 lines, Arial Bold 18pt, keep this color

Sponsored by: Institute for Regenerative Engineering, UCONN Health Center
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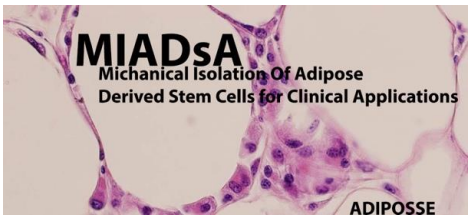

BIOMEDICAL ENGINEERING

Cartilage is a connective tissue within the human body that provides the cushioning and lubrication needed for joints. Osteoarthritis is a degenerative disease that affects the cartilage of the knees. There is currently no approved cartilage regeneration treatment in the United States. Osteoarthritis causes debilitating pain depending on the stage of degeneration and it is the leading cause of decreased or impaired mobility in the elderly. Around 700,000 people each year in the United States receive a knee replacement surgery. Many recipients of these surgeries are patients who suffer from osteoarthritis. However, these procedures are invasive and can have complications such as implant loosening.

Adipose derived stem cells (ADSCs) are a multipotent stem cell that is found within the fat of most species. These stem cells have been shown to have great potential in terms of healing and improving tissue regeneration. ADSCs are more readily available and ethically favorable when compared to embryonic stem cells. ADSCs are easier to isolate than mesenchymal stem cells (MSC) from bone marrow. Obtaining stem cells from adipose tissue is a much more attractive prospect for patients in terms of non-invasiveness, comfort, availability, and expendability than obtaining them from the bone marrow. ADSC's have the ability to differentiate into chondrocytes which has immense potential as a cartilage regeneration option. In order to utilize the potential of ADSC's, they need to be isolated from the body tissue and then replanted to the desired location.

The goal of this project is to create a method to rapidly harvest adipose tissue and adipose derived stem cells that can be used within a patient to help regenerate the cartilage. The most prevalent method to isolate ADSCs utilizes collagenase to breakdown the extracellular matrix. Due to the FDA guidelines, this method has limited clinical applications. Therefore, experimentation will be done to determine the efficacy of utilizing freeze and thaw cycles, ultrasound radiation, and vibrations to break down collagen. These methods will be developed into a rapid closed looped sterile system to increase the clinical potential of a cartilage regeneration treatment.

Once adipose-tissue harvesting and stem cell isolation procedures are developed, an induced osteoarthritis model will be created in rats to mimic what occurs in humans. The isolated ADSC's viability (proliferation and differentiation) will be examined by implanting them in the osteoarthritis-induced joint. This project has the potential to improve human health as it is aimed at regenerating deteriorated cartilage which affects a multitude of patients.