

Group #76 Elevator Pitch Video Link: <https://www.youtube.com/watch?v=6z6N1-7yO48&feature=youtu.be>

Injection of Autologous Mitochondria to Regenerate Osteoarthritic Cartilage in Rats

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In 2020, over 151 million people globally suffer from osteoarthritis (OA)¹, the most prevalent cause of disability in older adults². Presently, no treatment can reverse OA cartilage damage. Current research suggests that mitochondrial dysfunction plays a key role in OA by decreasing extracellular adenosine levels, which dysregulates chondrocyte homeostasis¹. A recent study tackled this issue by injecting adenosine in OA rodent knees, which reversed cartilage damage by binding to the anti-inflammatory receptor A2A³. However, this method required weekly injections and did not fix the root of the issue. We propose mitochondrial autotransplantation in OA chondrocytes as a sustainable approach to increasing the production of ATP, which is then transported to the extracellular matrix and broken down into adenosine³. It has already been demonstrated that mitochondria from bone marrow mesenchymal stem cells (BM-MSC) can be taken up by OA rat chondrocytes *in vitro*⁴ and that ischemic rabbit cardiomyocytes can integrate isolated mitochondria injected *in vivo*⁵. We hypothesize that injection of mitochondria isolated from autologous BM-MSC into OA rat knees will result in increased extracellular adenosine, promoting cartilage regeneration. The isolated mitochondria will be tagged with LV-Mito-GFP⁴, an immunofluorescence marker, for later analysis. We expect a successful mitochondrial uptake that will ensure a steady and sufficient supply of extracellular adenosine, suggesting a long-term effect on regenerating OA cartilage. Treatment effectiveness will be measured through weekly comparison of OARSI scores, which assesses cartilage damage severity⁶. If successful, mitochondrial transplantation could be further explored as a regenerative approach to treating osteoarthritis.

Key words: osteoarthritis, regenerative medicine, mitochondrial transplantation

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