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Targeted joint therapy using TAT peptides in Osteoarthritic cartilage

Osteoarthritis (OA) is a debilitating disease that affects millions of Americans each year. It is characterized as a loss cartilage, the smooth tissue lining human joints. Currently, there is no cure for OA and the only treatment is an invasive and painful knee or hip replacement. Due to this, there is a need for a novel drug therapy to be developed. The objective of this study is to characterize the diffusion and uptake of TAT Protein Transduction Domain (TAT-PTD), a positively charged, small peptide. TAT-PTD has been tested in FDA clinical trials and has been shown to be a safe and effective drug delivery vehicle. We hypothesize the charge difference between positively charged TAT-PTD and negatively charged cartilage will increase the efficacy of drug delivery to cartilage. In this study, samples of OA cartilage were placed into a solution containing fluorescently labeled TAT peptides. I expect the study will show limited results because there is a diminished negative charge in OA cartilage due to the loss of negatively charged proteins. This will then decrease the attractive force between the TAT-PTD and cartilage. Multiple other studies have also had the same results. These studies have found that positively charged molecules have a decreased uptake in OA affected cartilage. Therefore, similar results could be expected in this OA model system. The impact of this data is to better understand how positive charge can affect the efficacy of drug delivery to OA cartilage. In addition, the data provides information on how positively charged molecules could be used to enhance drug delivery.

Acknowledgements: Sarah Mailhiot (MSU Graduate Student) - Mechanical & Industrial Engineering