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Cartilage Engineering: Optimization of Media for Chondrogenic Differentiation *In Vitro*

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ABSTRACT

Lower back pain from intervertebral disc injury affects around 84% of the population at some point in their life, which at its worst may cause total immobilization. This pain can only be temporarily relieved by spinal fusion or intervertebral disc replacement; however, both of these cause loss of natural motion in patients by removing damaged fibrocartilage discs. While these techniques help mitigate pain briefly, no permanent solution exists currently to both relieve pain and preserve natural motion. My work may be a solution by eventually providing patient-specific implants that resemble native tissue in the regeneration process that could be absorbed and remodeled by the body. The purpose of this study is to use tunable type I oligomeric collagen matrices for culturing of patient-derived stem cells to optimize chondrogenic media. Human adipose stem cells (hASCs) were passaged and used in conjunction with oligomer collagen, which was polymerized as cell/oligomer mixtures and plastically compressed to a density of 24.5mg/mL, with 4.5×10^5 cells per sample. These cell-matrix constructs were cultured with different media and supplements (namely TGF- β (3) and L-ascorbic-acid-2-phosphate) for 1 week. Safranin-o staining was used to detect sulfated glycosaminoglycans, a direct measure of chondrogenesis. Preliminary results show that supplemented DMEM media has the most chondrogenic potential, but further study is required. These results will be used to further improve the process of chondrogenesis *in vitro* in order to develop fibrocartilage constructs for use *in vivo*, eventually allowing for implantable constructs that both preserve natural disc height and relieve pain more permanently.

KEYWORDS

Chondrocyte, media, differentiation, type I oligomer collagen, adipose stem cells