**INTRODUCTION**

Articular cartilage defects affect 25 million people [1]. Microfracture and Matrix-induced Autologous Chondrocyte Implantation (MACI) are two techniques to heal the cartilage, but they both have limitations. Microfracture is beneficial for short term treatment but requires intensive rehab and cannot be used for large defects [2]. Similarly, MACI allows the joint to be weight bearing but requires two surgeries and has a long turn around time [3]. Literature notes that biological based scaffolds promote regeneration and extracellular matrix (ECM) scaffolds might improve cartilage regeneration [4].

**SOLUTION: DECELLULARIZED PORCINE MENISCI (MEND)**

The Gottardi Lab has made significant efforts in creating a new ECM scaffold called MEND. Methacrylated collagen hydrogels (ColMA) and methacrylated gelatin hydrogels (GeMaHAMA) were chosen because of their clinical applications to compare to MEND, an ECM based biomaterial.

**MEND**
- Porcine derived decellularized meniscus
- Natural mechanical properties
- Mid-stiffness compared to other scaffolds

**ColMA**
- Bovine Derived Type I Collagen
- Used in MACI
- Type 1 collagen is main ECM component in MEND

**GeMaHAMA**
- Purified Porcine derived gelatin
- Similar molecular composition to CoMA properties
- HAMA is a significant GAG component of MEND

**FABRICATION AND RECELLULARIZATION OF MEND**

MEND is prepared through freeze/thaw cycles and enzyme degradation (pepsin and elastase) to decellularize and create channels for recellularization. To assess the preoperative properties of MEND, Mesenchymal Stem Cells (MSCs) were given 5 days for infiltration.

**CHARACTERIZING MEND**

Porosity and channel diameter are important for recellularization with MSCs. To decrease manual time and reduce bias, a code was developed using Python to automate the characterization process.

**HISTOLOGICAL RESULTS**

Histology shows increased GAG and collagen content for the GeMA/HAMA and ColMA gels. However, the gels and pellets do not show uniform matrix secretion suggesting a better clinical scaffold is needed for cartilage repair.

**TESTING CHONDROGENESIS**

CoMA, and GeMaHAMA scaffolds were seeded with MSCs at 104/mL and underwent 21 day chondrogenesis. Pellet culture was used as a positive control since chondrogenesis occurs best in 3D. Samples were collected for histological analysis to measure cell matrix secretion.

**CONCLUSIONS AND NEXT STEPS**

- The hydrogels show that they may not be an ideal chondrogenic scaffold because of the non uniformity of cells and their matrix secretion.
- We were able to characterize the porosity and channel diameter of MEND to ensure invasion with MSCs, as well as optimize cell density and time for better infiltration. Next Steps: Look at chondrogenesis of MSCs in MEND over a 21 day period and compare it to the histological results of the hydrogels. Additionally, biochemical assays and qRT-PCR will be analyzed for matrix content and gene expression.

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