Fetal Epiphyseal Chondrocytes Behavior Within 3D Hydrogels

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Rationale
- Natural cartilage repair capacity is limited due to a low cells supply and no access to blood vessels.
- Cell implantation is required to enhance cartilage repair.
- New cell source candidate for cell implantation:
  - Fetal Epiphyseal Chondrocytes (FECs)
  - FECs behavior while encapsulated in 3 dimensional substrate is unknown and should be studied.
- This study benefits from the use of a well known photopolymerized PEGDM hydrogel substrate to facilitate systematic analyses of FECs behavior.

Aim
Link 3D substrate properties with FEC behavior.

Methodology

Hydrogel Synthesis
Six formulation

Hydrogel Characterization
Swelling, Mechanical Evaluation

Cell Viability
Live/Dead, Cell titer (Day 7, 21)

Matrix Production
FECs Viability/Cytotoxicity
qPCR, Histology (Day 7, 21)

Processing

3D Hydrogels Substrate
Poly(Ethylene glycol)-Dimethacrylate (PEGDM)

FECs Photoencapsulation
Polymer solution
- PEGDM
- FECs
- Photoinitiator

Six Different Hydrogels Formulations
PEGDM Concentration [% w/w] 10, 20 and 30
PEGDM Molecular weight [kDa] 6 and 20

Results

Hydrogel Characterization

FECs Viability/Cytotoxicity

Matrix Production
Glycosaminoglycan deposition
Gene expression by qPCR

Summary
- PEGDM hydrogels constitute a controllable system for the encapsulation of FECs.
- FECs maintain viability in gels with less than 20 %w/w PEGDM.
- Increased chondrogenic gene expression was observed in four gel formulations.
- 10% w/w PEGDM 6 kDa shows overall better results.

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