Biopolymer Micro-Structured Photoreceptor Replacement Scaffolds

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Problem: Age-Related Macular Degeneration (AMD)

- AMD causes gradual blindness due to tissue death in the macula
- No cure exists for AMD
- Current treatments cannot restore vision after the death of photoreceptor cells
- 9.1 million people suffer in the United States alone

https://www.lasereyesurgeryhub.co.uk/age-related-macular-degeneration-amd-guide/
Current Treatments

EARLY AMD
• Nutritional therapy
• Gene therapy

LATE AMD
• Anti-VEGF therapy
• Photocoagulation

Need to replace photoreceptor cells!

Scaffold Fabrication

- UV Light
- Biopolymer Solution
- 50µm Spacers

Photopolymerized Biopolymer Scaffold
Scaffold Stiffness

\[ G' = G'_\infty (1 - \exp[-\alpha (t/t_c - 1)^\beta]) \]
Scaffold Fidelity

Normalized Pore Diameter (µm)

- Gelatin
- Gelatin/Hyaluronic Acid

Expected Pore Diameter
~75 µm

UV Intensity (W/cm^2)
% Weight Remaining = (1 - \frac{\text{Initial Wet Weight} - \text{Wet Weight at Timepoint}}{\text{Initial Wet Weight}}) \times 100
Scaffold Swelling

\[ \text{Swelling \%} = \left( \frac{\text{Wet Weight}}{\text{Dry Weight}} \right) \times 100 \]
Biocompatibility

GELATIN

50/50 GELATIN/HA

Blue = Alive
Green = Dead
Future Work

• Continue degradation and swelling studies at longer time points

• Determining if scaffolds influence cell differentiation

• Determining necessary mechanical properties for implantation