Characterizing GelMA Stiffness for 3D Tumor-Microenvironment Studies

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Introduction

Engineered Tumor Models

- In Dr. Shen’s lab, researchers look to study the interaction between tumors and their microenvironment using engineered models.
- Our lab mainly utilizes 2D models, but 3D models are more representative of the in vivo setting.

Hydrogel Use in Culturing

- Hydrogels (highly cross-linked polymer networks) serve as the scaffolding material for these 3D models.
- Gelatin methacrylate (GelMA) is a highly customizable hydrogel that interacts well with cells and is biodegradable, making it ideal for culturing.

Our goal is to characterize GelMA hydrogels to create 3D cultures that effectively replicate the in vivo environment.

Methods

GelMA Synthesis:

- Dissolve gelatin 10% (w/v) at 50°C.
- Add methacrylic anhydride
- Dilute 2x with DPBS at 40°C.
- Lyophilize for 1 week at -80°C.
- Create different GelMA w/v ratios
- Crosslink using UV light.

Mechanical Testing

- Biopsy punch disks of GelMA for each formulation.
- Measure height and diameter of each of the disks.
- Mechanically test disks using Instron machine.

Results and Discussion

- As strain increases, need much more force to continue compression of disks.
- Higher w/v ratios have steeper curvature.
- Linear range was from 0 to 10% strain.

Future Steps

- Culture different cell types onto differing GelMA hydrogels to optimize stiffness for the cell types.
- Also, could calculate true degree of methacrylation in the crosslinked samples.

Acknowledgments

I want to thank all of the Ph. D., undergraduate, and high school students I have had the pleasure of interacting with during the course of this summer. I would also like to thank Dr. Katie Mills for giving me this incredible opportunity, all of the SHINE coordinators who made sure that everything went smoothly, and my SURE mentor, Josh Posen. Finally, I would like to thank my extremely patient and helpful mentor Peter Ta and of course Dr. Keyue Shen for allowing me to work in his lab over the summer.

References