Growth of ARPE Cells on a 3D Printed PLA Scaffold

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Introduction

- Tissue Engineering is the science of artificially creating tissues or organs to replace organs or tissues naturally found in the body.
- Promoting blood vessel growth is a common obstacle in tissue-engineered organs.
- 3D printed scaffolds are promising as tissue engineering methods.
- Poly-lactic acid (PLA) has been used in the past for scaffolds for other tissue types
- This study seeks to determine how cells are able to be cultured on 3D-printed PLA scaffolds with cylindrical geometries.

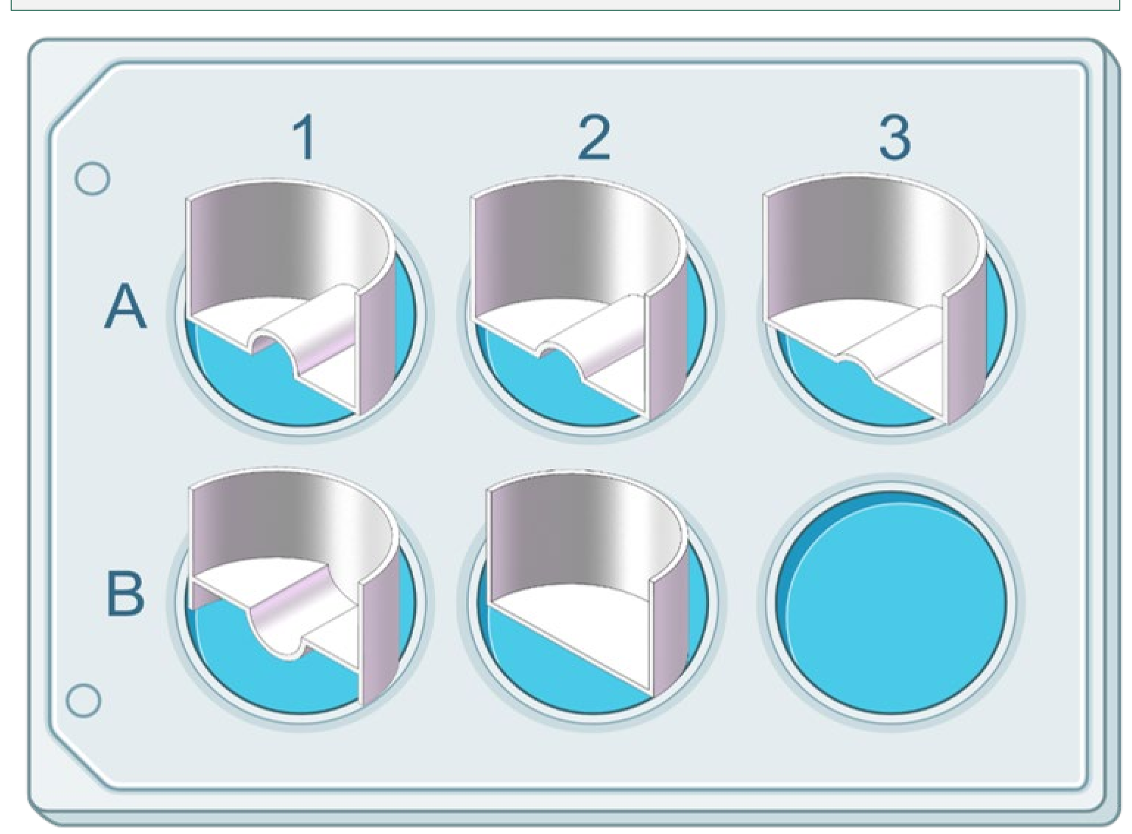

Figure 1 – Experimental design showing the layout of the scaffolds in the well plate.

Methods

- 3D printed scaffolds were prepared using transparent PLA filament.
- Scaffolds were chemically sterilized with ethanol and UV treated, then plasma treated to increase their hydrophilic properties.
- ARPE-19 cells were seeded onto the scaffolds, and cultured for 8 days.
- Fluorescence microscopy was used to view cell growth in the wells.
- Cells were counted to determine extent of growth on scaffolds.

Figure 2 – PLA 3D printed scaffolds. (Top, from left to right) Large diameter convex, medium diameter convex, and small diameter convex. (Bottom, from left to right) concave, flat

Results

- The control well – no PLA scaffold – had the highest number of cells per square cm.
- Well A1 – scaffold with largest convex geometry – had the second highest cell density.
- The scaffold that showed the least amount of cell growth was the well with the least severe angle.
- Imaging cells on 3D portions of scaffolds was difficult using traditional inverted microscopes.

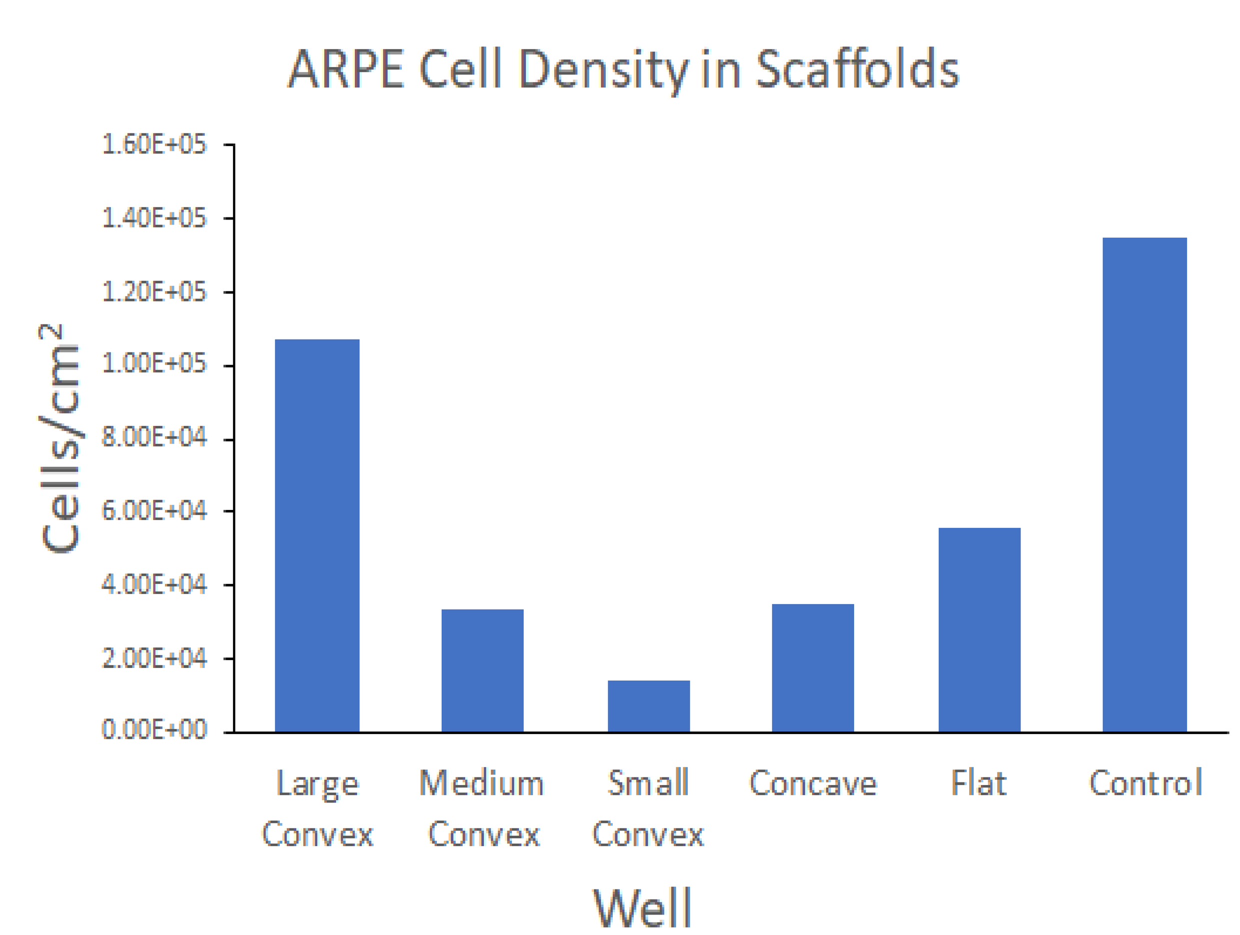

Figure 3 – The resulting cell density normalized for different surface areas.

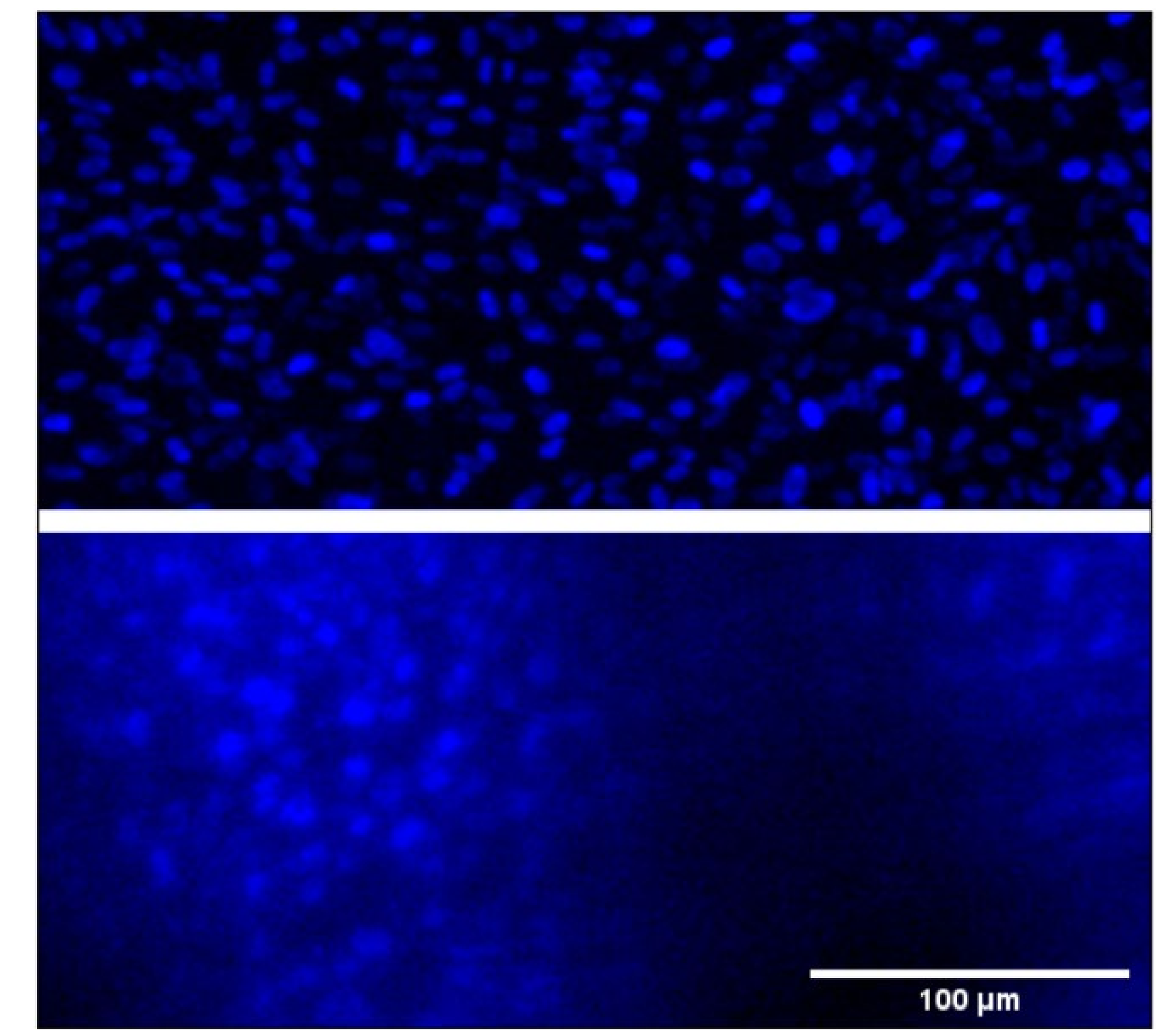

Figure 4 – Nuclear stains of the control well (top) and the flat PLA scaffold (bottom).

Conclusions

- This experiment shows great promise for the use of PLA as a scaffold for use in tissue engineering applications.
- In order to further validate our results, the experiment should be repeated with another cell line, and more replicates should be performed to gather additional data points.
- A better method of imaging the cells on the scaffold surface needs to be developed to evaluate spatial distribution of cells across scaffolds.

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