3D- Micromanufacturing Organoid Culture Devices

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Introduction

Professor McCain's lab focus:
- Develop reliable human tissue models, used for drugs testing and progression of diseases

James' research:
- Research neurological diseases- Alzheimer's, Autism, etc.
- 3D-chambers are used to grow cortical brain organoids

My research:
- Fabrication of 3D-Chambers
- Cutting lids and bases (PDMS)
- Quality control

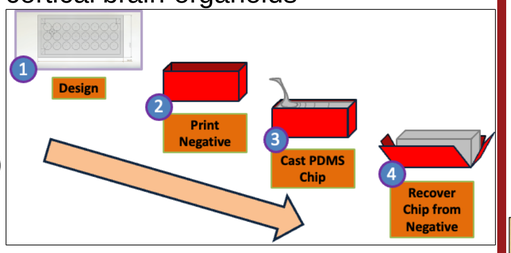


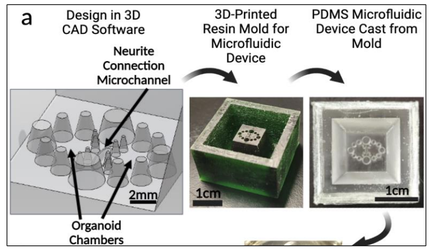
Figure 1: The creation of PDMS molds.PC: James Eichenbaum

Objective/Research Impact

Objective
- Engineering a 3D organoid device that will allow for the cortical nervous cells to grow

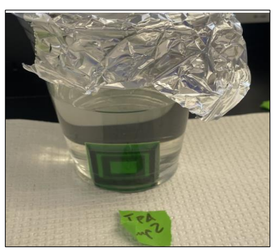
Research Impact:
- Better understanding of neurological disorders
- Further research in disorder identification
- Brain development understanding

Methods & Results



Creating 3D printed organoid:
- Send design to the resign printer
- Take off printed design from tray and clean it off
- Place in 2 different IPA baths
- Air brush dry, place in oven

Quality Control:
- Tie PDMS organoid prints in cases
- Fill syringe with Mili Q water
- Place tubes into 2mm holes in base



Research Skills Developed

Hard Skills
- Cutting/pouring PDMS
- Using centrifuge
- Using degasser
- 3D-Printing (resin, extrusion)
- Fabrication

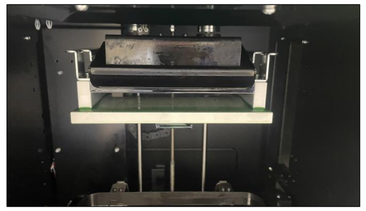


Figure 3: Above, Organoid device being created in resign 3D printer. PC: Gianna Anguiano

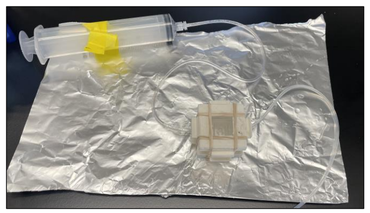


Figure 2: Quality control process. PC: Gianna Anguiano

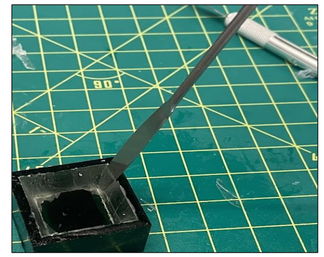


Figure 4: Cutting PDMS out of a 3D printed mold using a blade and scalpel. PC: Gianna Anguiano

Soft Skills
- Following lab protocols
- Reading/ annotating research papers
- Scientific presentation

Advice for Future SHINE students

My advice for future SHINE students is to use every opportunity you get to the fullest. Every week professionals in the engineering field come in and talk about what they do. Take that opportunity to talk to them and ask the questions. If you're in a lab, take every chance you get to be in there and write down everything you absorb. This is an amazing opportunity to use it the future so take advantage of it right now.

Acknowledgements

A special thank you to Northrop Gruman, Professor McCain, James Eichenbaum, Alisa Peshina, Heidi Repp, Estrella Garrido, Monica Lopez, Marcus Guiterrez, the entire SHINE team, Mr. Boyle, Ms. Munoz, Mr. Park, and the Biomedical lab, and lastly thank you to my parents for supporting me, especially throughout this program.

References

1.Sun, N. *et al.* Applications of brain organoids in Neurodevelopment and neurological diseases. *Journal of Biomedical Science* **28,** (2021).