

Multi-chamber culture insert for connected neuronal aggregates

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Client: Dr. Jason Brant

Advisor: Prof. Mehmet Orman

Team:

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Problem statement

Common devices used in biological research, including well plates and petri dishes, are readily accessible, provide easy platforms for addition of cells, media, and reagents, and allow for observation using standard laboratory microscopes; however, they fail in their ability to model the complex physiological environments of the human body. In recent decades, there has been a large push toward the development of microphysiological systems used for research, for example, the Organ-on-a-Chip platforms. The ability to model complex tissue environments is incredibly important for the study of the auditory pathway because of its dynamic environment. 2D systems completely isolate cells from the complex physical forces, specialized microenvironments, and 3D neural networks that are vital to the transduction of sound to the brain. The multi-chamber culture insert device provides a more dynamic platform to study the growth and interactions of neuronal cell bodies on a 3D platform. The device allows for growth and interaction of neuronal cell aggregates in a structured manner. The device separates a well plate chamber into distinct sections each holding a neuronal aggregate. The device allows for growth of neurons between chambers, but separates the media in each chamber, allowing for independent treatments of aggregates.

Brief status update

The team has been working on the preliminary report and continuing research on materials and fabrication methods. The team plans to begin fabricating next week.

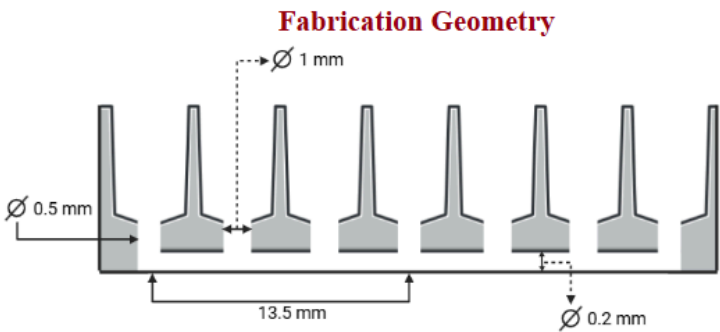
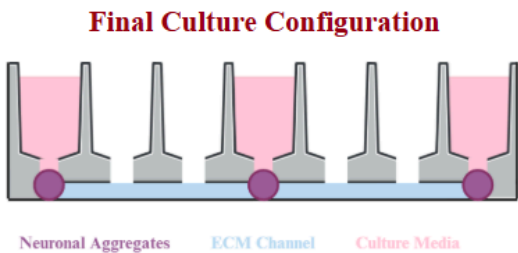
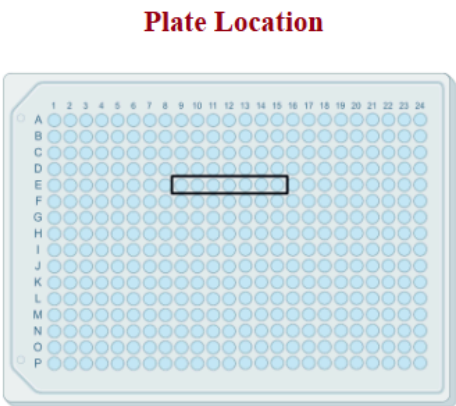
Difficulties / advice requests

- N/A

Current design

Final Design: Milled 384 Well Plate

Three culture wells connected by an ECM-filled channel at the plate base



Materials and expenses

Item	Description	Manufac-turer	Mft Pt#	Vendor	Vendor Cat#	Date	#	Cost Each	Total	Link
Category 1										
									\$0.00	
									\$0.00	
Category 2										
									\$0.00	
									\$0.00	
								TOTAL:	\$0.00	

Major team goals for the next week

1. Finalize preliminary report
2. Begin prototyping

Next week's individual goals

- Greta
 - Begin prototyping and designing in Fusion 360
 - Finish preliminary report
 - Develop test methods for testing our device
- Eli
 - Begin prototyping and designing the milled well plate in fusion 360
- Sam
 - Finish preliminary report sections
 - Review and edit preliminary report
 - Conduct necessary research for my report sections
- Safia
 - Finish preliminary report
 - Work on required training
 - Begin prototyping our design.
- Sri
 - Finish up preliminary report
 - Continue finding research that could assist with enhancing designs
- Sophia
 - Finish preliminary report
 - Continue research on necessary and relevant fabrication topics
 - Begin prototyping

Timeline

Task	Sept				Oct					Nov				Dec	
	4	11	18	25	2	9	16	23	30	6	13	20	27	4	9
Project R&D															
Empathize	X	X	X												
Background & Research	X	X	X	X	X	X									
Preliminary Designing				X	X										
Final Design Prototyping						X									
Testing															
Deliverables															
Progress Reports		X	X	X	X	X									

Product Design Specifications			X												
Design Matrix				X											
Prelim presentation & Selection of Final Design					X										
Show and Tell															
Final Poster															
All Deliverables Due															
Meetings															
Client			X	X											
Advisor	X	X	X	X		X									
Website															
Update	X	X	X	X	X										

Filled boxes = projected timeline

X = task was worked on or completed

Previous week's goals and accomplishments

- Greta
 - Complete preliminary report
 - Begin designing a CAD file for milled well plate
 - Research fabrication techniques and necessary additional materials needed for well plate fabrication.
- Eli
 - Complete preliminary report
 - Research necessary topics for preliminary report
- Sam
 - Complete preliminary report
 - Conduct research for preliminary report
 - Look into fabrication methods
- Safia
 - Write preliminary report
 - Research more about the milled well plate design, how to fabricate it, how to make it work, etc.
- Sri
 - Help write preliminary report and continue research on design fabrication methods
 - Understand more about the design we are pursuing and see if there's areas of improvement
- Sophia
 - Complete and write preliminary report
 - Do more research as necessary
 - Look more deeply into fabrication methods

Activities

Name	Date	Activity	Time (h)	Week Total (h)	Sem. Total (h)
Greta	10/2	Set up preliminary report for group	0.25	2.75	21.25
	10/4	Meet with team to divide report and start working on it	1		
	10/7	Work on preliminary report and research materials for fabrication	1.5		
Eli	10/4	Met with team to discuss preliminary report	1	3	19.25
	10/8	Conducted research for the report	1		
	10/8	Worked on the preliminary report	1		
Sam	10/4	Met with team to assign report sections and discussed report expectations.	1		17.5
	10/8	Conducted research for the report and began working on section.	2		
Safia	10/4	Met with team to discuss and assign	1	3	19

		preliminary report sections.			
	10/8	Conducted research for the project and worked on some responses.	2		
Sri	10/4	Worked with the team to divide up preliminary report sections and started understanding my section a bit further.	1	3.5	22
	10/7	Started looking through articles for research this week	.5		
	10/8	Picked out two articles to do analysis on and will work on the report	2		
Sophia	10/4	Met with team to discuss report	1	3	20
	10/8	Gathered articles for report to begin working on it	2		