

Multi-chamber culture insert for connected neuronal aggregates

Date: 10/15/2026

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 continuing research on fabrication methods and developing well plate designs for cell culturing through Fusion. The team plans to begin testing designs next week.

Difficulties / advice requests

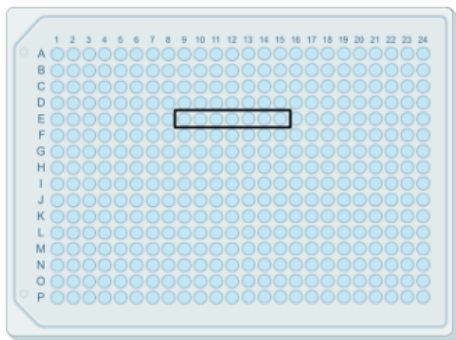
- N/A

Current design

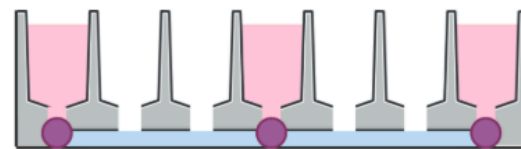
Final Design: Milled 384 Well Plate

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

Plate Location

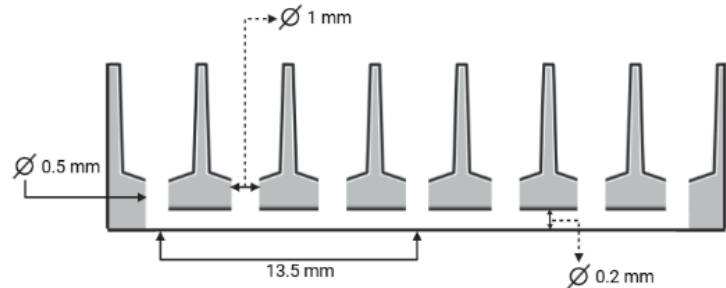


Final Culture Configuration



Neuronal Aggregates ECM Channel Culture Media

Fabrication Geometry



Materials and expenses

Item	Description	Manufacturer	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. Enhance online designs for fabrication
2. Begin testing on matrix loading and media transfer

Next week's individual goals

- Greta
 - Prototype milled well plate iterations
 - Test matrix loading in the plate
 - Make edits to optimize dimensions of well plate based on testing
- Eli
 - Test matrix loading in the plate
 - Test media transfer in the plate
- Sam
 - Begin the prototyping process for the milled well plate.
 - Set-up and begin using Fusion to help with milled well plates design iterations.
- Safia
 - Learn and get more well acquainted with Fusion
 - Begin prototyping the milled well plate
- Sri
 - Do research on milled well plate designs
 - Set up Fusion account to help with virtual mill plate design
- Sophia
 - Continue to learn fusion
 - Begin prototyping the well plate

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	X								
Preliminary Designing				X	X										
Final Design Prototyping						X	X								
Testing															
Deliverables															
Progress Reports		X	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	X								
Website															
Update	X	X	X	X	X	X	X								

Filled boxes = projected timeline

X = task was worked on or completed

Previous week's goals and accomplishments

- 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
 - Finish preliminary report
- 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

Activities

Name	Date	Activity	Time (h)	Week Total (h)	Sem. Total (h)
Greta	10/10	Finish preliminary report sections	2.5	7.5	28.75
	10/10	Research materials for design	1		
	10/11	Revise and edit report with team	2		
	10/14	Work on CAD model for well plate	2		
Eli	10/10	Worked on preliminary report	2	6	25.25
	10/11	Revised and edited preliminary report with team	2		
	10/14	Conducted research into materials	1		
	10/15	CAD modeling in Fusion	1		
Sam	10/9	Downloaded and began setting up fusion	0.5	5.5	26
	10/11	Worked on preliminary report sections	3		
	10/11	Went over preliminary report with team and updated PDS	2		

Safia	10/9	Downloaded and set up Autodesk Fusion	0.5	5	24
	10/10	Worked on and completed the preliminary report section.	1.5		
	10/11	Met with the team to review, fix, and polish the preliminary report.	2		
	10/15	Read articles and watched videos on Fusion	1		
Sri	10/09	Downloaded Fusion and finished set-up	0.5	2	24
	10/15	Read articles to understand well-plate design fabrication	1.5		
Sophia	10/9	Downloaded and set up Autodesk Fusion	.5	6.5	26.5
	10/10	Finalized specific sections of preliminary report	3		
	10/11	Met with team to go over report and make edits as necessary	2		
	10/15	Completed a Fusion tutorial	1		