Multi-chamber culture insert for connected neuronal aggregates

Date: 11/05/2026

Client: Dr. Jason Brant
Advisor: Prof. Mehmet Orman

Team:

Greta Mahlke	gmahlke@wisc.edu (Co-Leader)
Eli Von Holtum	evonholtum@wisc.edu (Communicator)
Sam Brandt	sdbrandt@wisc.edu (Co-Leader)
Safia Syed	ssyed23@wisc.edu (BSAC)
Sri Krishnan	skrishnan32@wisc.edu (BPAG)
Sophia Mazer	smazer@wisc.edu (BWIG)

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 continuing to test and modify the design based on results. The team met with clients this week to give them a plate to test on and give feedback on.

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

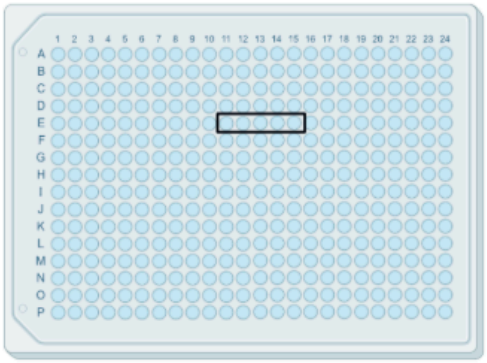


Figure 10: Plate location of culture configuration

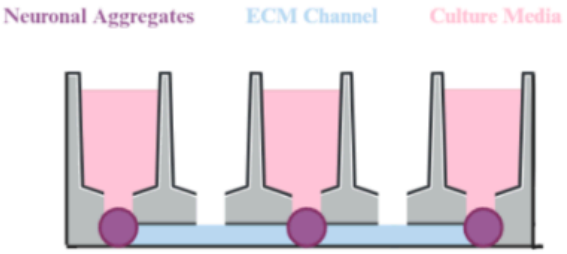


Figure 11: Culture configuration

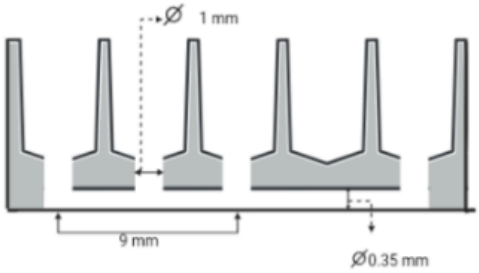


Figure 12: Fabrication geometry

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. Conduct diffusion testing
2. Finalize funnel design

Next week's individual goals

- Greta
  - Fabricate and test aggregate funnel
  - Research diffusion testing
- Eli
  - Fabricate and test aggregate funndl
- Sam
  - Begin fabricating and testing aggregate funnel
  - Research possible design improvements
- Safia
  - Finalize fusion design for funnel mold
  - 3D print the funnel mold and begin testing with it.
- Sri
  - Help team with further testing
  - Conduct more research to improve design
- Sophia
  - Assist with testing of aggregate funnel
  - Research possible improvements and well-extensions

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	X	X						
Preliminary Designing				X	X										
Final Design Prototyping						X	X	X	X	X					
Testing										X					
Deliverables															
Progress Reports		X	X	X	X	X	X	X	X	X					
Product Design Specifications			X												
Design Matrix				X											

BME Design: 200, 300

Prelim presentation & Selection of Final Design					X										
Show and Tell									X						
Final Poster															
All Deliverables Due															
Meetings															
Client			X	X						X					
Advisor	X	X	X	X		X	X	X							
Website															
Update	X	X	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
  - Conduct diffusion testing
  - Conduct research into centrifuging aspect of design
- Eli
  - Conduct diffusion testing
  - Print funnel
- Sam
  - Conduct diffusion testing
  - Look into non-cytotoxic glue
- Safia
  - Continue testing and fixing design as needed
  - Finalize funnel design on Fusion, and determine how to fabricate and with what material/
- Sri
  - Continue with testing and design modifications
  - Look into non cytotoxic glue and other methods to prevent tape usage
- Sophia
  - Continue testing
  - Look more into funnel insert designs
  - Look into well-extensions to hold extra volume of liquid

Name	Date	Activity	Time (h)	Week Total (h)	Sem. Total (
Greta	11/12	Research non-cytotoxic adhesives	1	1	44.25
Eli	11/12	Researched non cytotoxic adhesive materials	1	1	37.25
Sam	11/12	Researched non-cyctotoxic printing materials	1	1	36.5
Safia	11/10	Worked on fusion design for funnel mold	1	1	37.5
Sri	11/11	Looked into alternate adhesive methods for the well plate, understood what other issues we might face with our design	1.5	2.5	37
	11/12	Typed brief notes about the articles I found into LabArchives	1		
Sophia	11/10	Looked more into well extensions and leak-proof walls	1.5	2.5	36.5
	11/12	Looked into materials	1		