

Improving the precision of small human tissue biopsy processing

Date: 11/13/25-11/20/25

Client: Dr. Angela Gibson

Advisor: Dr. Tracy Jane Puccinelli

Team:

Ruhi Nagarkatte (Team Leader)

Ella Lang (Communicator)

Gianna Inga (BSAC)

Simon Nam (BWIG)

Sarah Raubenstine (BPAG)

Grace Spiegelhoff (Med Tech)

Problem Statement

In the treatment of extensive burns or wounds, patients rely on emerging treatment research in the field of tissue growth and healing. Currently, studies into the healing properties of porcine skin are conducted to visualize how viable epidermis cells migrate over the site of the wound to promote cell regrowth. However, once in a culture, the porcine tissue samples cannot remain viable unless all fat is removed and the cells are able to absorb the culture media. Additionally, this process of creating samples is not standardized, resulting in samples of varying sizes with jagged edges, which limits the efficiency of sample preparation. To solve this, fabricating a tool that incorporates multiple sample slots, with uniform sizing, and a fixed blade will help to streamline research efficiency and produce more viable samples that can be successfully imaged.

Brief Status Update

Our team began and completed sterilizability testing on our final modified design using the Glow Germ product. Different cleaning techniques were incorporated to test the effectiveness of removing the content from the surface that normally would be exposed to porcine skin. The neoprene rubber was modified to create the base design using the mills in the Team Lab. Finally, the IRB application was submitted a second time and was approved, allowing the team to move into usability testing soon.

Summary of Weekly Team Member Design Accomplishments

- Team
 - Completed sterilizability testing with Glo Germ
 - Completed rough draft for final poster presentation
 - Developed CAD draft for the base and machined the rubber design
- Ruhi Nagarkatte
 - Updated, revised, and resubmitted IRB application
 - Researched forces and grip strengths for force analysis testing
 - Performed sterilizability testing with Glo Germ

- o Began looking into OnShape FEA analyses for the hinges and blade handle
- Ella Lang
 - o Completed testing protocol for sterilizability testing
 - o Ran and completed sterilizability testing
 - o Printed design out of final material- nylon
- Gianna Inga
 - o Updated the CAD drawing to make the slit smaller, blade holder to encase the entire blade, reduced the width of the pressing device
 - o Created a hinge locking mechanism for the biopsy press and a encasing locking mechanism for the blade handle
 - o Assessed the printed device to ensure functionality
 - o Approved the CAD file to be printed in the final material
- Simon Nam
 - o Worked on modifying the dimensions of the base design
 - o Worked on rough draft of the poster
 - o Updated the BME design page
- Sarah Raubenstine
 - o Work on poster rough draft to get advisor feedback
 - o Performed sterilizability testing
 - o Update materials and expense sheet with recent purchases

Weekly/Ongoing Difficulties

As the semester comes to an end, there are certain time constraints and deliverables that the team is facing. Throughout the next week, the team will finalize the design in a nylon material and finalize the testing. Additionally, the rubber track will be machined and attached to the base of the biopsy press by 11/21/25. The testing will include sterilizability, usability, and mechanical force analysis through FBDs and perhaps an FEA simulation. Once the testing is complete, the final poster and report will be completed and the device will be handed off to the client..

Upcoming Team and Individual Goals

- Team
 - o Finalize the poster for final presentation
 - o Check with the client on Pig Skin studies and usability testing for the final design
 - o Finalize the Materials & Expense sheet
- Ruhi Nagarkatte
 - o Finalize FBDs and FEAs and receive feedback from advisor on final poster
 - o Complete first draft of the final poster and revise based on feedback
 - o Organize usability testing with the MedTechs before 12/3
- Ella Lang
 - o Assist in rubber base fabrication
 - o Reprint the final design prior to Thanksgiving
 - o Finalize the poster and review with our advisor

- Gianna Inga
 - Assess the final material print
 - Finalize individual parts of the poster
- Simon Nam
 - Meet with the client on Nov 26th for biopsy press device testing on pig skin (wound healing studies)
 - Update the poster with further results (pictures & data)
 - Assemble the base design with the final design
- Sarah Raubenstine
 - Finalize results from testing and include on poster
 - Organize and conduct usability testing with the MedTechs
 - Finalize other poster elements and expenses in time for final presentations

Project Timeline

Project Goal	Deadline	Team Assigned	Progress	Completed
Product Design Specification First Draft	Thursday, 09/18/2025	All	100%	X
Design Matrix Design Ideas	Friday, 09/26/2025	All	100%	X
Preliminary Presentations	Friday, 10/03/2025	All	100%	X
Preliminary Deliverables	Wednesday, 10/08/2025	All	100%	X
Show and Tell	Friday, 10/31/2025	All	100%	X
Poster Presentations	Friday, 12/05/2025	All	50%	
Final Deliverables	Wednesday, 12/10/2025	All	0%	

Materials and Expenses

Item	Description	Manufacturer	Mft Pt#	Vendor	Vendor Cat#	Date	QTY	Cost Each	Total	Link
PLA	3D printed polymer through BME design Makerspace budget	Makerspace	N/A	UW-Madison	N/A	9/26/25	1	\$5.00	\$5.00	N/A
PLA	3D printed polymer through BME design Makerspace	Makerspace	N/A	UW-Madison	N/A	10/16/25	1	\$1.20	\$1.20	N/A

	budget									
Rubber Slab	12 in x 12 in sheet of 50A black rubber	Grainger Vendor	605 0-1/2A	Grainger	848EH8	10/31/25	1	\$49.99	\$49.99	https://www.grainger.com/product/Rubber-Sheet-Commercial-Grade-848EH8
Glo Germ Gel - White	Gel used to investigate thoroughness of surface cleaning.	Glo Germ	GEL	Avantor Science Central	470100-620	11/7/25	1	\$25.75	\$25.75	https://www.avantorsciences.com/us/en/product/8875880/glo-germ
PLA	3D printed polymer through BME design Makerspace budget	Makerspace	N/A	UW-Madison	N/A	11/18/25	1	\$1.84	\$1.84	N/A
Nylon	3D printed polymer through BME design Makerspace budget	Makerspace	N/A	UW-Madison	N/A	11/28/25	1	\$21.00	\$21.00	N/A
								TOTAL:	\$104.78	