Improving the precision of small human tissue biopsy processing

Date: 11/20/25 - 12/4/25

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

The team is in good shape going into the end of the semester. Over the last two weeks, the usability survey testing with styrofoam samples was completed with Grace and other medical students. Additionally, members of the client's lab participated in usability testing with porcine skin samples. Based on the data and feedback received, iterations were made to the final design to accommodate for the concerns. Additionally, an FEA analysis was conducted in OnShape to identify weak points of the design. Lastly, the final poster presentation was finalized and printed on Wednesday, 12/3.

Summary of Weekly Team Member Design Accomplishments

- Team
    - Met with client to discuss feedback and concerns about the device
    - Received new nylon and PLA 3D prints from the makerspace
    - Conducted usability testing on med students and members from the client's lab

    - Performed FEA simulations on the biopsy press body and blade handle
    - Analyzed usability and FEA testing results
    - Drafted, finalized, and printed the final poster presentation
- Ruhi Nagarkatte
    - Conducted FEA simulations and analysis
    - Completed assigned portion of the final poster presentation
    - Attended meeting with client to understand user experience with the device
- Ella Lang
    - Completed poster sections- final design and sanitization testing
    - Printed final design in PLA and nylon
    - Met with team to discuss future work
- Gianna Inga
    - Accessed the final print
    - Implemented changes to the CAD drawing based on med student and bailey feedback
    - Completed individual part of the poster
- Simon Nam
    - Met with client last week & this week to test the finalized design and receive further feedbacks and plans for next semester
    - Organized survey testing results and feedbacks for deliverables
    - Completed assigned portion of the final poster presentation
    - Discussed with team for next steps for final deliverables
- Sarah Raubenstine
    - Worked on finalizing the poster
    - Completed usability survey results analysis
    - Met with the client to discuss future work and suggestions after testing was completed

Weekly/Ongoing Difficulties

The team is hoping to complete the final deliverables, such as the report and notebook, by next week as the semester wraps up. The final design will be ready to hand off to the clients by next week; however, adjustments may need to be made to accommodate for a microtome blade. Given the time constraints, this task may be completed early next semester. Overall, the team is in great shape at this point of the semester and is proud of all of their progress!

Upcoming Team and Individual Goals

- Team
    - Draft and complete the final report and notebook

    - Deliver final design and presentation to the clients
    - Complete draft of outreach activity by next week
- Ruhi Nagarkatte
    - Complete assigned portion of report, notebook, and outreach activity
    - Finalize end of semester deliverables
    - Meet with advisor and client once more before the end of the semester
- Ella Lang
    - Complete report, notebook entries and outreach documentation
    - Present to clients and our advisor
    - Prepare for next semester's improvements
- Gianna Inga
    - Present poster
    - Update lab archive notebook
    - Work on individual part of the final report
- Simon Nam
    - Rehearse for the poster presentation (12/5)
    - Update all the necessary contents on the team's notebook (lab archive)
    - Work on the assigned sections of final report
    - Consult with advisor and client before the end of semester
    - Possibly deliver another modified version of the design in-person to the clients on finals week
- Sarah Raubenstine
    - Complete assigned portions of the final report
    - Meet with the clients before the semester is over to discuss next steps
    - Prepare and rehearse for the final presentation

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	100%	X
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 budget	Makerspace	N/A	UW-Madison	N/A	10/16/25	1	$1.20	$1.20	N/A
Rubber Slab	12 in x 12 in sheet of 50A black rubber	Grainger Vendor	6050-1/2A	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	N/A	UW-Madison	N/A	11/18/25	1	$1.84	$1.84	N/A

	Makerspace budget									
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
Nylon	3D printed polymer through BME design Makerspace budget	Makerspace	N/A	UW-Madison	N/A	12/3/25	1	$19.50	$19.50	N/A
								TOTAL:	$124.28	