Improving the precision of small human tissue biopsy processing

Date: 11/6/25-11/13/25

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

Over the past week, the team continued to develop the final design. The neoprene rubber layer was ordered and received by the client on 11/12. Additionally, the team and client ordered a Glo Germ product to begin sterilizability testing next week; it has not been delivered yet. The first draft of the IRB was submitted last Friday, 11/7, and revisions have been made to the notes. The testing protocol was finalized and will be utilized right before Thanksgiving to perform usability testing on the client. Lastly, the team hopes to finalize all testing methods by 11/25.

Summary of Weekly Team Member Design Accomplishments

- Team
    - Finalized testing protocol for the usability survey
    - Ordered sterilizability testing materials (Glo Germ)
    - Established deadline to get the first draft of the final poster presentation completed
    - Established dates to perform testing (usability and sterilization)
    - Revised IRB application based on advisor feedback and submitted first draft
- Ruhi Nagarkatte
    - Revised IRB application and submitted first draft

    - Began brainstorming FBDs to estimate applied force on the device
    - Established upcoming deadlines for the final deliverables for the team
    - Prepared Progress Report 10
- Ella Lang
    - Ordered materials and continued to modify sterilizability testing plans
    - Helped prepare and submit IRB
    - Made plans for fabrication and testing next week
- Gianna Inga
    - Printed design
    - Consulted with team with the flaws or improvements for the design
    - Defined the changes needed to the design
- Simon Nam
    - Consulted with client to conduct the device and blade compatibility testing (scheduled on Nov 26th*)
    - Discussed with group members about further fabrication of base design and testing protocols
    - Updated the BME design page
- Sarah Raubenstine
    - Finalized survey protocols based on feedback from advisor meeting
    - Submitted first draft of IRB and received feedback from IRB
    - Met with team to discuss finalizing design and next steps for testing

Weekly/Ongoing Difficulties

In the upcoming week, the second draft of the IRB submission will be submitted. The team is hoping to start and complete different areas of testing, such as sterilizability and usability testing, before 11/25. While the Glo Germ solution has not been delivered yet, the neoprene rubber layer was received and the team expects to fabricate the base of the Biopsy Press device by the end of next week. Additionally, the team is coordinating dates with the client to utilize the device with their fresh samples of porcine skin.

Upcoming Team and Individual Goals

- Team
    - Prepare first draft of the final poster presentation
    - Pick up rubber layer from client and assemble it onto Biopsy Press Device
    - Begin sterilizability testing once the Glo Germ solution is received
    - Finalize all aspects of the design, including the base and the blade handle
- Ruhi Nagarkatte
    - Finalize FBDs and other force diagrams for the final poster presentation
    - Help assemble the rubber layer onto the device
    - Revise and submit the second draft of the IRB application
- Ella Lang
    - Begin sterilizability testing
    - Assist in FBD preparation and force analysis simulations

    - Help with base preparation and design printing
- Gianna Inga
    - Implement the changes to the CAD drawing
    - Reprint to ensure the new design functions
    - Print design in nylon 12 to give to client for testing
- Simon Nam
    - Initialize on base design assembly with materials collected and testing
    - Begin working on final presentation / report drafting
- Sarah Raubenstine
    - Submit second iteration of the IRB application based on IRB feedback
    - Begin initial drafts of final poster and final report
    - Finalize and fully fabricate final design

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	0%	
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	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
								TOTAL:	$81.94	