Democratizing Placement of Endoluminal Negative Pressure Devices for Gastrointestinal Leaks

Client: Dr. Amber Shada
General Surgery
UW School of Medicine and Public Health
shada@surgery.wisc.edu
(608) 263-1036

Advisor: Prof. John Puccinelli

Team: Simon Fetherston (Leader)
Mariah Smeeding (Communicator)
Evelyn Mikkelson (BSAC)
Yeanne Hwang (BPAG, BWIG)

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Problem statement

Currently, large defects in the GI tract (often caused by surgical complications) are treated with surgery. For external wounds, the use of negative pressure wound therapy has become widely used. This therapy, colloquially called VAC therapy, leads to improved healing of superficial wounds. For the past few years, some surgeons have been placing similar VAC devices into the GI tract through the mouth or anus to treat defects in the GI tract. The success of this therapy has been outstanding, with some studies finding that 90% of wounds that would have otherwise required surgery can be closed without making any additional incisions at all. The process of VAC placement is currently labor intensive and requires some skill in manipulating an endoscope, which has limited its widespread use. Development of a streamlined way to deploy VAC therapy into the GI tract would allow more surgeons to use this therapy to heal anastomotic leaks.

Brief status update

This week the team finalized a gelatin mixture that can be dried to create a gelatin film. This film will be fabricated multiple times to allow for degradation testing. Also, the team began fabricating a mold to cover the sponge in the film. This mold will be used to clamp and seal a film around the sponge, allowing it to set and create a final prototype. The team plans on testing the gelatin film, as while as the expansion of the sponge after it is covered in the film and exposed to physiological conditions.

Difficulties / advice requests

The mold will be 3D printed. The team is concerned that the gelatin will stick to the filament, and once it sets, it will not be possible to remove the gelatin film from the mold without breaking it. The team is considering coating the mold in parchment paper or other nonstick materials and could use advice on possible materials to use.

Current design

The current design to be fabricated and tested is a gelatin film. Fabrication and testing of the degradation properties will indicate the plausibility of the film in being used as an encapsulating, degradable film. This film will then be used as the sponge coating and its application into an esophagus can be tested.

Materials and expenses

Item	Description	Manufac-turer	Mft Pt#	Vendor	Vendor Cat#	Date	#	Cost	Link
Category 1									
Porcine Gelatin	CAS 9000-70-8 Type A powder, ~300 g Bloom, suitable for cell culture	Sigma Aldrich	G1890	Sigma Aldrich	G1890-100g	Mar 11 2026	100g * 1	$53.40	Link
Glycerin	CAS 56-81-5 Density 1.261 g/mL USP/FCC grade	Fisher Chemical	G314	Fisher Scientific	G314	Mar 11 2026	4L * 1	$676.7	Link
Alginate acid sodium salt from brown algae	CAS 9005-38-3 Medium viscosity	Sigma Aldrich	A2033	Sigma Aldrich	A2033-100G	Mar 12 2026	100g * 1	$82.80	Link
							Total:	**$812.9**	

Major team goals for the next week

1. Finalize testing protocols
2. Test degradation of the gelatin film
3. 3D print mold and use it to encapsulate sponge in gelatin film
    a. Assemble multiple final prototypes

Next week's individual goals

- Simon Fetherston
    - Fabricate enough prototypes to conduct testing

    - Complete testing of gelatin degradation
    - Create a final prototype where the film encapsulates the sponge
- Evelyn Mikkelson
    - Meet with team to build and test prototypes
    - Incorporate executive summary feedback
    -
- Mariah Smeeding
    - Figure out how to shape the gelatin into the sponge coating film shape we want it in
    - Prepare multiple films so we can begin degradation testing
    - Meet with Dr. Shada to discuss what is working well and problems faced
- Yeanne Hwang
    - Test sponge compression mold and revise
    - Meet with team for fabrication and testing
    - Prepare for material testing

Timeline

Task	Jan	Feb				March					April				May	
	24	1	8	15	22	1	8	15	22	29	5	12	19	26	3	10
Project R&D																
Empathize	X	X	X													
Background	X	X	X	X	X	X	X									
Material Fabrication							X	X	X							
Mold Fabrication							X	X			X					
Prototyping				X	X	X	X	X	X		X					
Testings											X					
Deliverables																
Progress Reports	X	X	X	X	X	X	X	X	X		X					
Prelim presentation				X												
Show and Tell																
Final Poster																
Meetings																
Client		X		X		X										
Advisor	X	X	X	X	X	X	X	X	X		X					
Website																
Update	X	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

- Individual:
    - Evelyn Mikkelson
        - Looked into dissolvable PVA availability at Makerspace
        - Brainstorm methods of coating sponge
        - Look into different testing we can do
    - Simon Fetherston
        - Reviewed and edited executive summary
        - Continued prototyping gelatin films
        - Developed a plan for testing
    - Mariah Smeeding
        - Made rough draft of executive summary
        - Continued to contribute to prototyping gelatin films
        - Look into testing
    - Yeanne Hwang
        - Design sponge compression mold
        - Researched material for the mold
        - Developed plan for testing
- Team :
    - Gelatin prototyping
    - Executive summary

Activities

Name	Date	Activity	Time (h)	Week Total (h)	Sem. Total (h)
Evelyn M	04/06/2026 04/08/2026 04/09/2026	Write and review executive draft summary Look at most recent materials, edit executive draft summary, and brainstorm testing Research degradation testing methods	0.5 1 0.5	2	28.5
Simon F	04/06/2026 04/08/2026 04/08/2026	Fabricated gelatin film prototypes and finalized concentrations Reviewed draft of executive summary Took qualitative notes and analyzed films fabricated on 04/06/2026	3 0.5 1	4.5	29
Yeanne H	04/07/2026 04/07/2026 04/09/2026 04/08/2026	Design sponge compression mold Researched material for the mold Fabricated sponge compression mold using 3D printer Reviewed draft version of executive summary	1 1 0.5 0.5	3	31
Mariah S	4/6/26 4/7/26	Gelatin prototyping Executive summary draft	1 1.5	2.5	29