Democratizing Placement of Endoluminal Negative Pressure Devices for Gastrointestinal Leaks

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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 performed degradation testing on the gelatin hydrogel, gelatin film, and crosslinked sodium alginate. Also, the team began assembling multiple full prototypes with the film compressing the sponge. These will undergo testing to measure how the sponge expands. The team plans to produce final prototypes to show at poster presentation next Friday.

Difficulties / advice requests

The team is seeking clarification on the deployment timeline for the sponge. Specifically, how long it takes from the moment it enters the mouth to when it is properly placed at the leak site. This information will help us determine whether our degradation rates are clinically meaningful.

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. Make final prototypes for presentation
2. Finalize executive summary and poster

Next week's individual goals

- Simon Fetherston
    - Work on final deliverables (poster, report)
    - Fabricate a final prototype for the poster session
    - Provide and receive peer feedback on posters
- Evelyn Mikkelson
    - Prepare final poster

    - Begin work on final report
    - Make final prototypes for poster presentation
- Mariah Smeeding
    - Analyze degradation data in Matlab
    - Write my portions of the report and final presentation
    - Have a draft of the presentation turned in by Wednesday
- Yeanne Hwang
    - Work on final poster and report
    - Redesign mold edge
    - Prepare for final presentation
    - Analyze testing data and visualize it

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	X				
Prototyping				X	X	X	X	X	X		X	X				
Testings											X	X	X			
Deliverables																
Progress Reports	X	X	X	X	X	X	X	X	X		X	X	X			
Prelim presentation				X												
Show and Tell																
Final Poster																
Meetings																
Client		X		X		X						X				
Advisor	X	X	X	X	X	X	X	X	X		X	X	X			
Website																
Update	X	X	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
        - Work with team to make prototypes and perform tests

    - Simon Fetherston
        - Fabricated sponge-gel prototypes for expansion testing
        - Finalized process for prototype assembly
        - Began brainstorming poster format
    - Mariah Smeeding
        - Completed degradation testing for uncovered gelatin and sodium alginate
        - Work on executive summary
    - Yeanne Hwang
        - Worked with team to make prototype and testing
        - Designed and printed 6 molds with different sizes with 3D printer
        - Fabricated sponge-film prototype
- Team :
    - Gelatin degradation testing
    - Sodium alginate degradation testing
    - Sponge mold and making prototypes
    - Executive summary

Activities

Name	Date	Activity	Time (h)	Week Total (h)	Sem. Total (h)
Evelyn M	04/15/2026 04/16/2026	Testing and fabrication Sodium alginate fabrication and executive summary	1 1	2	30.5
Simon F	04/13-16/2026	Worked on final prototype fabrication and assembly	8	8	37
Yeanne H	04/13/2026 04/15/2026 04/15/2026	Worked with team to make prototype and testing Designed and printed 6 molds with different sizes with 3D printer Fabricated sponge-film prototype	4 2.5 1	7.5	38.5
Mariah S	4/14/26 4/15/26 4/16/26	Prepare for degradation testing by making PBS solution and setting it to the right time, setting incubator, take initial weight recordings Degradation testing Meeting with team to discuss expansion testing plan and review executive summary notes	3 6 1	10	39