# 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 began initial prototyping. Using finalized fabrication team protocols, the team made initial gelatin and sodium alginate films. These preliminary prototypes had flaws, including errors made during the fabrication process. However, iterating will help to limit error and create precise and accurate gels. The team will continue to fabricate preliminary prototypes until a process has been determined that will produce a strong gel.

## Difficulties / advice requests

Initial prototypes of the gelatin film melted in the oven before drying. The fabrication process followed previous research studies. This suggests that there may have been an error in the production of the gel or changes in the temperature of the oven. The team will test the differences between drying the initial gelatin gel in the oven to make a film compared to cooling the gelatin in a fridge.

## Current design

The current design to be fabricated and tested is a gelatin film and a sodium alginate film. Fabrication and testing of the degradation properties will indicate the plausibility of either 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. Continue fabrication of sodium alginate and gelatin films and iterate designs
2. Work on executive summary
3. Create testing protocol for material degradation

# Next week's individual goals

- Simon Fetherston
    - Work on executive summary
    - Revise sodium alginate fabrication protocol

    - Brainstorm methods to seal films and attach films to the sponge
- Evelyn Mikkelson
    - Get and incorporate feedback from show and tell
    - Brainstorm ways to utilize a mold to attach film to sponge
    - Work on executive summary
- Mariah Smeeding
    - Iterate our material fabrication protocols based on feedback from show and tell
    - Take degradation testing feedback/advice into account as we consider strategies to use when we begin testing
    - Work on executive summary
    - Finalize/work on sodium alginate protocol
- Yeanne Hwang
    - Receive and revise from feedback from show and tell
    - Work on executive summary
    - Update material expense spreadsheet

## *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 | | | | | | | | |
| Mold Fabrication | | | | | | | X | X | | | | | | | | |
| Prototyping | | | | X | X | X | X | X | | | | | | | | |
| Testings | | | | | | | | | | | | | | | | |
| **Deliverables** | | | | | | | | | | | | | | | | |
| Progress Reports | 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 | | | | | | | | |
| **Website** | | | | | | | | | | | | | | | | |
| Update | 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
        - Helped team with initial fabrication
        - Researched material properties of sodium alginate films
    - Simon Fetherston
        - Finished gelatin fabrication protocol
        - Fabricated initial sodium alginate and gelatin films
    - Mariah Smeeding
        - Begin initial fabrication of gelatin and sodium alginate as well as daily check in's to lab
        - Complete first draft of sodium alginate protocol (still work in progress)
    - Yeanne Hwang
        - Helped writing fabrication protocol for materials
        - Begin fabrication of sodium alginate and gelatin films
- Team :
    - Completed initial fabrication of gelatin and sodium alginate films
    - Brainstormed iterations to fabrication protocols

## *Activities*

| Name | Date | Activity | Time (h) | Week Total (h) | Sem. Total (h) |
|---|---|---|---|---|---|
| Evelyn M | 03/16/2026<br>03/18/2026 | Fabrication sodium alginate and gelatin gels<br>Fabrication of gels | 1.5<br>1 | 2.5 | 24.5 |
| Simon F | 03/15/2026<br>03/16/2026<br>03/17/2026<br>03/18/2026 | Completed gelatin fabrication protocol<br>Fabricated sodium alginate and gelatin gels | 0.5<br>1.5<br>0.5<br>1 | 3.5 | 27.5 |
| Yeanne H | 03/15/2026<br><br>03/17/2026<br>03/18/2026 | Helped writing fabrication protocol for materials<br>Begin fabrication of sodium alginate and gelatin films | 1<br><br>1<br>1 | 3 | 25 |
| Mariah S | 03/16/2026<br>03/17/2026<br>03/18/2026<br>03/19/2026 | Rough draft of sodium alginate protocol complete<br>First fabrications of gelatin and sodium alginate complete | 1<br><br>3 | 4 | 24.6 |