

Microfluidic droplet generator for lymph node microphysiological models

Progress Report 5

Date: October 2, 2026 - October 8, 2026

Client: Dr. Cristina Sanchez de Diego

Advisor: Prof. Monica Ohnsorg

Team:

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Project Website: [Link](#)

Problem Statement: Prostate cancer (PCa) commonly metastasizes through the lymphatic system. Understanding how cancer cells spread through lymph nodes is therefore critical to developing therapies that can prevent or limit metastasis. However, current lymph node models primarily represent tissue in two dimensions and cannot fully replicate its complex three-dimensional structure and cellular interactions. This project aims to fabricate a microfluidic droplet device capable of producing B- and T-cell-containing collagen microspheres, which will serve as building blocks for a realistic 3D lymph node model to more accurately study cancer metastasis.

Brief status update: The team spent this week writing the preliminary report paper and editing our product design specifications and design matrices based on initial comments left by Dr. Ohnsorg and feedback from our preliminary presentation.

Current design: SolidWorks Mask Design

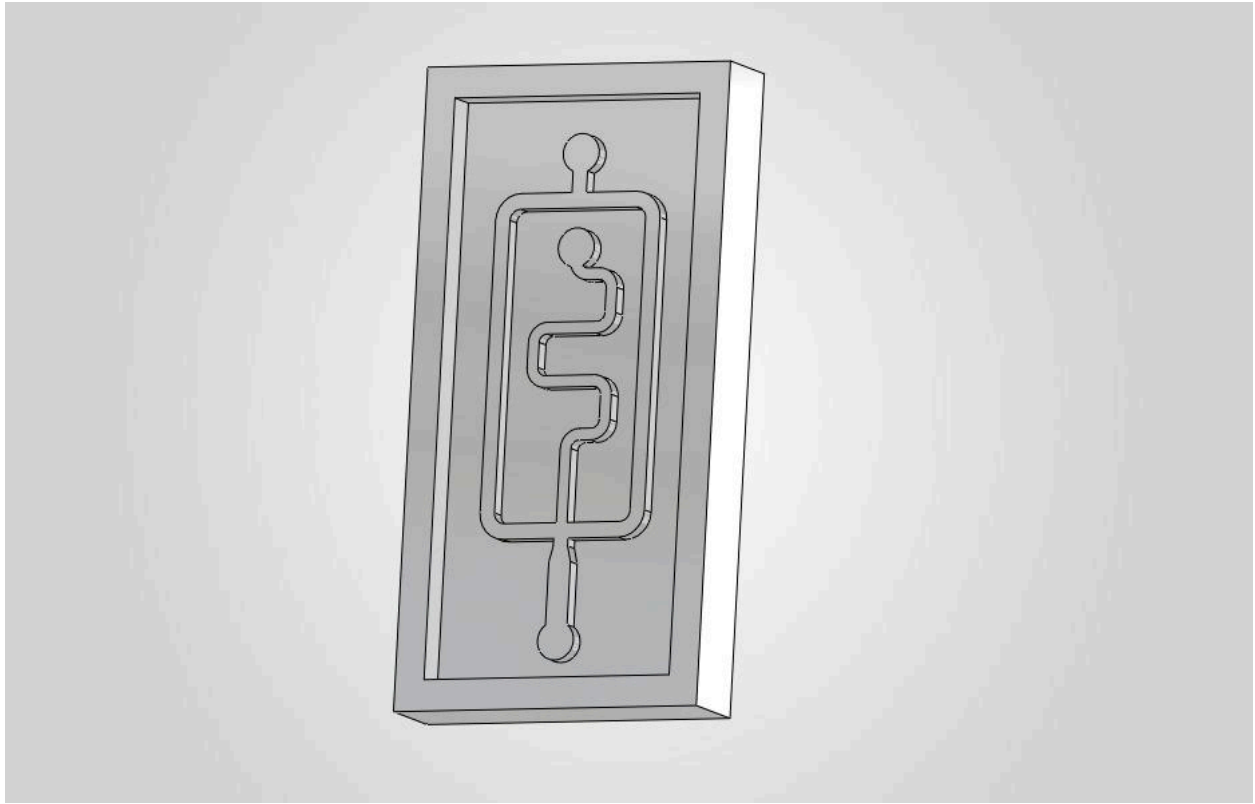


Figure 1: Current Microfluidic CAD design for 0.5uL Droplets

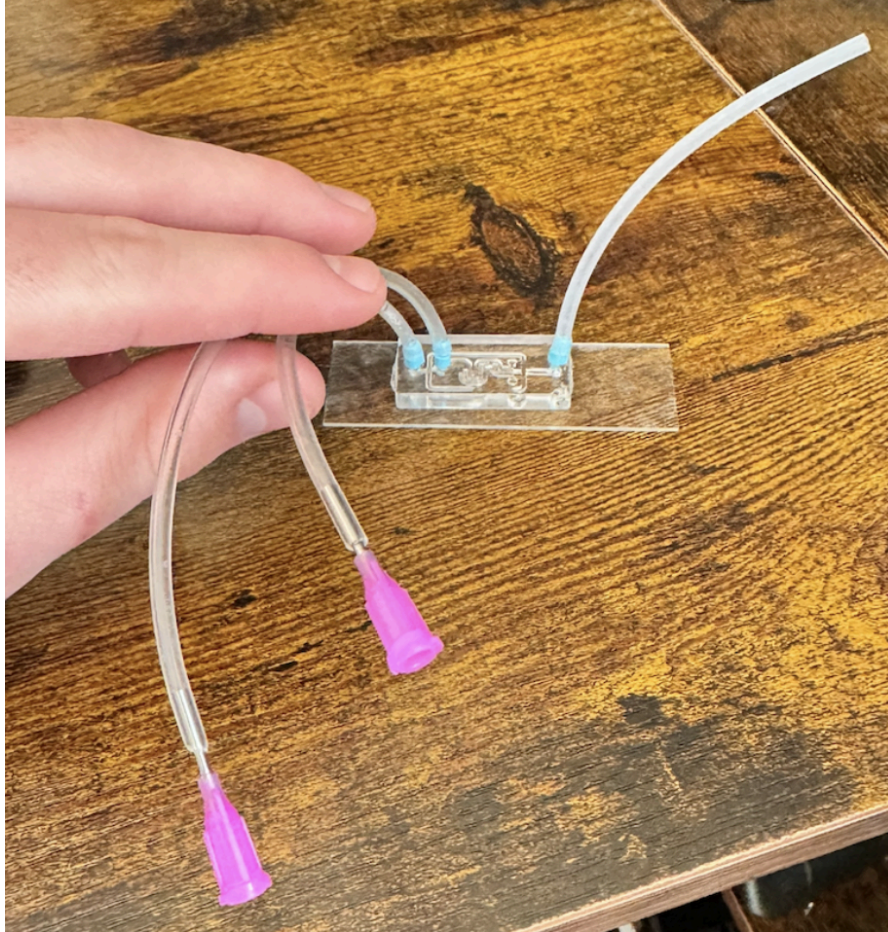


Figure 2: Assembled Microfluidic Device

Previous Week's Accomplishments

- Sam Kamin (6 hours)
 - Worked on the preliminary paper
 - Edited the product design specifications (PDS) and design matrices with the comments left by Dr. Ohnsorg
 - Researched competing methods such as bulk emulsification and extrusion fragmentation
- Murphy Diggins (2 hours)
 - Worked on preliminary paper and edited PDS
 - Researched other 3d-lymph node models
- Will McGuire (3 hours)
 - Working on preliminary report and updating PDS
 - Researched competing methods such as bulk emulsification and extrusion fragmentation
- Dylan Libel (3 hours)

- Worked on the preliminary report, specifically the discussion and conclusion sections
- Researched more competing designs and methods to accomplish the task above
- Edited parts of the PDS and Design Matrices
- Eduardo Usandivaras (2 hours)
 - Worked on a preliminary report, and communicated with clients regarding our next meeting time, and further questions we had.
 - Researched different methods for sterilizing all of our materials since our end design will have to take that into consideration.
- Vir Jaiswal (2 hours)
 - Worked on the preliminary report
 - Researched the flow rate and polymerization of collagen along with the biological composition of collagen

Team Goals

- Complete fabrication of cooling methods and begin implementation into the design.
- Order necessary materials needed for running the prototype
- Begin collagen testing on the device and measure collagen bead sizes.
- Continue editing product design specifications based on comments from Dr. Ohnsorg.

Individual Goals

- Sam Kamin
 - Go in to WIMR to learn about PDMS chip fabrication from Murphy
 - Go in to WIMR to learn about the collagen solution fabrication process
 - Test the current designs with collagen and make iterative design improvements
 - Continue researching and prototyping
- Murphy Diggins
 - Teach team members PDMS chip fabrication
 - Learn collagen procedure
- Will McGuire
 - Continue research focusing more on the fluids side than the mechanism side.
 - Test device with collagen
 - Prototype water/glycerol cooling channel chip
- Dylan Libel
 - Go back to WIMR and complete the set-up of the syringe pumps
 - Start testing the syringe pumps and the collagen solution
 - Add surfactant to the collagen solution to see how it operates in the PDMS chip
- Eduardo Usandivaras
 - Go to WIMR and begin testing collagen in the microfluidic device, and test how it behaves with various flow rates

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Project Timeline

Task	Sept.				Oct.				Nov.					Dec.	
	10	17	24	30	7	14	21	28	4	11	18	25		5	12
Deliverables															
Progress Reports	X	X	X	X	X										
Product Design Specification		X													
Design Matrix			X												
Preliminary Oral Presentation				X											
Preliminary Lab Notebook					X										
Preliminary Report					X										
Preliminary Evaluations					X										
Final Presentation															
Final Lab Notebook															
Final Report															
Final Evaluations															
Meetings															

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