

PhD Candidate, Biomedical Engineering

Professional Summary

Biomedical Engineering PhD candidate with over 6 years of experience in tissue engineering and medical device design. Proven technical and leadership skills at every stage from initial concept to system validation. Internship at FDA provided deep introduction to regulatory science. Adept at prototyping at multiple levels including rapid manufacturing techniques, computational modeling, and rigorous in vitro testing and device validation. Passionate about rigor and reproducibility, designing intuitive user experiences, and believes that all design should cultivate human flourishing.

Education

University of Minnesota, PhD Biomedical Engineering	Expected May 2026
- NSF Graduate Research Fellow, Creating Inclusive Cohorts Fellow - NIH NHLBI Cardiovascular Tissue Engineering T32 Trainee - Clinical shadowing in cardiothoracic surgery, interventional radiology, and ultrasound venography	GPA: 3.9/4.0
Rice University, BS Bioengineering	Received May 2021
- Distinction for Research and Creative Works - President's Honor Roll, Tau Beta Sigma Engineering Honor Society	GPA: 3.8/4.0
University of Navarra, Study Abroad and Spanish Immersion for the Medical Professions	Summer 2018
Certificate for (Spanish) Language and Intercultural Communication	

Patents

Provisional patent application: <i>Methods and Compositions for Endothelializing Grafts</i>	Apr. 2025
<i>Medical Drain Device</i>	USPTO US-20240198062-A1, Jun. 2024

Publications and Presentations (visit tate.fyi/resume for clickable links)

(Presentation) <u>Regulatory Science for Prosthetic Vein Valves: Development of a Regulatory Science Tool for Steady Flow Characterization of Prosthetic Vein Valves</u> , UMN BME Industry Grand Rounds	Dec. 2024
(Co-author) <u>Evaluation of an engineered vascular graft exhibiting somatic growth in lambs to model repair of absent pulmonary artery branch</u> , Nature Communications Medicine	Oct. 2024
(Invited 1st author) <u>Cell-based endothelialization approaches for emergency coronary artery bypass surgery</u> , European Symposium on Vascular Biology	Apr. 2023
(Co-author) <u>Development of a Modular, Biocompatible Thiolated Gelatin Microparticle Platform for Drug Delivery and Tissue Engineering Applications</u> , Regenerative Biomaterials	Feb. 2021
(Co-author) <u>Effect of Substrate Stiffness on Human Intestinal Enteroids Infectivity by Enterococcus</u> , Acta Biomaterialia	Sep. 2021
(Poster) <u>Engineering an Intestinal Model Using Fused-Deposition 3D Printing and Microfluidics</u> , BMES	Oct. 2020

Research and Employment

FDA ORISE Fellow, Office of Science and Engineering Labs (OSEL)	June-July 2024
- Developed and documented two "least-burdensome" testing protocols to evaluate novel prosthetic vein valve devices based on ISO 5840 for future publication as an official regulatory science tool. - Designed and fabricated a novel, parametrically generated venous-flow testing apparatus (from concept to validation) with a custom LabView VI user interface for automated in vitro testing. - Presented this work to ~120 industry and university partners at the UMN Industry Grand Rounds (link). - Completed FDA 101 to learn about various regulatory pathways and save accompanying reference material.	
Tranquillo Research Group, PhD Candidate	Aug. 2021-Present
<u>Tissue-Engineered Vein Valve and Vascular Graft Development</u>	
Led development of an autologously pre-endothelialized vascular graft by increasing cell isolation yield by 500%, culturing 16 full-sized vascular grafts, and coordinating with 2 CROs and 2 university centers to obtain tissue samples.	

- Developed novel dynamic flow waveforms from clinical data to characterize in vitro hemodynamic performance of prosthetic vein valve devices using a custom pulse-duplication system.
- Developed a numerical model of vascular flow to predict hemodynamic performance of valves in vitro and in vivo.
- Designed dozens of custom parts (PCBs, 3D prints, machined pieces) for bioreactors and automated in vitro testing and guided their implementation through collaboration with machinists and engineers.

Leadership and Quality Control

- Recruited, interviewed, trained, and led 9 students to complete complex, independent projects producing a master's thesis, an honor's thesis, 5 university funded research awards, and a full-time industry job placement.
- Resolved lab-wide contamination incident by developing and implementing new protocols, a bio-containment plan, and targeted one-on-one training.
- Complete "Practical Skills for Future R&D Leaders" course with Dave Knapp.

NIH NHLBI Catalyze Commercialization Program (for Preclinical Testing of Tissue-Engineered Vein Valve)

- Won 1st place against 47 teams (including senior scientists and CEOs) in the annual Catalyze pitch competition.
- Met rigorous commercialization requirements through setting and meeting milestones, quarterly progress presentations, and preparing and presenting extensive documentation for future FDA submission.

Grande-Allen Integrative Matrix Laboratory, Undergraduate Researcher

Aug. 2019-May 2021

- Engineered a milifluidic intestine-on-a-chip model with tunable-stiffness PEG substrate and primary human intestinal stem cells ([Acta Biomaterialia](#) (link), DOI: 10.1016/j.actbio.2021.07.024)
- Developed and fabricated novel FDM 3D printed molds for cleanroom fabrication of milifluidic devices ([link to poster](#))

Mikos Research Group, Undergraduate Research Assistant

Aug. 2018-Aug. 2019

- Optimized gelatin microparticle synthesis using quantitative analysis to achieve specific particle size distribution ([Regenerative Biomaterials](#) (link), DOI: 10.1093/rb/rbab012)

Selected Projects and Leadership

Surgical Drain Monitoring Device (Rice University Senior Design)

Sep. 2020-May 2021

- Designed, manufactured, and tested prototype of novel automatic fluid volume monitor for surgical drains.
- Performed early market analysis, developed project timelines (Gantt), and managed team communication (Slack).
- Awarded patent (US-20240198062-A1) for medical drain device as co-inventor.

Rice University Bioengineering Curriculum Advisory Committee

Sep. 2019-May 2021

- Selected by faculty and peers to redesign the undergraduate advising process, the elective selection process, and to interview new teaching faculty affecting ~150 students.

Technical Skills

Parametric CAD	PCB design (EasyEDA)	Aseptic technique	Coding/development
• SOLIDWORKS	Bioreactor design	Primary cell isolation	• Python, R, MATLAB
• Fusion 360	Flow loop design	Tissue decellularization	• LabView
3D Printing	3D tissue culture	ICC/IHC/ELISA	• Flutter for mobile

Core Competencies

Prototyping	Project management	Team leadership	Test automation
Design iteration	Mentorship	Technical communication	Statistical analysis

Other Interests

Certified organist in American Guild of Organists	Backcountry camping	Reading, writing, blogging
Organ performances (click to view)	Road biking	Carpentry