Sanjoy Saha

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Highlights

- 5+ years of experience in mammalian cell culture, bioassay development, and upstream process optimization.
- Demonstrated ability in developing 3D cell culture systems, complex in vitro models, and engineering biomaterials for vascular and lymphatic morphogenesis.
- Expertise in developing high-efficiency stem cell differentiation methods with proven success in creating disease-relevant cell types
- Extensive experience in imaging techniques, molecular biology methods, high-throughput screening, and translational research for drug discovery and therapeutics.
- Strong technical writing and cross-functional collaboration skills, with 6+ publications and 2 pending patents.

Education

PhD in Bioengineering: Material Sci & Eng. **Aug 2020 – July 2025 (expected)**
University of Notre Dame, Notre Dame, IN

Master of Science in Mechanical Engineering **Aug 2018 – Aug 2020**
Southern Illinois University, Carbondale, IL

Bachelor of Science in Mechanical Engineering
Bangladesh University of Engineering and Technology, Dhaka, Bangladesh

Professional Experience

Graduate Research Assistant
University of Notre Dame, Bioengineering **Aug 2020 – Present**

- Engineered synthetic biomaterials to support optimal cell growth and function, resulting in a patent and high-impact publication.
- Designed microphysiological systems to model organ-level interactions and evaluate cellular responses to mechanical and chemical cues.
- Developed and optimized scalable protocols for stem cell (hiPSCs) differentiation into lymphatic endothelial cells (LECs), advancing translational research and disease modeling.
- Established high-throughput screening platform in iPSC-derived cell models for drug discovery and target validation applications.
- Developed and validated cell-based assays to evaluate differentiation efficiency and cellular response to various stimuli, leveraging advanced imaging techniques and microfluidic chips.
- Collaborated with cross-functional teams to secure funding through NSF and NIH grants, showcasing project management and technical writing expertise.

Southern Illinois University, Mechanical Engineering **Aug 2018 – Aug 2020**

- Synthesized tunable culture substrates for stem cell differentiation studies, investigating mechanobiological influences on differentiation outcomes.
- Modeled and simulated cell-ECM interactions to investigate underlying causes of heterogeneity in stem cell colonies.

Instructor
Southern Illinois University, Physics **Aug 2019 – Aug 2020**

- Contributed to curriculum development and conducted lab sessions on Electro-Magnetism for a class of 100+ students, promoting a hands-on learning approach.

Graduate Teaching Assistant

University of Notre Dame, Mechanical Engineering **Aug 2020 – May 2024**

- Mentored 100+ students in courses such as Biomaterials, Solid Mechanics, and Thermodynamics.
- Developed hands-on learning modules to enhance understanding of complex engineering and biological concepts.

Southern Illinois University, Mechanical Engineering **Aug 2018 – Aug 2020**

- Provided comprehensive mentorship to 100+ students in courses like Machine Design and Statics; aiding their understanding through practical applications.

Key Projects

Differentiation of iPSC to LEC | Funded by NSF, NIH **2020 – Present**

- Formulated rapid stem cell to lymphatic endothelial cell differentiation protocol using lentiviral transduction of ETS2/ETV2 transcription factors, achieving >85% conversion efficiency with functional vascular network formation within 7 days.
- Pioneered iPSC to LEC differentiation via metabolic programming, yielding cells with 15x higher marker expression and demonstrated efficacy in disease models.
- Analyzed bulk RNA-sequencing data to perform transcriptomic profiling, confirming the high fidelity of differentiated cells by comparing their gene expression signatures against primary LECs.
- Established quality control metrics and standardization of protocols to ensure reproducibility across multiple cell lines.

Spatiotemporal Mapping of Ca2+ and Membrane Potential | Funded by NSF **2022 – Present**

- Created reporter cell lines using piggyback transposon, utilized time-lapse live-cell fluorescent imaging to map Ca2+ and membrane potential dynamics during stem cell vascular differentiation.
- Investigated the effects of growth factors and shear stress on Ca2+ and membrane potential dynamics in differentiating cells using a microfluidic chip.
- Developed a novel vascular differentiation protocol by integrating data on membrane potential changes and optimizing it with depolarizing and hyperpolarizing drugs, achieving a 50% increase in stem cell differentiation efficiency into vascular lineages.

Biomaterials for LEC Morphogenesis | Funded by NSF, NIH, AHA **2020 – Present**

- Engineered a synthetic biopolymer specifically tailored for optimal growth of lymphatic endothelial cells increasing their sustenance by 15%.
- Led longitudinal studies collecting phenotypic and genotypic data from cultured LECs of various origins, exploring mechanisms behind preservation of cell-type characteristics.
- Investigated the mechanoregulation of LECs within a dynamic viscoelastic hydrogel, revealing how mechanical forces influence their behavior and functionality.
- Developed a tunable microphysiological system to generate lymphatic vessels in vitro, offering a platform for therapeutic transplantation and drug screening.

Skills

Cell & Molecular Biology: Mammalian cell culture, Stem cell differentiation, Lentiviral transduction, Piggyback transposon, Flow cytometry, ELISA, qRT-PCR, Confocal microscopy, Immunofluorescence, Fluorescent & magnetic assisted cell sorting, Live cell imaging

Bioengineering: Biomaterial preparation and characterization, Microfluidic systems, Complex in vitro models, Traction force microscopy, Bioprinting

Data Analysis & Modeling: MATLAB, Python, ImageJ, GraphPad Prism, ANSYS, SolidWorks, AutoCAD

Professional Skills: Technical writing, Project management, Cross-functional collaboration

Leadership and Service

Mentor, *Research Experiences for Undergraduates (REU) Program* **2022 – present**

- Supervised undergraduate students from experimental design and assay execution to data analysis and interpretation.
- Mentored two students who successfully presented their research at the university's annual symposium.

Volunteer, *STEM Labs for Middle School Students, DNA Learning Center* **2021 – Present**

- Organized scientific exhibition for underprivileged middle school students to inspire them towards STEM career

Patents

1. Multi-parameter Tunable Synthetic Matrix for Engineering Lymphatic Vessels. Application No. PCT/IB2024/057334
2. Synthetic Hyaluronic Acid-Dopamine coatings. Application No.PCT/US2024/040065

Publications (Full list available at Google Scholar)

1. Saha, S., Fan, F., Alderfer, L. et al. Synthetic hyaluronic acid coating preserves the phenotypes of lymphatic endothelial cells. https://doi.org/10.1039/d3bm00873h
2. Saha, S., Graham, F., Knopp, J. et al. Robust Differentiation of Human Pluripotent Stem Cells into Lymphatic Endothelial Cells Using Transcription Factors. https://doi.org/10.1159/000539699
3. Alderfer, L., Saha, S., Fan, F. et al. Multi-parameter tunable synthetic matrix for engineering lymphatic vessels. https://doi.org/10.1038/s42003-024-06935-7

   Montes, D., Saha, S., jeong, J. et al. Tuning the Morphological Properties of Granular Hydrogels to Control Lymphatic Capillary Formation. https://doi.org/10.1002/admi.202401037
4. Amar, K.; Saha, S.; Debnath, A. et al. Reduced Cell–ECM Interactions in the EpiSC Colony Center Cause Heterogeneous Differentiation. https://doi.org/10.3390/cells12020326
5. Fan, F., Su, B., Kolodychak, A., Ekwueme, E., Alderfer, L., Saha, S. et al. Hyaluronic Acid Hydrogels with Phototunable Supramolecular Cross-Linking for Spatially Controlled Lymphatic Tube Formation. https://doi.org/10.1021/acsami.3c12514
6. Fan, F., Saha, S., & Hanjaya-Putra, D. (2021). Biomimetic Hydrogels to Promote Wound Healing. https://doi.org/10.3389/fbioe.2021.718377

7. Hall, E., Alderfer, L., Neu, E., Saha, S. et al. The Effects of Preeclamptic Milieu on Cord Blood Derived Endothelial Colony-Forming Cells. https://doi.org/10.1101/2023.12.03.569585

8. Saha,.S. et al., Calcium Signaling and Membrane Potential Dynamics Govern iPSC-to-Endothelial Differentiation [in preparation]

Professional Development

1. 3D Bioprinting Workshop - Carnegie Mellon University **Fall 2022**

2. Strategic Management Initiative, Harper Cancer Research Institute - ND **Summer 2024**