

Aylin Acun

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EDUCATION

- UNIVERSITY OF NOTRE DAME** Notre Dame, IN
January 2013 - May 2018
- Ph.D., Bioengineering Graduate Program
 - Dissertation topic: hiPSC-based, human-origin, aged in vitro cardiac disease models
 - Advisor: Dr. Pinar Zorlutuna
- MIDDLE EAST TECHNICAL UNIVERSITY** Ankara, Turkey
September 2010 - January 2013
- MSc., Biotechnology Graduate Program
 - Thesis topic: Collagen-based, double layer cornea tissue engineering
 - Advisor: Dr. Vasif Hasirci
- MIDDLE EAST TECHNICAL UNIVERSITY** Ankara, Turkey
September 2005 - June 2010
- B.S., Biological Sciences

RESEARCH EXPERIENCE

Center for Engineering in Medicine and Surgery at Harvard Medical School, Massachusetts General Hospital, Shriners Hospitals for Children Boston, MA

Postdoctoral Research Fellow September 2018-Ongoing

- Whole human liver decellularization and recellularization for repurposing livers clinically not accepted for transplantation
- Recellularization of decellularized rat livers with iPSCs for developing in vitro and in vivo functional liver substitutes
- Developing large-scale, vascularized skin grafts through decellularization of porcine and human skin

University of Notre Dame Notre Dame, IN

Doctoral Researcher, Bioengineering January 2013 – May 2018

- Designed and developed the first hiPSC-derived, in vitro aged myocardial tissue models for modeling age-related cardiovascular diseases using tissue engineering and stem cell culture techniques.
- Involved in design and development of myocardium-on-chip model with integrated flow using hiPSC-derived cardiomyocytes and endothelial cells.
- Developed HIF-1a knock down hiPSC-derived endothelial cells using shRNA and siRNA targeting to investigate endothelial cell-mediated cardio-protection under cardiac reperfusion injury conditions.

Harvard University Boston, MA

Visiting Researcher, Stem Cell and Regenerative Biology June 2014 – February 2015

- Developed and characterized HIF-1a knockout hiPSCs using CRISPR/Cas9 technology.
- Implemented stem differentiation techniques to develop human-origin endothelial cells and cardiomyocytes.

Middle East Technical University
 Graduate Researcher, Biotechnology

Ankara, Turkey
 February 2011 – January 2013

- Designed and developed a two-layered, collagen-based tissue engineered cornea model using phase separation and electrospinning techniques and characterized its structure and functionality.

FUNDING SUPPORT

1. Recellularization of vascularized engineered scaffolds for facial reconstruction 01/2020-12/2022

Shriners Hospitals for Children, Grant#: 85127

Role: Key Personnel (PIs: Uygun, Cetrulo) (\$222,876/yr)

This project aims to create complex engineered grafts for facial reconstruction using patient specific cells. If successful, a novel alternative to allografts eliminating the need of immunosuppression will be established.

2. Engineering of vascular composite skin grafts using iPS cells 07/2019-06/2021

Shriners Hospitals for Children, Grant#: 84702

Role: PI (\$72,019/yr)

This project aims to reconstruct the microvascular network of vascular composite skin grafts using stem cell derived endothelial cells.

AWARDS & HONORS

- **2nd International Conference on Stem Cells Student Travel Award**, Aegean Conferences, Rhodes, Greece (September 2017)
- **Graduate Student Union Conference Presentation Grant**, University of Notre Dame, IN (October 2017)
- **Middle East Technical University Research Coordination Office Graduate Student Research Grant** (METU-BAP- DPT, 2011-2012)
- **Graduated with Honors from METU**, Department of Biological Sciences, Biology Program (2010)

PUBLICATIONS

Research Publications

1. **A. Acun**, R. Oganessian, H. Yeh, K. Uygun, M.L. Yarmush, B.E. Uygun (2021). Liver donor age affects hepatocyte function through age-dependent changes in decellularized liver matrix. **Biomaterials**. <https://doi.org/10.1016/j.biomaterials.2021.120689>
2. R.V. Oganessian, A.G. Lellouch, **A. Acun**, E. Lupon, C.B. Taveau, L.C. Burlage, L.A. Lantieri, M.A. Randolph, C.L. Cetrulo, B.E. Uygun (2021). Establishment of an acellular nipple scaffold in a swine model for pre-clinical application. **Plastic and Reconstructive Surgery**. (*Under Review*)
3. B. Bulutoglu, J. Devalliere, S.L. Deng, **A. Acun**, S.S. Kelangi, B.E. Uygun, M.L. Yarmush (2020). Tissue scaffolds functionalized with therapeutic elastin-like biopolymer particles. **Biotechnology and Bioengineering**. 117, 1575-83.
4. **A. Acun**, & P. Zorlutuna (2019). CRISPR/Cas9 edited hiPSC-based vascular tissues to model aging and disease-dependent impairment. **Tissue Engineering Part A**. 25(9-10):759-772
5. **A. Acun**, T.D. Nguyen, P. Zorlutuna (2019). In vitro aged, hiPSC-origin engineered heart tissue models with age-dependent functional deterioration to study myocardial infarction. **Acta Biomaterialia**. 94:372-391

6. A. YekrangSafakar, **A. Acun**, J.W. Choi, E. Song, P. Zorlutuna, K. Park (2018). Hollow microcarriers for large scale expansion of anchorage-dependent cells in a stirred bioreactor. **Biotechnology and Bioengineering**. 115(7):1717-1728
7. D. Suma, **A. Acun**, P. Zorlutuna, D.C. Vural (2018). Interdependence Theory of Tissue Aging: Bulk and Boundary Effects. **Royal Society Open Science**. 5(2): 171395
8. **A. Acun**, D.C. Vural, P. Zorlutuna (2017). Beyond Cellular Aging: Interdependence and Cooperative Effects in Failing Tissues. **Scientific Reports**. 7, 5051.
9. **A. Acun**, P. Zorlutuna. (2017). Engineered Myocardium Model to Study the Roles of HIF-1 α and HIF1A-AS1 in Paracrine-only Signaling under Pathological Level Oxidative Stress. **Acta Biomaterialia**. 58, 323–336.
10. X. Yue, **A. Acun**, P. Zorlutuna. (2017). Transcriptome Profiling of 3D Co-cultured Cardiomyocytes and Endothelial Cells under Oxidative Stress using a Photocrosslinkable Hydrogel System. **Acta Biomaterialia**. 58, 337–348.
11. B. Ellis, **A. Acun**, U.I. Can, P. Zorlutuna. (2017). Human iPSC-Derived Myocardium-on-chip with Capillary-like Flow for Personalized Medicine. **Biomicrofluidics**. 11, 024105.
12. J. Casey, X. Yue, D.T. Nguyen, **A. Acun**, V. Zellmer, S. Zhang, P. Zorlutuna. (2017). 3D Hydrogel-Based Microwell Arrays as A Tumor Microenvironment Model To Study Breast Cancer Growth. **Biomedical Materials**. 12(2):025009
13. **A. Acun**, V. Hasirci (2014). Construction of a collagen-based, split-thickness cornea substitute. **Journal of Biomaterials Science Polymer Edition**. 1-23:8.

Book Chapters

1. **A. Acun**, B.E. Uygun (2020), “Decellularized liver extracellular matrix for iPSC-based liver engineering” in Induced Pluripotent Stem Cells – Novel Concepts, Elsevier Inc. Editor-in-chief: Alexander Birabir.
2. Raigani, S., **Acun, A.**, Uygun, B., Uygun, K. & Yeh, H. Steatotic livers for transplantation: improving utilization of a prevalent resource through organ repair. in Organ Repair and Regeneration: Preserving Organs in the Regenerative Medicine Era (eds. Orlando, G. & Keshavjee, S.) (Academic Press, 2021).
3. **A. Acun**, A. Panzo, P. Zorlutuna (2015), “Hydrogels in controlling stem cell fate” in Applications of Hydrogels in Regenerative Medicine, World Scientific Publishing Company, Editor-in-chiefs: Ali Khademhosseini and Utkan Demirci.

Review Articles

1. **A. Acun**, R. Ogenasyan, B. Uygun (2019). Liver Bioengineering Promise, Pitfalls, and Hurdles to Overcome. **Current Transplantation Reports**, 1-8.

Thesis and Dissertations

1. **A. Acun** (2018). Aged, Human-origin Engineered Myocardium Model to Study Reperfusion. Ph.D. dissertation, University of Notre Dame, IN.
2. **A. Acun** (2013). Construction of a collagen-based, split thickness cornea substitute. M.Sc. thesis, Middle East Technical University, Turkey.

TEACHING EXPERIENCE

- Invited Seminar Course Teaching**, Nebraska Wesleyan University November 2020
Prepared and presented an invited lecture on tissue/organ engineering based on my research experience as a part of STEM Seminar course offered to all STEM undergraduates at Nebraska Wesleyan University.
- Workshop Teaching Experience**, CEMS Summer Academy July 2019
I volunteered to prepare the content and present a full workshop for undergraduate interns at the summer academy on how to keep a lab notebook.
- Graduate Teaching Assistant**, Aerospace and Mechanical Engineering Fall 2017
AME 50548 Next Generation Nano-scale Manufacturing of Biomedical Systems:
I demonstrated hydrogel tissue model fabrication, microfluidic device assembly, graded homework and midterm.
I volunteered to prepare the lecture materials and present a full lecture.
- Graduate Teaching Assistant**, Aerospace and Mechanical Engineering Springs 2016, 2017
AME 21213 Solid Mechanics: I was in charge of demonstrating the experiments such as tensile testing, building a beam, and three- and four-point bending tests and guiding the students during the experiments. Helped students with their questions on the related theoretical information, and graded lab reports for this Sophomore level class with over 150 students.
- Graduate Teaching Assistant**, Aerospace and Mechanical Engineering Spring 2015, Fall 2016
AME 60677 Biomimetic Tissue Engineering: Graded quizzes and midterms, lead graduate and undergraduate students in cell/tissue culture room and demonstrated basic steps of cell culture and cell encapsulation in hydrogels for this Graduate level class with 12 students.
- Graduate Teaching Assistant**, Aerospace and Mechanical Engineering Fall 2014, Fall 2015
AME 30362 Design Methodologies: Graded homework and quizzes for this Sophomore level class with over 100 students.

CERTIFICATIONS

- **Research Management and Leadership Training Certificate**, University of Colorado (Online Course) (November 2020)
- **Trusted Reviewer Certificate**, in recognition of an exceptionally high level of peer review competency, IOP Publishing (September 2020)
- **Striving for Excellence in Teaching Certificate**, Kaneb Center for Teaching and Learning, University of Notre Dame (February 2018)
- **Cancer Nanotechnology and Cell Mechanics Workshop Completion Certificate**, University of Illinois at Urbana-Champaign, 2015 BioNanotechnology Summer Institute (August 2015).

LEADERSHIP AND SERVICE

- Seminar Series Organization**, Center for Engineering in Medicine and Surgery 2019-present
Involved in the organization of Seminar Series at Center for Medicine in Engineering, Massachusetts General Hospital – Harvard Medical School. Contacted researchers that excel in various disciplines of biomedical engineering and helped arranging over 15 seminar talks.
- Research Technician Training**, Center for Engineering in Medicine and Surgery Spring 2019

Trained a research technician in iPSC culture and maintenance techniques over 3 months with hands on demonstrations.

Surgical Resident Training, Center for Engineering in Medicine and Surgery 2018-present
Trained 2 surgical residents in wet lab techniques with hands on demonstrations and regular meetings over 2 years.

Recruitment Committee, Center for Engineering in Medicine and Surgery 2018-present
Postdoctoral member. Interviewed candidates and provided feedback to help recruit the best candidates possible for open postdoctoral and research technician positions at the center.

Student Intern Mentorship, Center for Engineering in Medicine Summer 2019
Mentored an undergraduate and a high school student as a part of 2019 Summer Academy Program in Center for Engineering in Medicine. I supervised the students daily through 9 weeks for understanding and applying basic cell and tissue culture techniques for bioengineering applications.

Journal Reviewer 2018-present

1. Biofabrication
2. Biomaterials
3. Cells Tissues Organs
4. Regenerative Engineering and Translational Medicine
5. Tissue engineering and regenerative medicine

High School Student Mentorship, University of Notre Dame 2015-2017
Trained a high school junior on basic principles of tissue engineering for introducing her to science and research and help her to have her own project for two years.

Undergraduate Student Mentorship, University of Notre Dame 2013-2018
Trained 7 undergraduate students with various backgrounds on basic principles of tissue engineering for introducing them to science and research in graduate level and mentoring them on their own projects.

Workshop Organization, University of Notre Dame 2015-2018
Organized and lead the workshops that includes an oral presentation and hands-on experience of cell and tissue culture and basic tissue engineering concepts for my research group in Expanding Your Horizons Conference in 2015, 2016, 2017, and 2018.

Professional Memberships

Biomedical Engineering Society, Student Member	2014-2018
Biomedical Engineering Society, Early-Career Member	2018-present

RESEARCH TALKS

Invited Talks

Center for Transplantation Sciences at MGH Seminar Series “Organ Engineering Through Decellularized Grafts”
April 2020

Center for Engineering in Medicine and Surgery Seminar Series “Aged, Human-Origin Engineered Myocardium Model to Study Reperfusion Injury” May 2018

University of Notre Dame Stem Cell Colloquium, Notre Dame, IN. “Tissue Engineered Myocardium to Study the Role of Cellular Interactions in Protection from Reperfusion Injury” August 2016

University of Notre Dame Bioengineering Program Departmental Seminar, Notre Dame, IN. “Engineering myocardial tissues to study the role of HIF1 α and endothelial cells in cardioprotection under oxidative stress” February 2015

Conference Talks

ATP-Bio Annual Meeting, Virtual. “Perfusion for Engineering Organ and Large-scale Tissue Substitutes”. November 2020

Virginia Society of Plastic Surgeons Annual Meeting, Virtual. “Decellularization Protocol for porcine Fasciocutaneous flap: An update” October 2020

2019 BMES Annual Meeting, Philadelphia, PA. “Identifying Role of Extracellular Matrix Age in Liver Function and Regeneration” October 2019

2017 International Conference on Stem Cells, Rhodes, Greece. “Tissue engineered disease models using human iPSC-derived myocardial cells for personalized medicine” September 2017

2017 Summer Biomechanics, Bioengineering, and Biotransport Conference, Tucson, AZ. “Interdependence Driven Aging in Synthetic Tissues” June 2017

POSTER PRESENTATIONS

Invited Presentations

Eli Lilly and Company Grand Rounds Seminar Series, Indianapolis, IN. “hiPSC-derived Engineered Myocardium Towards Personalized Medicine Applications” October 2016

Conference Presentations

2020 International Society for Stem Cell Research, Virtual. “Donor Age Alters the Function and Regenerative Capacity of Human Liver Extracellular Matrix” June 2020

American Transplant Congress, Virtual. “Development and Characterization of Decellularized Whole Human Livers for Increasing Donor Pool” June 2020

2017 BMES Annual Meeting, Phoenix, AZ. “An Aged, Human-Origin, Engineered Infarct Model” October 2017

2017 International Conference on Stem Cells, Rhodes, Greece. “Optimization of Human Induced Pluripotent Stem Cell-Derived Cardiomyocytes for Tissue Engineering and Disease Modeling” September 2017

2016 BMES Annual Meeting, Minneapolis, MN. “A Tissue Engineered Model of Aging” October 2016

2016 BMES Annual Meeting, Minneapolis, MN. “A hiPSC-Derived 3-D Myocardium-On-A-Chip for The Study of Cardiovascular Disease” October 2016

Indiana CTSI 8th Annual Meeting, Indianapolis, IN. “hiPSC-derived Engineered Myocardium Towards Personalized Medicine Applications” September 2016

2015 BMES Annual Meeting, Tampa, FL. “A microfluidic system to study the role of hif1a and endothelial cells in reperfusion injury” October 2015

EMBS Micro and Nanotechnology in Medicine Conference, Translating Technology from the Bench to the Bedside, Oahu, HI. “An Engineered Microfluidic Device for Modeling Cardiac Tissue” December 2014

3rd Annual AD&T Symposium, Notre Dame, IN. “Engineering Myocardial Disease Models using Genetically Modified Human iPSCS” November 2014

2014 BMES Annual Meeting, San Antonio, TX. “Oxygen Monitoring for Three-Dimensional Engineered Tissues” October 2014

Frontiers in Bioengineering Symposium, Urbana-Champaign, IL. “Baby Steps Towards Living Micromachines” September 2014