

## AYLIN ACUN

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### RESEARCH EXPERIENCE

HARVARD MEDICAL SCHOOL-MASSACHUSETTS GENERAL HOSPITAL – CENTER  
FOR ENGINEERING IN MEDICINE Boston, MA

Postdoctoral Research Fellow September 2018-Ongoing

Whole human liver decellularization and recellularization for repurposing livers  
clinically not accepted for transplantation

Recellularizing decellularized rat livers with iPSCs for developing in vitro and in  
vivo functional liver substitutes

Developing novel wound closure remedies for chronic wound healing

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 cell culture and differentiation techniques to develop human-origin  
endothelial cells and cardiomyocytes.

MIDDLE EAST TECHNICAL UNIVERSITY Ankara, Turkey  
Graduate Researcher, Biotechnology 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.

## EDUCATION

UNIVERSITY OF NOTRE DAME  
Ph.D., Bioengineering Graduate Program  
Dissertation topic: hiPSC-based, human-origin, aged in vitro cardiac disease models  
Advisor: Dr. Pinar Zorlutuna

Notre Dame, IN  
May 2018

MIDDLE EAST TECHNICAL UNIVERSITY  
MSc., Biotechnology Graduate Program  
Thesis topic: Collagen-based, double layer cornea tissue engineering  
Advisor: Dr. Vasif Hasirci

Ankara, Turkey  
January 2013

MIDDLE EAST TECHNICAL UNIVERSITY  
B.S., Biological Sciences

Ankara, Turkey  
June 2010

## AWARDS AND HONORS

2<sup>nd</sup> 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)

## CERTIFICATIONS

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).

## RESEARCH INTERESTS

Tissue Engineering and Regenerative Medicine

Developing 3D in vitro tissue models towards whole organ fabrication

Aging Research – in vitro Aged Tissue Models to Study Age-related Diseases

Modeling Age-related Cancers and Neurodegenerative Diseases in vitro and in vivo

Stem Cell Research

Developing iPSC-based therapies using tissue and animal models

BIOMEMS - Organ-on-chip Technology

Cancer, brain, and heart-on-chip models for clinical applications

## TECHNICAL SKILLS

Whole and partial rat and human liver decellularization and recellularization

Induced pluripotent stem cell culture and differentiation to endothelial cells and cardiomyocytes

Tissue engineering construct fabrication, characterization, and culture

Microfluidic heart-on-chip fabrication and culture

Confocal and fluorescence microscopy

CRISPR/Cas9 editing

Molecular biology techniques (shRNA and siRNA editing, RT-qPCR)

## PUBLICATIONS

B. Bulutoglu, J. Devalliere, S. Deng, **A. Acun**, S. Kelangi, B. Uygun, M. Yarmush, (2019).

Tissue Scaffolds Functionalized with Therapeutic Elastin Biopolymer Particles. Biofabrication (Submitted)

**A. Acun**, R. Ogenasyan, B. Uygun (2018). Liver Bioengineering Promise, Pitfalls, and Hurdles to Overcome. Current Transplantation Reports, 1-8.

**A. Acun**, & P. Zorlutuna (2018). CRISPR/Cas9 edited hiPSC-based vascular tissues to model aging and disease-dependent impairment. Tissue Engineering Part A. Published Online: Feb 1 2019, <https://doi.org/10.1089/ten.TEA.2018.0271>.

**A. Acun**, T.D. Nguyen, P. Zorlutuna (2018). hiPSC-derived in vitro aged heart tissue model shows molecular and functional deterioration resembling aged mammalian heart. Acta Biomaterialia. (Under Review) [BioRxiv preprint] doi: <https://doi.org/10.1101/287334>

**A. Acun**, D.C. Vural, P. Zorlutuna (2017). Beyond Cellular Aging: Interdependence and Cooperative Effects in Failing Tissues. **Scientific Reports**. 7, 5051.

**A. Acun**, P. Zorlutuna. (2017). Engineered Myocardium Model to Study the Roles of HIF-1 $\alpha$  and HIF1A-AS1 in Paracrine-only Signaling under Pathological Level Oxidative Stress. **Acta Biomaterialia**. 58, 323–336.

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.

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.

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* DOI: 10.1002/bit.26601

D. Suma, **A. Acun**, P. Zorlutuna, D.C. Vural (2018). Interdependence Theory of Tissue Aging: Bulk and Boundary Effects. *Royal Society Open Science* DOI:10.1098/rsos.171395

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

**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

**A. Acun**, V. Hasirci (2014). Construction of a collagen-based, split-thickness cornea substitute. *Journal of Biomaterials Science Polymer Edition*. 1-23:8.

## PRESENTATIONS

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

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 $\alpha$  and endothelial cells in cardioprotection under oxidative stress” February 2015

## POSTERS

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

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

3<sup>rd</sup> 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

## TEACHING EXPERIENCE

UNIVERSITY OF NOTRE DAME	Notre Dame, IN
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, and <u>prepared and presented a full lecture</u> .	

Graduate Teaching Assistant, Aerospace and Mechanical Engineering Spring 2016, Spring 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.

## **LEADERSHIP AND SERVICE**

High School Student Mentorship, University of Notre Dame  
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  
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  
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 2016 and 2017.

## **REFERENCES**

Dr. Basak Uygun, Postdoctoral Advisor, Harvard Medical School

e-mail: buygun@mgh.harvard.edu

Dr. Pinar Zorlutuna, Ph.D. advisor, University of Notre Dame

e-mail: Pinar.Zorlutuna.1@nd.edu

Dr. Kidong Park, Collaborator, Louisiana State University

Curriculum Vitae – Aylin Acun

e-mail: kidongp@lsu.edu

Dr. Vasif Hasirci, M.Sc. advisor, Middle East Technical University

e-mail: vhasirci@metu.edu.tr