

**DATE PREPARED:** June 25, 2018

**Name:** Ula V. Jurkunas, M.D.

**Education:**

1992-1996	B.S., cum laude	Biochemistry	Centre College, Danville, KY
1996-2000	M.D., cum laude	Medicine	University of Louisville, Louisville, KY

**Postdoctoral Training:**

7/1/2000-6/30/2001	Intern	Internal Medicine University of Louisville, Louisville, KY
7/1/2001-6/30/2004	Resident	Ophthalmology Boston University, Boston, MA
7/1/2004-6/30/2006	Clinical and Research Fellow	Cornea and Refractive Surgery Massachusetts Eye and Ear and Schepens Eye Research Institute, Harvard Medical School, Boston, MA
7/1/2006-8/7/2006	Trainee	Clinical Effectiveness Program Harvard School of Public Health, Boston, MA
8/14/2006-9/8/2006	Professional Training	Kyoto Prefectural University of Medicine, Kyoto Japan
4/3/2012-4/6/2012	Attendee	Harvard Medical School Leadership Development for Physicians and Scientists Harvard University, Boston, MA

**Faculty Academic Appointments:**

7/1/2006-7/31/2009	Instructor Ophthalmology Harvard Medical School, Boston, MA
8/1/2009-3/31/2014	Assistant Professor Ophthalmology Harvard Medical School, Boston, MA
4/1/2014-present	Associate Professor of Ophthalmology Harvard Medical School, Boston, MA

**Appointments at Hospitals/Affiliated Institutions:**

7/1/2006-present Assistant in Ophthalmology/Active Staff, Massachusetts Eye and Ear, Boston, MA

7/1/2006-8/20/2010 Investigator, Schepens Eye Research Institute, Boston, MA

9/20/2007-present Clinical Associate, Massachusetts General Hospital, Boston, MA

6/6/2008-11/1/2008 Staff Attending, University of Massachusetts Memorial Medical Center, Worcester, MA

7/1/2009-present Associate Surgeon, Active Staff, Brigham and Women's Hospital, Boston, MA

8/21/2010-3/31/2014 Assistant Scientist, Schepens Eye Research Institute, Boston, MA

11/7/2012-present Affiliate Faculty, Harvard Stem Cell Institute, Boston, MA

4/28/2013-present Associate Surgeon, Active Staff, Massachusetts Eye and Ear, Boston, MA

4/1/2014-present Associate Scientist, Schepens Eye Research Institute, Boston, MA

**Major Administrative Leadership Positions:**

2005-2006 Chief Fellow, Cornea and Refractive Surgery Service, Massachusetts Eye and Ear, Boston, MA

2008-2009 Course Director, Kevin Hill Course, Colby College, Waterville, Maine

2009-2013 Senior Instructor, "Extreme Cornea: Diagnostic and Management Dilemmas in Your Practice," American Academy of Ophthalmology, Cornea Course, Intermediate-advanced level, 2 hours

2011-present Co-Director of Annual Meeting, Harvard Department of Ophthalmology Annual Meeting, Massachusetts Eye and Ear, Boston, MA

2013-2016 Association for Research in Vision and Ophthalmology (ARVO), Cornea Section Annual Meeting Program Committee, Chair 2015-2016

2013-present Co-Director, Harvard Department of Ophthalmology Cornea Center of Excellence, Boston, MA

2017 Co-Chair, 30<sup>th</sup> Biennial Cornea Conference, Boston, MA

**Committee Service:**Local

2005-2006 Clinical Fellows' Representative in Fellowship Committee, Massachusetts Eye and Ear, Boston, MA

2007-2011 Quality Council Committee, Massachusetts Eye and Ear, Boston, MA

2008-2013 Executive Committee, Cornea Center of Excellence, Schepens Eye Research Institute, Massachusetts Eye and Ear, Boston, MA.

2008-2012 Anterior/Posterior Segment Planning Committee, Massachusetts Eye and Ear, Boston, MA

2008-2014 Human Studies Committee, Massachusetts Eye and Ear, Boston, MA

2010-2013 Selection Committee for Eleanor and Miles Shore 50<sup>th</sup> Anniversary Fellowship Program for Scholars in Medicine, Harvard Medical School, Boston, MA

2010-present Schepens Eye Research Institute Fellowship Training Committee

2011-present Selection Committee for Bausch and Lomb Fellowship, Massachusetts Eye and Ear, Boston, MA

2012-present Harvard Medical School, Department of Ophthalmology Nominations Committee, Boston, MA

2012-2014 New England Ophthalmological Society, Moderator/Program Committee Organizer, Cornea Session, 5/30/14

2015-present Glaucoma Faculty Search Committee, Massachusetts Eye and Ear, Boston, MA

2016-present Selection Committee for the Gragoudas-Folkman Award, Massachusetts Eye and Ear, Boston, MA

National

2008-present Executive Committee for Biennial Cornea Research Conferences, Schepens Eye Research Institute, Boston, MA

2008-2012 Executive Committee Member, Women's Eye Health.org, Schepens Eye Research Institute, Department of Ophthalmology, Harvard Medical School, Boston, MA

2009-present Women in Eye and Vision Research (WEAVR)

2010-2016 Advisor on molecular biology for the Fuchs Endothelial Dystrophy Genetics Study, Cleveland Clinic, OH

2018-present Selection Committee, Cornea Journal Editor in Chief

International

2012-present Limbal Stem Cell Disease Working Group

**Professional Societies:**

1996-2000 American Family Physicians Association

2001-present American Academy of Ophthalmology

2001-present American Society of Cataract and Refractive Surgery

2004-present Association for Research in Vision and Ophthalmology

2004-2006 American Medical Association

2008-present International Society of Eye Research

2009-2010, Section Co-Organizer; 2010 International Society for Eye Research Biennial Congress, Montreal, Canada

2011- present New England Ophthalmological Society

2016-present Eye Bank Association of America Society

2017-present R. Townley Paton Cornea Society

**Editorial Activities:**

Ad hoc reviewer

2006-present *Experimental Eye Research*

2007-present *Cornea*

2008-present *Investigative Ophthalmology Visual Science*

2009-present *American Journal of Ophthalmology*

2010-present *American Journal of Pathology*

2010-present *Eye*

2009-present *Survey of Ophthalmology*

2010-present *Molecular Vision*

2011-present *Human Molecular Genetics*  
2011-present *PLoS ONE*

Editorial Board Member  
2013–2018

*Investigative Ophthalmology Visual Science*

**Honors and Prizes:**

1992-1996 Dean's List (every semester), Centre College, Danville, KY  
1995 Phi Beta Kappa, Centre College, Danville, KY  
1999 Alpha Omega Alpha, University of Louisville Medical School, Louisville, KY  
1996-2000 Lithuanian Foundation Scholarship, Chicago, IL  
1996-2000 James Dennis Riehm, M.D. Scholarship, University of Louisville Medical School, Louisville, KY  
2004 Best Scientific Poster Award, New England Ophthalmological Society, "Novel Role of Keratocytes in Corneal Edema," Boston, MA  
2007 Best Scientific Abstract Award. The 25<sup>th</sup> Biennial Cornea Research Conference, Schepens Eye Research Institute, Boston, MA  
2008 ARVO/Alcon Early Career Clinician-Scientist Research Award  
2008 Ophthalmology Awardee of the Friends of Massachusetts Eye and Ear Award  
2008 ISER Travel Fellowship, Beijing, China  
2008 Normal Knight Leadership Development Award, Massachusetts Eye and Ear  
2010 Ophthalmology Scholar, Harvard Medical School Department of Ophthalmology  
2013 Young Investigator Award, Alcon Research Institute  
2016 American Academy of Ophthalmology Achievement Award, AAO 2016, Chicago, IL  
2017 2017 ARVO Foundation/Pfizer Ophthalmics Carl Camras Translational Research Award, ARVO 2017, Baltimore, MD

**REPORT OF FUNDED AND UNFUNDED PROJECTS**

**Funded Projects:**

Past

2004-2006 "Proteomic Analysis of Human Corneal Endothelium and Fuchs' Corneal Dystrophy."  
Joint Clinical Research Center Fellowship, Harvard Medical School, Boston, MA.  
Investigator  
The major goal of the project was to compare proteomic analyses of normal and Fuchs endothelial dystrophy (FED) endothelial samples. FED is one of the most common corneal dystrophies, accounting for one-third of corneal transplants performed in the U.S.

2006-2011 "Pathophysiology of Fuchs' Endothelial Corneal Dystrophy."  
Harvard-Vision Clinical Scientist Development Program,

NIH/NEI K12 EY016335

PI

Mentors: Ilene Gipson, PhD and Reza Dana, MD

The major goal of the study was to determine the proteomic and gene expression differences between normal and Fuchs endothelial dystrophy endothelium and to determine the role of oxidative stress in the pathogenesis of the dystrophy.

2007-2008

“Cultivated Oral Mucosal Transplantation for Ocular Surface Reconstruction.”

Harvard Medical School’s Center of Excellence in Women’s Health Award, Boston, MA.

PI

The major goal of this study was to establish the collaboration with oral surgeons at the Harvard Dental School and to develop oral epithelial cultivation techniques.

2007-2009

“Cultivation of Oral and Corneal Epithelium for Corneal Transplantation.”

New England Corneal Transplant Research Award.

PI

The major goal of this study was to test the viability of oral and corneal stem cell sheets cultivated with and without the use of feeder layers on different substrates.

2007-2010

“Cultivation of Oral Mucosal Sheets for Corneal Transplantation.”

2011-2102

Massachusetts Lions Eye Research Fund.

PI

The major goal of this study was to develop safe and efficient cultivation techniques for the development of oral mucosal epithelial sheets that will be used for transplantation in limbal stem cell deficiency patients.

2008-2009

“Cell Culture Model for Fuchs Endothelial Corneal Dystrophy.”

The Alice J. Adler Fellowship, the Eleanor and Miles Shore 50<sup>th</sup> Anniversary Fellowship, Harvard Medical School.

PI

The major goal of this study was to establish a cell culture model of Fuchs’ Endothelial Corneal Dystrophy. This fund was used to obtain preliminary data for writing an RO1 grant.

2009-2012

“Novel Therapeutic Approaches for Corneal Disorders.” Falk Medical Research Foundation

Investigator

The major goal of this project is to study novel therapeutic modalities that avoid use of standard allogeneic corneal transplantation for blinding corneal conditions.

- 2010-2011 “Cultivation of Corneal and Oral Stem Cells on Pre-Cut Sterile Corneal Substrates.”  
Frederick N. Griffith Foundation, Tissue Banks International.  
PI  
The major goal of the study was to evaluate the suitability of pre-cut sterile corneas as substrates for ex vivo cultivation of limbal and oral stem cells.
- 2010-2011 “Culture Model of Fuchs Endothelial Corneal Dystrophy.”  
Massachusetts Lions Eye Research Fund (SERI)  
PI  
The major goal of this study was to develop telomerase-immortalized normal and Fuchs endothelial corneal dystrophy cell lines.
- 2010-2011 “Pathogenesis of Fuchs Endothelial Dystrophy”  
Research to Prevent Blindness, Physician Scientist Award  
PI  
The goal of the proposed studies was to determine how chronic oxidative stress causes molecular and cellular damage in susceptible human corneal endothelial cells, which, in turn, leads to the pathological and clinical findings of FECD.
- 2011-2012 “The Role of DJ-1 in Pathogenesis of Fuchs Endothelial Corneal Dystrophy.”  
The New England Corneal Transplant Research Fund (MEE).  
PI  
The main goal of the study is to investigate the suitability of DJ-1 knockout mice in development of an animal model for studying Fuchs endothelial corneal dystrophy.
- 2011-2013 “Ex-vivo expansion of Corneal and Oral Stem Cells for Autologous Cornea Transplantation: from Bench to Bedside.”  
2011 Curing Kids Fund (MEE)  
PI  
The main objective of this study is to gather pre-clinical data for an Investigational New Drug (IND) application to the US FDA and determine release criteria for the manufacture of clinical grade autologous epithelial stem cells.
- 2009-2014 “Novel Therapeutic Approaches for Corneal Disorders”  
Falk Medical Research Foundation  
PI  
The goal of the study is to develop pharmacotherapeutic targets to reverse corneal endothelial degeneration.
- 2010-2015 “Role of Oxidative Stress in Pathogenesis of Fuchs Endothelial Corneal Dystrophy.”  
NEI/NIH R01 EY020581  
PI

The major goal of the study is to determine specific cellular mechanisms that can be manipulated to reverse endothelial cell degeneration due to oxidative stress.

- 2010-2015 “Translational Application to Manufacture Cultivated Corneal and Oral Epithelial Stem Cells for Corneal Transplantation.”  
Production Assistance for Cellular Therapies (PACT), National Heart Lung and Blood Program, National Institutes of Health, #00027  
PI (No direct funding)  
The major goal of this study is to manufacture corneal and oral epithelial stem cell constructs and to obtain FDA approval for human transplantation.
- 2013-2014 “The Role of Oxidative DNA Damage in Pathogenesis of Fuchs Endothelial Corneal Dystrophy”  
2013 Alcon Research Institute Young Investigator Grant  
PI  
The major goal of this study is to determine how oxidative DNA damage contributes to FECD pathogenesis.
- 2013-2014 “The Chemoprotective Effects of Nrf2 Agonists on Endothelial Cell Apoptosis”  
GlaxoSmithKlein  
PI  
The goal of this project is to investigate the effect of Nrf2 agonists on protecting human corneal endothelial cells (HCECS) against oxidant-induced apoptosis.
- 2015-2016 “Understanding the Mechanisms of Mitophagy, a Mitochondrial Quality Control Pathway, in Fuchs Endothelial Corneal Dystrophy”  
Massachusetts Lions Eye Research Fund, Inc.  
PI (\$18,000)  
The goal of this project is elucidate the mechanism of mitochondrial dysfunction in the pathogenesis of FECD.
- 2015-2016 “Development of Mitochondrially Targeted Therapies for Fuchs Endothelial Corneal Dystrophy”  
New England Corneal Transplant Research Fund  
PI (\$24,733)
- 2012-2016 “Safety and Efficacy of Bevacizumab in High-Risk Corneal Transplant Survival.”  
United States Department of Defense  
Co-Investigator (\$27,368)  
The goal of the study is to determine the safety and efficacy of subconjunctival and topical bevacizumab treatment in patients who have undergone high-risk corneal transplantation.

- 2016-2017 “Role of aberrant DNA damage response in Fuchs Endothelial Corneal Dystrophy and its effect on the trinucleotide repeat expansion in *TCF4*”  
Eversight Foundation  
PI (\$16,529)  
The goal of this study is to explore uncharted territories regarding the role of repeat expansion and oxidative damage relevant to FECD that may help identify target proteins for potential therapeutic approaches.
- 2017-2018 “30<sup>th</sup> Biennial Cornea Conference”  
NIH/NEI, Support for Conferences and Scientific Meetings (R13)  
PI (\$12,500)  
The goal of this proposal is to obtain funds to host the 30<sup>th</sup> Biennial Corneal Conference. The aims are as follows: Aim 1: Provide a venue for cutting-edge vision scientists to present their current work exploring basic and translational developments of the cornea and anterior ocular surface; Aim 2: Offer trainees the opportunity to present their work, to interact with leading senior scientists in the field, and to be inspired by the high quality science and conversations; Aim 3: Create an environment that will foster discussion and interactions among leaders in the field with a panel discussion at the end of each session topic; and Aim 4: Cultivate an atmosphere conducive for future collaborations.
- Current  
2015-2020 “Role of Oxidative Stress in Pathogenesis of Fuchs Endothelial Corneal Dystrophy.”  
NEI/NIH R01 EY020581  
PI (\$1,375,328)  
The major goal of the study is to determine specific cellular mechanisms involved in the pathogenesis of FECD that can be manipulated to reverse endothelial cell degeneration due to oxidative stress.
- 2017-2021 “Safety and Feasibility of Cultivated Autologous Limbal Epithelial Cell Transplantation in the Treatment of Limbal Stem Cell Deficiency”  
NIH/NEI, UG1 EY026508  
PI (\$1,384,370)  
The goal of this study is to show the safety and feasibility of cultivated autologous limbal epithelial cell (CALEC) transplantation, and its efficacy compared to conjunctival limbal autograft (CLAU) in this multi-specialty organizational structure which we hope will lead to the standardization of this technique for treatment of patients with unilateral limbal stem cell deficiency (LSCD). This study will pave the way for acceptance of this technique to be considered standard care in the U.S.
- 2017-2018 “Fuchs Corneal Endothelial Dystrophy”  
Intellia Therapeutics, Inc  
PI (\$167,581)  
Goal: to determine the feasibility of treating Fuch’s Endothelial Corneal



Dystrophy (FECD) using CRISPR.

Aim 1: to assess delivery approaches for HCEnc-21T cells

Aim 2: to determine if HCEnc-21T cells are amenable to CRISPR/Cas9-based gene editing

Aim 3: to identify optimal guide pairs for excision of the *TCF4* repeat expansion (performed at Intellia)

Aim 4: to phenotype Fuchs cells with and without excision of the *TCF4* repeat expansion

**Past Unfunded Projects:**

2006-2012

Site Co-Investigator, Fuchs Endothelial Corneal Dystrophy Genetics Study Multi-Center Study Group, originated by Case Western University, Cleveland, OH.

The major goal of the study was to define genetic loci responsible for the onset of familial forms of Fuchs endothelial dystrophy.

2007-2010

“Effectiveness and Safety of Topical Bevacizumab (Avastin) for Treatment of Corneal Neovascularization.”

Co-Investigator

The goal of the study was to investigate the efficacy of topical Avastin on corneal neovascularization. My role is to select appropriate patients for the study, assess the effectiveness of the treatment and to perform data analysis.

2007-2011

“Safety and Efficacy of Topical Interleukin-1-Receptor Antagonist in the Treatment of Signs and Symptoms of Posterior Blepharitis.”

Co-Investigator

The goal of the study was to investigate the effectiveness of a new drug to treat refractory blepharitis. My role is to select and treat appropriate patients and to perform data analysis after the treatment

2008-2011

“Determination of Intraocular Lens Power in Postrefractive Surgery Patients.”

Co-Investigator

I supervise residents involved in the project by providing my patients and expertise for developing the most reliable method of lens power calculations.

2010-2012

“Safety and Efficacy of Topical Pazopanib in Treatment of Corneal Neovascularization.”

Co-Investigator

The goal of this study is to determine safety and tolerability of topical pazopanib in the treatment of corneal neovascularization as identified by ocular examination, including the incidence and severity of ocular and systemic adverse events.

2011-2013

“Relative Efficacy of Loteprednol (Lotemax®) vs.

Loteprednol/Tobramycin (Zylet®) in Treatment of Chronic Ocular Surface Inflammation Associated with Meibomian Gland Dysfunction (MGD)/Posterior Blepharitis.”

	<p>Co-Investigator</p> <p>The goal of the study is to determine whether Zylet (a corticosteroid and antibiotic) is superior to Lotemax (steroid only) in managing meibomian gland dysfunction associated ocular surface disease.</p>
2012-2013	<p>“A Phase 3 Randomized, Double-masked, Placebo-controlled Study of the Pharmacokinetics of OMS302 and the Effect of OMS302 on Intraoperative Pupil Diameter and Early Postoperative Pain in Subjects Undergoing Intraocular Lens Replacement with Phacoemulsification.”</p> <p>PI</p> <p>The goal of this study is to understand whether an investigational mixture of cataract surgery solutions will be better than placebo in dilating the pupil and reducing pain during the post-operative period.</p>
2008-2014	<p>“Cellular Changes in Fuchs Endothelial Corneal Dystrophy: An in Vivo Confocal Microscopy Study.”</p> <p>Co-Investigator</p> <p>The major goal of the study is to assess the involvement of corneal nerves and cellular changes in patients with Fuchs dystrophy.</p>
2009-2014	<p>“Utilization of Confocal Microscopy for the Assessment of Corneal Nerve and Cellular Characteristics in Fungal, Acanthamoeba, Bacterial and Adenoviral Keratitis.”</p> <p>Co-Investigator</p> <p>The goal of this study is to investigate alterations in corneal sub-basal nerves and dendritic cells in fungal, acanthamoeba, bacterial and adenoviral keratitis patients using in-vivo confocal microscopy.</p>
2009-2015	<p>“Utilization of Confocal Microscopy for the Assessment of Corneal Nerve and Cellular Characteristics in Corneal Dystrophies.”</p> <p>Co-Investigator</p> <p>The goal of this study is to investigate density and morphology of corneal cells in corneal dystrophies using in-vivo confocal microscopy.</p>
2010-2015	<p>“In Vivo Confocal Microscopy in Corneal Graft Rejection.”</p> <p>Co-Investigator</p> <p>The goal of this study is to investigate early detection of prognosticators for corneal graft rejection by detecting cellular changes after corneal transplantation by using in-vivo confocal microscopy.</p>
<b>Unfunded Projects:</b>	
2012-present	<p>“Regional Variability in Endothelial Cell Density in Fuchs Endothelial Corneal Dystrophy: A Retrospective Study.”</p> <p>PI</p> <p>The goal of this study is to compare endothelial cell density using specular and confocal microscopies and to analyze regional variability of ECD between guttate and non-guttate areas of patients with FECD.</p>
2013-present	<p>Corneal Disease Biorepository</p> <p>PI</p>

The purpose of this biorepository is to collect tissue samples on patients who have been diagnosed with a corneal disease and to provide a readily available source of tissue for future studies that run in conjunction with this biorepository.

2013-present “Assessment of Corneal Endothelial Function Following Hypoxic Stress”  
PI  
The purpose of this study is to establish a tool to measure corneal endothelial cell function by comparing the amounts of corneal deswelling between normal and Fuchs patients.

## **REPORT OF LOCAL TEACHING AND TRAINING**

### **Teaching Students in Courses:**

1997-1999 Tutor in Human Anatomy, Biochemistry, and Physiology.  
University of Louisville Medical School. 5 hours/month.

2011-present Mentor in teaching Harvard Medical School second-year students  
ophthalmic examination. 3 1/2 hours/year.

### **Formal Teaching of Residents, Clinical Fellows and Research Fellows:**

2006-2013 Cornea and External Disease, Ophthalmology Resident Lecture Series,  
Massachusetts Eye and Ear. “Corneal transplantation.” One-hour lecture.

2006-present Corneal endothelial disorders with emphasis on Fuchs endothelial  
dystrophy. Research Fellows, Schepens Eye Research Institute  
Seminars. One-hour lecture.

2006-present Refractive Surgery Club, Massachusetts Eye and Ear. Once monthly  
lectures and case presentations.

2009-2017 Molecular Bases of Eye Diseases Training Program, Harvard Medical  
School, Department of Ophthalmology. One hour annually.

2009-2018 Co-organizer: New Frontiers in Corneal Research Meeting hosted by  
Cornea Center of Excellence, Harvard Department of Ophthalmology,  
Boston, MA

2010-2013 Co-organizer: “Slit-lamp Conference,” Massachusetts Eye and Ear.  
Case-based hourly lectures geared towards corneal fellows. Once  
monthly.

2017 Cornea and External Disease, Ophthalmology Resident Lecture Series,  
Massachusetts Eye and Ear. “Corneal Dystrophies and Novel  
Approaches to Restore Corneal Endothelial Dysfunction .” One-hour  
lecture.

**Clinical Supervisory and Training Responsibilities:**

- 2004-2006 Attending physician: Massachusetts Eye and Ear Emergency Room, 24 shifts/year, residents and medical students.
- 2006-present Clinical preceptor: cornea and refractive surgery clinics. Clinical fellows, residents and national/international observers, 12 sessions per month.
- 2006-present Surgical preceptor: refractive surgery and laser procedures, Massachusetts Eye and Ear. Clinical fellows, residents, 3 sessions per month.
- 2006-present Surgical preceptor: cornea, cataract and anterior segment reconstruction surgery, Massachusetts Eye and Ear, Clinical fellows, 3 sessions per month.
- 2006-present Preceptor for Ophthalmology Grand Rounds: Presentations for residents and clinical fellows, Massachusetts Eye and Ear.
- 2011-present Mentor: Harvard Medical School's basic clinical elective in Ophthalmology (OP501).
- 2016 Discussion Panel Faculty: Clinical Scientist Career Information Night, Harvard-Vision Clinical Scientist Development Program, Massachusetts Eye and Ear, Boston, MA

**Laboratory and Research Supervision and Training:**

- 2007-present Supervision of full-time postdoctoral research fellows; daily mentorship and teaching of scientific methodology, data analysis, hypothesis formation, and manuscript writing.
- 2007-present Supervision of Ophthalmology residents interested in research; weekly mentorship.
- 2007-present Supervision of Bausch and Lomb Research Fellow from Japan; daily mentorship.
- 2008-2009 Supervision of Massachusetts Institute of Technology's undergraduate student taking an elective for credit; daily mentorship for 3 months.
- 2010-present Supervision of Harvard Medical School medical students in laboratory.

**Formally Supervised Trainees:**

- 2007-2009 Maya Bitar, M.D., Schepens Eye Research Institute, Harvard Medical School.  
Published four manuscripts in *Invest Ophthalmol Vis Sci*.  
Currently: Ophthalmology Resident at University of Louisville, KY.

- 2007-2009 Kenneth Mandell, Massachusetts Eye and Ear, Harvard Medical School. Selected for the Heed Ophthalmic Foundation Resident Retreat. Currently: Vice President, Early Development, Liquidia Technologies, Inc., Morrisville, NC.
- 2008-2009 Toshinari Funaki, M.D., Ph.D., Schepens Eye Research Institute, Harvard Medical School. Presented two posters at ARVO. Currently: Assistant Professor, Juntendo University, Japan.
- 2008-2009 Pauline Lim, M.D. Massachusetts Eye and Ear, Harvard Medical School. Preceptor for a fellowship course paper presented at the Claes Dohlman Lecture Series. Currently: Cornea Practice, Sacramento, CA.
- 2008-2009 Sophia Mian. Bioengineering, Massachusetts Institute of Technology undergraduate student.
- 2009-2011 Behrooz Azizi, M.D., Schepens Eye Research Institute, Harvard Medical School. Currently: Ophthalmology Resident at University of Ottawa, Canada
- 2010-2013 Alireza Ziaei, M.D., Schepens Eye Research Institute, Harvard Medical School. Currently: Postdoctoral Research Associate in the Department of Ophthalmology at Boston University School of Medicine
- 2010-2013 Thore Schmedt, Ph.D., Schepens Eye Research Institute, Harvard Medical School. Presented one paper (ARVO 2012) and one poster (ARVO 2013) Awardee: Association for Research in Vision and Ophthalmology (ARVO) Foundation for Eye Research (AFER) Travel Grant 2012. Currently: Relocated back to Germany.
- 2011- 2017 Kishore Reddy, Ph.D., Schepens Eye Research Institute, Harvard Medical School. First-authored two articles in the journal *Stem Cells* (2014) and *Methods in Molecular Biology* (2016) Presented three posters (ARVO 2012, 2013 and 2014)
- 2011- present Cailing Liu, Ph.D., Schepens Eye Research Institute, Harvard Medical School. First-authored two articles in *Investigative Ophthalmology and Visual Science* (2014, 2016) Presented four posters (ARVO 2012, 2014, 2015, 2018) and two papers (ARVO 2013, 2016)
- 2011-2012 Guadalupe Villarreal Jr., M.D. Medical Student, HMS

- Awardee: National Eye Institute of the National Institutes of Health  
Travel Grant, ARVO 2012
- 2012-2013 Cecily Hamill, M.D./Ph.D., Combined Clinical and Research Fellow,  
Cornea Service, Massachusetts Eye and Ear, Schepens Eye Research  
Institute.  
Awardee:  
NIH/NEI T32 Training Grant in the Molecular Bases for Eye Diseases  
Grant  
National Eye Institute of the National Institutes of Health Travel Grant,  
ARVO 2013  
Heed Ophthalmic Foundation Fellowship Award 2013-2014
- 2013 – 2015 Duna Raoof-Daneshuar, MD, Combined Clinical and Research  
Fellow, Cornea Service, Massachusetts Eye and Ear, Schepens  
Eye Research Institute, Harvard Medical School.  
Awardee: Heed Ophthalmic Foundation Fellowship Award 2013-2014.  
Presented one paper (ARVO 2014)
- 2013 – 2016 Adna Halilovic, PhD, Postdoctoral Fellow  
Presented two posters (ARVO 2014, 2016) and one paper (ISER 2014)  
Currently: Manager of Scientific Affairs, Aldeyra Therapeutics,  
Lexington, MA
- 2013 – 2016 Takashi Miyai, MD, Postdoctoral Fellow  
Knights Templar ARVO Travel Award (2015)  
Presented one paper (ARVO 2015)
- 2014 – 2016 Anne-Sophie Benischke, PhD, Postdoctoral Fellow  
Presented one poster (ARVO 2016)
- 2015 – 2017 Viridiana Kocaba, MD, Visiting Fulbright Scholar  
Best Paper Award, Eye Bank Association of America & Cornea Society,  
AAO 2016, Chicago, IL  
Presented one paper (ARVO 2017)  
PhD Thesis Advisor, Co-Director of Thesis "Tissue engineering for  
cornea reconstruction" (2018)
- 2016 – 2017 Jennifer Tran, BS, Medical Student  
Abstract accepted and Travel award granted, American Medical  
Women's Association Conference, March 2017
- 2015 – 2017 Shivakumar Vasanth, PhD, Senior Scientific Associate (2015-2017)  
Investigator/Instructor (2017)  
Presented one paper (ARVO 2017, 30<sup>th</sup> Biennial Cornea Conference)
- 2016 – 2018 Reena Gupta, MD, Clinical Research Fellow  
Presented one poster (ARVO 2017)

Selected Abelson Family Fellowship in Cornea at Massachusetts Eye and Ear (2017)

2016 – present Taiga Miyama, MD, Research Fellow  
Presented one poster 1359 - B0119 (ARVO 2018)

2017– present Tomas White, PhD, Postdoctoral Fellow  
Presented one poster 2269-B0223 (ARVO 2018)

2018-present Lynette Johns, OD, Research Associate

**Formal Teaching of Peers:**

2008-present Instructor: Lancaster Course, Colby College, Waterville, ME. CME credits. Yearly presentation. Lectures: “Dry eyes”; “Corneal transplantation;” “Complication of corneal transplantation.”

11/1/2012 Panelist: Harvard Medical School/Harvard School of Dental Medicine, Junior Faculty Orientation. “Strategies for starting your academic career at HMS/HSDM.”

10/24/2013 Heed Ophthalmic Foundation Residents Retreat Faculty Mentor, Chicago, IL.

9/29/2014 Heed Ophthalmic Foundation Residents Retreat, Faculty Mentor, Speaker, Panelist, “The path I chose and why (#2)”, Chicago, IL.

10/20/2014 Instructor: American Academy of Ophthalmology, Chicago, IL. Course on “Diagnosis and management of corneal endothelial diseases.”

11/17/2015 Instructor: American Academy of Ophthalmology, Las Vegas, NV. Course on “Diagnosis and management of corneal endothelial diseases.”

11/17/2015 Instructor: American Academy of Ophthalmology, Las Vegas, NV. Course on “Advanced conjunctival surgery for ocular cicatrizing diseases.”

10/16/2016 Instructor, title: “Aging and the Eye”, Academy of Ophthalmology Annual Meeting, Chicago, IL

10/16/2016 Instructor, title: “Diagnosis and Management of Corneal Endothelial Diseases”, Academy of Ophthalmology Annual Meeting, Chicago, IL

10/17/2016 Instructor, title: “Advanced Conjunctival Surgery for Ocular Cicatrizing Diseases”, Academy of Ophthalmology Annual Meeting, Chicago, IL

4/17/2018 Instructor: American Society of Cataract and Refractive Surgery, Washington, DC. Course on “Recent Advancements in Descemetorhexis Without Endothelial Keratoplasty and Descemet Membrane Endothelial

Keratoplasty.”

**Local Presentations:**

- 1/4/2006 “Double purse-string suture pupilloplasty,” Grand Rounds, Department of Ophthalmology, Harvard Medical School, Boston, MA
- 4/22/2006 “Use of Voriconazole for treatment of fungal keratitis,” Claes Dohlman Lecture Series, Department of Ophthalmology, Harvard Medical School, Boston, MA
- 5/2006 “Proteomic analysis of Fuchs’ endothelial dystrophy,” Schepens Eye Research Institute, Harvard Medical School, Boston, MA
- 6/16/2006 “Fuchs’ endothelial dystrophy,” Ophthalmology Annual Meeting, Department of Ophthalmology, Harvard Medical School, Boston, MA
- 6/21/2008 “An update in pathogenesis of Fuchs’ endothelial dystrophy,” Ophthalmology Annual Meeting, Department of Ophthalmology, Harvard Medical School, Boston, MA
- 9/3/2008 “Corneal endotheliopathies and treatment options,” Schepens Eye Research Institute, Harvard Medical School, Boston, MA
- 2/25/2009 “Corneal endotheliopathies: New insights into pathogenesis,” Grand Rounds, Massachusetts Eye and Ear, Boston, MA
- 3/13/2009 “New insights into the use of stem cells for ocular surface reconstruction,” Harvard Center for Human Cell Therapy, Boston, MA
- 12/18/2009 “*Ex vivo* expansion of oral and corneal epithelium for ocular surface reconstruction,” Connell O’Reilly Cell Manipulation and Gene Transfer Laboratory, Dana-Farber Cancer Institute, Boston, MA
- 10/1/2010 “Future accommodative intraocular lenses,” New England Ophthalmologic Society, Boston, MA
- 10/13/2010 “Corneal endotheliopathies: New insights into pathogenesis,” New Frontiers in Cornea Research monthly meeting, Schepens Eye Research Institute, Boston, MA
- 10/26/2010 “Oxidative stress in cell degeneration seen in Fuchs endothelial corneal dystrophy,” Corporate Alliances, Schepens Eye Research Institute, Boston, MA
- 11/1/2010 “*Ex vivo* expansion of oral and corneal epithelium for corneal transplantation: from bench to bedside,” Annual SERIES Seminar, Schepens Eye Research Institute, Boston, MA



- 1/18/2011 “Overview of ocular disease,” Molecular Basis of Eye Disease Lecture Series, Schepens Eye Research Institute, Boston, MA
- 2/10/2011 “Corneal stem cell deficiency in clinical practice,” New Frontiers in Corneal Research monthly meeting, Schepens Eye Research Institute, Boston, MA
- 3/8/2011 “Ex vivo expansion of oral and corneal epithelium for corneal transplantation: from bench to bedside,” Grand Rounds, Boston University, Department of Ophthalmology, Boston, MA
- 6/3/2011 “Ex vivo expansion of oral and corneal epithelium for corneal transplantation to ameliorate corneal blindness,” Harvard Stem Cell Institute Retreat, Harvard University, Boston, MA
- 11/14/2011 “An update on the study of Fuchs endothelial corneal dystrophy pathogenesis,” Annual SERIES Seminar, Schepens Eye Research Institute, Boston, MA
- 3/20/2013 “Stem Cell Therapy,” New Frontiers in Corneal Research monthly meeting, Schepens Eye Research Institute, Boston, MA
- 4/5/2013 “An update on stem cell efforts,” Cornea Center of Excellence, Harvard Medical School, Department of Ophthalmology Faculty Retreat
- 9/6/2013 “An update in the study of Fuchs endothelial corneal dystrophy pathogenesis,” Annual SERIES Seminar, Schepens Eye Research Institute, Boston, MA
- 6/20/2014 “Fuchs Endothelial Corneal Dystrophy or Age-related Corneal Endothelial Degeneration?” Ophthalmology Annual Meeting, Harvard Medical School, Department of Ophthalmology, Boston, MA
- 9/14/2014 Limbal Stem Cell Opportunity Presentation  
5AM Ventures, Waltham, MA
- 4/7/2015 “DNA damage and mitochondrial dysfunction in Fuchs endothelial corneal dystrophy” Annual SERIES Seminar, Schepens Eye Research Institute, Boston, MA
- 5/12/2015 “Difficult DSEK”, New Frontiers in Corneal Research, Cornea Center of Excellence, Department of Ophthalmology, Harvard Medical School, Mass Eye and Ear Infirmary, Boston, MA
- 12/8/2015 “Diagnosis and Management of Limbal Stem Cell Deficiency”, New Frontiers in Corneal Research Seminar, Boston, MA
- 1/8/2016 “Limbal Stem Cell Disease/Therapy”, Resident Lecture Series, Mass

Eye and Ear Infirmary, Boston, MA

2/8/2017 “Lessons Learned in the Career Path of Clinician Scientist.” Oral presentation, 5 Year Strategic Planning Retreat, Boston University School of Medicine, Boston, MA

2/10/2017 “The Use of Femtosecond Laser in Refractive and Cataract Surgery” (joint presentation with Dr. Natalie Homer), 2017 Resident’s Course, Innovations in Ophthalmology, Mass Eye and Ear Infirmary, Boston, MA

9/8/2017 “Stem Cell Transplantation,” New Frontiers in Corneal Research monthly meeting, Schepens Eye Research Institute, Boston, MA

**REPORT OF REGIONAL, NATIONAL AND INTERNATIONAL INVITED TEACHING AND PRESENTATIONS** (Those presentations below that are sponsored by outside entities are so noted and the sponsor(s) is/are identified.)

**Regional Presentations:**

10/29/2008 “An update in pathogenesis and management of corneal endotheliopathies,” Boston University, Department of Ophthalmology, Boston, MA

6/10/2010 “*Ex vivo* expansion of oral and corneal epithelium for corneal transplantation,” Center for Integration of Medicine and Innovative Technology (CIMIT), Boston, MA

4/24/2012 “The use of cellular therapy products for corneal repair and transplantation,” Massachusetts Association of Blood Banks, New Bedford, MA

10/06/2012 “Advances in endothelial keratoplasty,” First Annual Ophthalmology Update: 2012, Boston Medical Center Department of Ophthalmology and Boston University School of Medicine, Boston, MA

3/6/2015 “The ocular surface in refractive cataract surgery-why it matters,” New England Ophthalmological Society, Boston, MA

12/11/2015 “Cataract Surgery and Fuchs Corneal Dystrophy”, New England Ophthalmological Society, Boston, MA

5/19/2016 “Cell Therapies for Eye Repair”, Panel Presentation at 11<sup>th</sup> Annual Harvard Stem Cell Institute Malkin Retreat, Boston, MA

10/20/2016 Moderator, 2<sup>nd</sup> Ocular Regenerative Medicine Symposium, Boston, MA

**National Presentations:**

1/14/2006 Invited Speaker, title: “Fuchs’ endothelial dystrophy: State of the art

- 2006,” University of Chicago, Department of Ophthalmology, Chicago, IL
- 2/8/2006 Invited Speaker, title: “Fuchs’ endothelial dystrophy,” Loyola University, Department of Ophthalmology, Chicago, IL
- 11/13/2006 Presentation, title: “Fungal keratitis: Changing pathogens, risk factors, and treatment options,” American Academy of Ophthalmology (AAO), Las Vegas, NV
- 10/13/2007 Moderator: Stem Cell Section, 25<sup>th</sup> Biennial Cornea Research Conference, Boston, MA
- 9/17/2008 Moderator, title: Anterior Segment Regenerative and Reconstructive Medicine, Third Biennial Military Vision Research Symposium, Boston, MA
- 5/6/2009 Moderator, Paper Session, title: Corneal Endothelial Disease and Health, Association for Research in Vision and Ophthalmology (ARVO) Annual Meeting, Fort Lauderdale, FL
- 5/6/2009 Presentation, title: “Impact of oxidative stress on corneal endothelial cell pleomorphism, polymegathism, and survival,” ARVO Annual Meeting, Fort Lauderdale, FL
- 10/10/2009 Presentation, title: “Pathogenesis of Fuchs endothelial corneal dystrophy,” 26<sup>th</sup> Biennial Cornea Research Conference, Boston, MA
- 10/23/2009 Presentation, title: “Ex vivo expansion of oral and corneal epithelium for ocular surface reconstruction,” Cornea Society, AAO, San Francisco, CA
- 5/5/2010 Moderator: Corneal Endothelium II. Paper session, ARVO Annual Meeting, Fort Lauderdale, FL
- 5/5/2010 Presentation, title: “Oxidative stress, a potential cause of apoptosis in Fuchs endothelial corneal dystrophy,” Paper session, presented by Behrooz Azizi, ARVO Annual Meeting, Fort Lauderdale, FL
- 10/15/2010 Presentation, title: “Apoptosis and oxidative damage in Fuchs endothelial dystrophy: correlation with in vivo confocal microscopy,” Eye Bank Association of America, AAO Annual Meeting, Chicago, IL
- 5/2/2011 Special Interest Group (SIG), title: “A Radical Approach to Aging Eye Disease,” ARVO Annual Meeting, Fort Lauderdale, FL
- 10/1/2011 Presentation, title: “An update on the study of Fuchs endothelial corneal dystrophy pathogenesis,” 27<sup>th</sup> Biennial Cornea Conference, Boston, MA
- 10/24/2011 Moderator, Session title: Cornea External Disease Part II, Original

Papers, AAO Annual Meeting, Orlando, FL

- 10/27/2011 Presentation, title: "Corneal endotheliopathies: New insights into pathogenesis," Yale University, Department of Ophthalmology, New Haven, CT
- 10/28/2011 Presentation, title: "How are we going to study Fuchs endothelial corneal dystrophy in the future?" Yale University, Department of Ophthalmology, New Haven, CT
- 3/3/2012 Presentation, title: "The role of oxidative stress in Fuchs endothelial corneal dystrophy," Tissue Banks International, Third Fuchs Corneal Dystrophy Symposium, Baltimore, MD
- 5/5/2012 ARVO Education Course, title: Early-stage Startup Companies: Strategies for Entrepreneurship in Ophthalmology; Presentation, title: "Case presentation #2, a drug that protects the corneal endothelium from oxidative stress," ARVO Annual Meeting, Fort Lauderdale, FL
- 5/8/2012 SIG, title: Translational Research for Dysfunctional Corneal Endothelial Diseases; Presentation title: "Molecular targets for treatment of Fuchs dystrophy," ARVO Annual Meeting, Fort Lauderdale, FL
- 5/9/2012 SIG, title: Science of the Aging Eye: Let's Get Radical!; Presentation, title: "Chemoprotective effects of sulforaphane in corneal endothelial disease," ARVO Annual meeting, Fort Lauderdale, FL
- 5/23/2012 Invited lecture, title: "The role of oxidative stress in the pathogenesis of Fuchs endothelial corneal dystrophy," Grand Rounds, title: Autologous limbal epithelial cell (ALEC) transplantation to treat limbal stem cell deficiency, Vision Sciences Research Center Speaker Series, \*Case Western Reserve University, Cleveland, OH (\*Sponsor)
- 9/18/2012 Moderator, Session, title: Combat Ocular Readiness; Fifth Biennial Military Vision Research Symposium, Boston, MA
- 5/7/2013 SIG, title: Endothelial Dysfunction: From Pathophysiology to Treatment; Presentation, title: "Mitochondrial dysfunction as a novel therapeutic target in Fuchs endothelial corneal dystrophy," ARVO Annual Meeting, Seattle, WA
- 10/19/2013 Presentation, title: "Impaired mitochondrial biogenesis in Fuchs endothelial corneal dystrophy," Biennial Cornea Research Conference, Boston, MA
- 11/16/2013 Panelist: Subspecialty Day, title: Through the Looking Glass, Cornea 13; Invited Lecture, title: "Pathogenesis of Fuchs Dystrophy," AAO Annual Meeting, New Orleans, LA

- 3/1/2014 Presentation, title: "The role of oxidative stress in Fuchs endothelial corneal dystrophy," The Fourth Fuchs Symposium, Navigating the Evolving Field of Endothelial Keratoplasty\*, Baltimore, MD (\*Sponsor: TBI/Tissue Banks International)
- 5/5/2014 Moderator, Paper Session, title: Ocular Nanotechnology and Regenerative Medicine, ARVO Annual Meeting, Orlando FL
- 5/5/2014 Invited speaker, title: "Oxidative stress in Fuchs dystrophy," ARVO Annual Meeting, Orlando, FL
- 5/6/2014 Moderator, Paper Session, title: Corneal Endothelium, ARVO Annual Meeting, Orlando, FL
- 5/7/2014 SIG, title: Translational Research: Drug or Regenerative Medicine; Presentation, title: "ROS as the drug target of treating Fuchs endothelial dystrophy," ARVO Annual Meeting, Orlando, FL
- 8/29/2014 Presentation, title: "Cultivated autologous limbal epithelial cell (CALEC) graft", Food and Drug Administration Approval, IND #16102, Center for Biologics Evaluation and Research, Silver Spring, MD
- 3/3/2015 Invited Speaker, title: "DNA Damage in the Pathogenesis of Fuchs Corneal Dystrophy"; Session, title: Oxidative Stress & Disease, Gordon Research Conference, Ventura, CA
- 1/29/2015 Presentation, title: "Fuchs Endothelial Corneal Dystrophy or Age-related corneal endothelial degeneration?," Weill Cornell Ophthalmology Grand Rounds Lecture, Weill Cornell Medical College, New York, NY
- 5/4/2015 SIG, title: Regenerative Medicine vs Pharmaceutical Agents: New Treatments for Corneal Endothelial Dysfunction; Presentation, title: "ROS as the drug target of treating Fuchs endothelial corneal dystrophy," ARVO Annual Meeting, Denver, CO
- 5/28/2015 "Cultivated autologous limbal epithelial cells (CALEC) for the treatment of limbal stem cell deficiency," Invited lecture, International Mini-Symposium, Harvard Medical School, Department of Ophthalmology, Boston, MA
- 6/19/2015 Presentation, title: "Fuchs Endothelial Corneal Dystrophy or Age-related corneal endothelial degeneration?," The Four Fathers Lectureship, Department of Ophthalmology and Visual Sciences, University of Illinois College of Medicine at Chicago, Chicago IL
- 9/18/2015 Presentation, title: "DNA damage leads to mitochondrial dysfunction in Fuchs Endothelial Corneal Dystrophy," Alcon Research Institute Annual

Awards Symposium, Boston, MA

- 10/16/2015 Presentation, title: “The Role of Mitochondrial Dysfunction in Fuchs Endothelial Corneal Dystrophy,” 29<sup>th</sup> Biennial Cornea Conference, Boston, MA
- 10/16/2015 Moderator, Session 3, title: Stem Cell, 29<sup>th</sup> Biennial Cornea Conference, Boston, MA
- 11/17/2015 Instructor, Course title: Diagnosis and Management of Corneal Endothelial Diseases, AAO Annual Meeting, Las Vegas, NV
- 11/17/2015 Instructor, Course title: Advanced Conjunctival Surgery for Ocular Cicatrizing Diseases, AAO Annual Meeting, Las Vegas, NV
- 3/5/2016 Presentation, title: “Mitochondrial dysfunction in Fuchs endothelial corneal dystrophy,” The Fifth FUCHS Symposium, Baltimore, MD
- 3/5/2016 Presentation, title: “Alternative treatments of central guttae,” The Fifth FUCHS Symposium, Baltimore, MD
- 5/2/2016 ARVO Workshop, title: How to Become a Successful Clinician-Scientist; Presentation, title: “Lessons learned in the career path of a clinician-scientist,” ARVO Annual Meeting, Seattle, WA
- 5/3/2016 Moderator: Paper Session, title: Corneal Endothelium, ARVO Annual Meeting, Seattle, WA
- 5/5/2016 Symposium, title: Dysregulation of autophagy and/or mitophagy leads to mitochondrial dysfunction in ocular disorders; Presentation, title: “Mitophagy in Fuchs Endothelial Corneal Dystrophy,” ARVO Annual Meeting, Seattle, WA
- 10/13/2017 Moderator, Session 2, title: Endothelial Cell Biology, 30<sup>th</sup> Biennial Cornea Conference, Boston, MA
- 10/13/2017 Introduction, J. Wayne Streilein Lecture, Reza Dana, title: “Trying to tame a chameleon-Our efforts in regulating immunity in corneal and ocular surface disorders”, 30<sup>th</sup> Biennial Cornea Conference, Boston, MA
- 10/14/2017 Speaker, Session 3, title: 60 Years of Claes Dohlman, 30<sup>th</sup> Biennial Cornea Conference, Boston, MA
- 2/22/2018 Presentation, title: “DNA Damage in the Pathogenesis of Fuchs Corneal Dystrophy”; Session, title: Tissue Homeostasis and Wound Healing, Gordon Research Conference, Ventura, CA

- 3/3/2018 Presentation, title: "UV light induces Fuchs Dystrophy: why females are more affected?"; Session, title: Genetics and Basic Research, The 6th FUCHS Symposium, Philadelphia, PA
- 4/13/2018 Presentation, title: "Corneal clearance without transplantation in Fuchs endothelial corneal dystrophy"; Session, title: Hot Topics, NIIOS USA, Washington, DC
- 4/17/2018 Moderator, Paper Session, title: Microbial Keratitis: Diagnosis/Treatment/CXL; American Society of Cataract and Refractive Surgery, Washington DC
- 5/1/2018 Moderator: ARVO Workshop, title: Clinician-Scientist Forum: How to become a successful clinician-scientist; ARVO Annual Meeting, Honolulu, HI
- 5/1/2018 Presentation, title: "Tips for establishing a productive clinical-research work balance and how to get help writing your first R01 grant"; Session, title: Clinician-Scientist Forum: How to become a successful clinician-scientist, ARVO Annual Meeting, Honolulu, HI
- 5/1/2018 Presentation, title: "Cultivated Autologous Limbal Epithelial Cell (CALEC) Transplantation: New Frontier in the Treatment of Limbal Stem Cell Deficiency"; Session, title: Bringing regenerative medicine therapies to the clinic, ARVO Annual Meeting, Honolulu, HI
- 5/2/2018 Presentation, title: "Future Therapies for Fuchs Endothelial Corneal Dystrophy"; Session, title: Treatment on the horizon for Fuchs endothelial corneal dystrophy - Minisymposium, ARVO Annual Meeting, Honolulu, HI
- 5/2/2018 Moderator, Paper Session, title: Corneal Endothelium and Fuchs Corneal Dystrophy; ARVO Annual Meeting, Honolulu, HI
- 5/2/2018 SIG, title: Mechanisms and therapies for corneal endothelial dysfunction; Presentation, title: "Mechanisms and therapies for corneal endothelial dysfunction"; ARVO Annual Meeting, Honolulu, HI
- 9/13/2018 Presentation, title: "Advances in Study of Fuchs endothelial Corneal Dystrophy: Why Females are More Affected?" F.I. Proctor Foundation Grand Rounds Lecture, University of California, San Francisco, San Francisco, CA
- 9/13/2018 Presentation, title: "Novel Strategies for Treating Fuchs Endothelial Corneal Dystrophy" F.I. Proctor Foundation Resident Talk, University of California, San Francisco, San Francisco, CA

**International Presentations:**

- 8/22/2008 “Novel proteomic alterations in Fuchs’ endothelial corneal dystrophy,”  
Invited lecture, International Society of Eye Research, Beijing, China
- 9/2009 Instructed Professor Vytautas Jasinskas in the technique of Boston  
keratoprosthesis surgery, Kaunas University of Medicine, Kaunas,  
Lithuania
- 9/24/2009 “New insights into the pathogenesis of Fuchs endothelial dystrophy,”  
Invited lecture, Annual German Ophthalmological Meeting (DOG),  
Leipzig, Germany
- 3/2010 Instructed Professor Wylegala in the technique of Boston  
keratoprosthesis surgery, Katowice, Poland
- 3/19/2010 “Boston keratoprosthesis type I,” Keynote speaker, Polish International  
Cornea Congress, Wisla, Poland
- 7/22/2010 Clinical Imaging, Moderator, Young Investigators Session, XIX  
Biennial Meeting of the International Society for Eye Research (ISER  
2010), Montreal, Canada
- 7/23/2010 “Oxidant-antioxidant imbalance in Fuchs endothelial corneal  
dystrophy,” Invited lecture, XIX Biennial Meeting of the International  
Society for Eye Research (ISER 2010), Montreal, Canada
- 12/2/2010 “Role of oxidative stress in pathogenesis of Fuchs endothelial corneal  
dystrophy,” Invited lecture, The 2nd Asia Cornea Society Biennial  
Scientific Meeting, Kyoto, Japan
- 11/3/2011 “Corneal endotheliopathies: New insights into pathogenesis,” Grand  
Rounds, Department of Ophthalmology, University of Montreal,  
Montreal, Canada
- 11/4/2011 “An update on the study of Fuchs endothelial corneal dystrophy  
pathogenesis,” Invited lecture, The Annual Meeting of the Quebec  
Vision Research Network, Universite Laval, Quebec, Canada
- 9/24/2014 “Pathogenesis of Fuchs Dystrophy,” Invited lecture, Collaboration  
between China and Department of Ophthalmology, Harvard Medical  
School, Boston MA, and Zhongshan Ophthalmic Center, Sun Yat-Sen  
University, Guangzhou China
- 9/26/2014 “Oxidative stress contributes to the pathogenesis of Fuchs Dystrophy,”  
Invited lecture, Collaboration between China and Department of  
Ophthalmology, Harvard Medical School, Boston MA, and Department  
of Ophthalmology and Vision Science, Shanghai Medical College,  
Fudan University, Shanghai China



- 9/6/2015 “Senescence and the cornea,” Invited lecture, The Ageing Eye: Can We Delay or Reverse the Process?, XXXIII Congress of the ESCRS, Barcelona, Spain
- 10/30/2016 Presentation, title: “Novel surgical and medical approaches to endothelial dysfunction”, International Ophthalmology Conference, Harbin, China
- 11/02/2016 Presentation, title: “Autologous cell therapy for corneal limbal stem cell deficiency”, Shanghai Medical College, Fudan University, Shanghai, China
- 11/22/2017 Guest Speaker, title: “Mitochondrial Dysfunction and EMT in Fuchs Endothelial Corneal Dystrophy”, Kyoto Prefectural University of Medicine (KPUM), Kyoto, Japan
- 11/25/2017 Keynote Speaker, title: “Advances in Study of Fuchs Endothelial Corneal Dystrophy with Implications for Therapeutics”, Kyoto Cornea Club Meeting, Kyoto, Japan

## **REPORT OF CLINICAL ACTIVITIES**

### **Current Licensure and Certification:**

2004-present Board of Registration of Medicine, Commonwealth of Massachusetts  
American Board of Ophthalmology

### **Practice Activities:**

Cornea and Refractive Surgery, ambulatory clinic, 3 sessions/week, 20-30 patients/session.  
Refractive surgery and laser procedures, 2-3 sessions/month  
Cornea, cataract and anterior segment reconstruction surgery, 3-4 sessions/month

My clinical activities focus on the management of corneal, anterior segment, ocular surface disorders and refractive surgery conditions. I perform complicated cataracts surgery, secondary intraocular lens placement (including sutured intraocular lenses), anterior segment reconstruction, corneal transplantation, corneal endothelial keratoplasty, deep anterior lamellar keratoplasty, keratoprosthesis (Kpro) I and II, and limbal stem cell transplantation. I am one of the highest refractive surgery volume surgeons at Massachusetts Eye and Ear (MEE). Moreover, I perform Laser in Situ Keratomileusis (LASIK) with femtosecond laser, photorefractive keratectomy with or without Epitome, phototherapeutic keratectomy, and refractive and premium intraocular lens insertion. The volume of corneal and refractive surgeries I perform is among the highest at MEE.

### **Clinical Innovations:**

I am adding a new area of clinical expertise to the Cornea and External Disease Service at MEE by introducing novel ocular surface reconstruction techniques. Our team has developed oral and corneal epithelial cell constructs from autologous sources of epithelial stem cells. These techniques use a minimal amount of animal-derived products and will provide a novel cell therapy-based treatment for patients suffering from bilateral limbal stem cell deficiency. The studies are underway in collaboration with the Center for Human Cell Therapy Boston to start a phase I/II clinical trial at MEE. The

preliminary IND application on Cultivated Autologous Limbal Epithelial Cells (CALEC) in patients with limbal stem cell deficiency was submitted to FDA and pre-IND meeting was held on 8/29/13 and approved on 8/20/14.

## **REPORT OF TECHNOLOGICAL AND OTHER SCIENTIFIC INNOVATIONS**

“Compositions and Methods of Treatment of Corneal Endothelium Disorders” International Patent Application, 61/482,769, filed May 5, 2011

My laboratory showed that oxidative stress is a contributor to the cell death of corneal endothelium; specifically, mitochondrial dysfunction and malfunctioning of Nrf2 pathway are involved. This patent is geared toward treatment and prevention of endothelial cell loss and treatment of Fuchs endothelial corneal dystrophy.

“Methods of Reducing Corneal Endothelial Cell Loss” International Patent Application, 15/037,292, filed May 17, 2016

This patent is focused on providing methods of reducing nerve-related corneal endothelial cell loss using vasoactive intestinal peptide and other agents used for treating Fuchs endothelial corneal dystrophy.

## **REPORT OF EDUCATION OF PATIENTS AND SERVICE TO THE COMMUNITY**

### **Recognition:**

2009 The Best Doctors in America 2009-2010

## **REPORT OF SCHOLARSHIP**

### **Peer-Reviewed Publications in Print or Other Media:**

#### Research Investigations:

1. Yu EN, **Jurkunas U**, Rubin PD, Baltatzis S, Foster CS. Obliterative microangiopathy presenting as chronic conjunctivitis in a patient with relapsing polychondritis. *Cornea*. 2006; 25(5):625-632.
2. **Jurkunas U**, Azar DT. Potential complications of ocular surgery in patients with coexistent keratoconus and Fuchs' endothelial dystrophy. *Ophthalmology*. 2006; 113:2187-2197.
3. Lee BW, **Jurkunas UV**, Poothullil AM, Tobaigy F, Azar DT. Ectatic disorders associated with a claw-shaped pattern on corneal topography. *Am J Ophthalmol*. 2007; 144:154-156.
4. Dagher MH, Dana R, **Jurkunas UV**. Keratoglobus in association with posterior polymorphous dystrophy. *Cornea*. 2007; 26:1288-1291.
5. **Jurkunas UV**, Rawe I, Bitar M, Zhu C, Harris DL, Colby K, Joyce N. Decreased expression of peroxiredoxins in Fuchs' endothelial dystrophy. *Invest Ophthalmol Vis Sci*. 2008; 49: 2946-2955. PMID: PMC2773676.

6. **Jurkunas UV**, Bitar M, Rawe I, Harris DL, Colby K, Joyce N. Increase in clusterin expression in Fuchs' endothelial dystrophy. *Invest Ophthalmol Vis Sci.* 2008; 49:2956-2963. PMID: PMC2789477.
7. **Jurkunas UV**, Bitar M, Rawe I. Co-localization of clusterin and TGFBIp in guttae of Fuchs' endothelial dystrophy patients. *Invest Ophthalmol Vis Sci.* 2009; 50:1129-1136. PMID: PMC2719557.
8. **Jurkunas UV**, Behlau E, Colby K. Fungal keratitis: changing pathogens, risk factors, and treatment options. *Cornea.* 2009; 28:638-643.
9. Dastjerdi MH, Al-Arfaj KM, Nallasamy N, Hamrah P, **Jurkunas UV**, Pineda R 2nd, Pavan Langston D, Dana R. Topical bevacizumab in the treatment of corneal neovascularization: results of a prospective, open-label, noncomparative study. *Arch Ophthalmol.* 2009; 127:381-389. PMID: PMC2703579.
10. Lam H, Wiggs JL, **Jurkunas UV**. Unusual presentation of presumed posterior polymorphous dystrophy associated with iris heterochromia, band keratopathy, and keratoconus. *Cornea.* 2010; 29:1180-1185. PMID: PMC2945457.
11. **Jurkunas UV**, Bitar M, Funaki T, Azizi B. Evidence of oxidative stress in pathogenesis of Fuchs endothelial corneal dystrophy. *Am J Pathol.* 2010; 177:2278-2289. PMID: PMC2966787.
12. Cruzat A, Witkin D, Baniyadi N, Zheng L, Ciolino JB, **Jurkunas UV**, Chodosh J, Pavan-Langston D, Dana R, Hamrah P. Inflammation and the nervous system: the connection in the cornea in patients with infectious keratitis. *Invest Ophthalmol Vis Sci.* 2011; 52:5136-5143. PMID: PMC3176064.
13. Fuchsluger TA, **Jurkunas U**, Kazlauskas A, Dana R. Anti-apoptotic gene therapy prolongs survival of corneal endothelial cells during storage. *Gene Ther.* 2011; 18:778-787. PMID: PMC3587653.
14. Fuchsluger TA, **Jurkunas U**, Kazlauskas A, Dana R. Corneal endothelial cells are protected from apoptosis by gene therapy. *Hum Gene Ther.* 2011; 22:549-558. PMID: PMC3081440.
15. **Jurkunas UV**, Jakobiec FA, Shin J, Zakka FR, Michaud N, Jethva R. Reversible corneal epitheliopathy caused by vitamin B12 and folate deficiency in a vegan with a genetic mutation: a new disease. *Eye (Lond).* 2011; 25:1512-1514. PMID: PMC3213645.
16. Azizi B, Ziaei A, Fuchsluger T, Schmedt T, Chen Y, **Jurkunas UV**. p53-regulated increase in oxidative-stress-induced apoptosis in Fuchs endothelial corneal dystrophy: a native tissue Model. *Invest Ophthalmol Vis Sci.* 2011; 52:9291-9297. PMID: PMC3250096.
17. Fuchsluger TA, **Jurkunas U**, Kazlauskas A, Dana R. Viral vectors for gene delivery to corneal endothelial cells. *Klin Monbl Augenheilkd.* 2011; 228:498-503. German.

18. Sharma SM, Fuchsluger T, Ahmad S, Katikireddy KR, Armant M, Dana R, **Jurkunas UV**. Comparative analysis of human-derived feeder layers with 3T3 fibroblasts for the ex vivo expansion of human limbal and oral epithelium. *Stem Cell Rev Rep*. 2012; 8:696-705.
19. Riazuddin SA, Parker DS, McGlumphy EJ, Oh EC, Iliff BW, Schmedt T, **Jurkunas U**, Schleif R, Katsanis N, Gottsch JD. Mutations in LOXHD1, a recessive-deafness locus, cause dominant late-onset Fuchs corneal dystrophy. *Am J Hum Genet*. 2012; 90:533-539. PMID: PMC3309196.
20. Kopplin LJ, Przepyszny K, Schmotzer B, Rudo K, Babineau DC, Patel SV, Verdier DD, **Jurkunas U**, Iyengar SK, Lass JH; Fuchs' Endothelial Corneal Dystrophy Genetics Multi-center Study Group. Relationship of Fuchs endothelial corneal dystrophy severity to central corneal thickness. *Arch Ophthalmol*. 2012; 30:433-439. PMID: PMC3859299
21. Bitar MS, Liu C, Ziaei A, Chen Y, Schmedt T, **Jurkunas UV**. Decline in DJ-1 and decreased nuclear translocation of Nrf2 in Fuchs endothelial corneal dystrophy. *Invest Ophthalmol Vis Sci*. 2012; 53:5806-5813. PMID: PMC3428112.
22. Schmedt T, Chen Y, Nguyen TT, Li S, Bonanno JA, **Jurkunas UV**. Telomerase immortalization of human corneal endothelial cells yields functional hexagonal monolayers. *PLoS ONE* 2012; 7(12):e51427. PMID: PMC3528758.
23. Amparo F, Sadrai Z, Jin Y, Alfonso-Bartolozzi B, Wang H, Shikari H, Ciolino JB, Chodosh J, **Jurkunas U**, Schaumberg DA, Dana R. Safety and efficacy of the multitargeted receptor kinase inhibitor Pazopanib in the treatment of corneal neovascularization. *Invest Ophthalmol Vis Sci*. 2013; 54:537-544. PMID: PMC3558296.
24. Schrems-Hoesl LM, Schrems WA, Cruzat A, Shahatit BM, Bayhan HA, **Jurkunas UV**, Hamrah P. Cellular and subbasal nerve alterations in early stage Fuchs' endothelial corneal dystrophy: an in vivo confocal microscopy study. *Eye (Lond)*. 2013; 27:42-49. PMID: PMC3545379
25. Amparo F, Dastjerdi MH, Okanobo A, Ferrari G, Smaga L, Hamrah P, **Jurkunas U**, Schaumberg DA, Dana R. Topical interleukin 1 receptor antagonist for treatment of dry eye disease: A Randomized Clinical Trial. *JAMA Ophthalmol*. 2013; 131:715-723. PMID: PMC4167802
26. Jašinskas V, Rudalevičius P, Miliauskas A, Milčius D, **Jurkunas UV**. Keratoprosthesis surgery as an alternative to keratoplasty. *Medic (Kaunas)*. 2013; 49:291-299. Free full text through PubMed.
27. Ziaei A, Schmedt T, Chen Y, **Jurkunas UV**. Sulforaphane decreases endothelial cell apoptosis in Fuchs endothelial corneal dystrophy: A novel treatment. *Invest Ophthalmol Vis Sci*. 2013; 54(10):6724-6734. PMID: PMC3797593.
28. Katikireddy KR, Dana R, **Jurkunas UV**. Differentiation potential of limbal fibroblasts and bone marrow mesenchymal stem cells to corneal epithelial cells. *Stem Cells* 2014; 32(3):717-729.
29. Liu C, Chen Y, Kochevar IE, **Jurkunas UV**. Decreased DJ-1 leads to impaired Nrf2-regulated antioxidant defense and increased UV-A-induced apoptosis in corneal endothelial cells. *Invest Ophthalmol Vis Sci*. 2014; 55(9):5551-5560. PMID: PMC4160071.

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### **NARRATIVE REPORT**

I am an Associate Professor at Harvard Medical School and an Associate Scientist at the Schepens Eye Research Institute in Boston. I am a clinician-scientist who performs corneal and refractive surgery at the Massachusetts Eye and Ear and research on the pathogenesis of corneal disorders at the Schepens Eye Research Institute. I teach residents and fellows in the areas of corneal, cataract, and refractive surgery and clinical management and diagnosis of corneal and refractive conditions. My two main research areas are the study of the pathogenesis of Fuchs endothelial corneal dystrophy (FECD) with emphasis on the role of oxidative stress in endothelial cell death seen in FECD, and development of cultivated epithelial (stem) cell transplantation for treatment of limbal stem cell deficiency patients. As a recipient of the K12 Award to study FECD, I laid the groundwork for my current research to test the hypothesis that chronic oxidative stress causes molecular and cellular damage in susceptible human corneal endothelial cells, which in turn leads to the pathologic findings of FECD. FECD is a chronic degenerative condition of corneal endothelium and the second most common reason for corneal transplants done in the elderly, in the U.S. To date, my laboratory has shown that: (1) there is an oxidant-antioxidant imbalance in FECD; (2) the oxidant-antioxidant imbalance is due to deficient Nrf2-DJ-1-regulated antioxidant defense; (3) there is an accumulation of oxidized DNA lesions in FECD corneal endothelium that is primarily confined to the mitochondrial genome; (4) oxidative stress causes characteristic changes in endothelial cell morphology and the stress response seen in FECD, and (5) oxidative stress causes p53-dependent apoptosis in FECD endothelium. These studies are significant because understanding the key regulators of antioxidant defense and oxidative stress-induced cellular damage may facilitate development of pharmacotherapeutic treatment for FECD patients. I have received RO1 funding from NEI/NIH for the proposed studies and have filed an international patent application for treatment of corneal endothelial disorders.

Since the study of corneal endothelium is hampered by lack of valid disease models, my laboratory was the first to derive a telomerase immortalized corneal endothelial cell line. This cell line



will provide a new and very important tool for the in vitro study of corneal endothelial cell biology and will be made available to the NIH community. Based on the studies in my laboratory, I have been invited as a collaborator on multiple NIH-funded studies as a national expert on FECD and endothelial cell biology.

The second main area of expertise is the development of autologous cultivated epithelial stem cell constructs for patients suffering from corneal blindness due to limbal stem cell deficiency. My laboratory has developed a technique for using defined and xenobiotic-free culture conditions for expanding autologous epithelial stem cells taken from patients' contralateral cornea and oral (mouth) regions. Ex vivo expansion and transplantation of autologous corneal and oral epithelial stem cells will be advantageous due to utilization of the patient's own tissue to create clear corneal surface and circumvention of the use of systemic immunosuppression required for allogeneic grafts. I have been collaborating with the Center for Human Cell Therapy at Boston and have been awarded the Production Assistance for Cellular Therapies (PACT) grant from National Heart/Lung and Blood Program of NIH to aid in the translational development of stem cell therapy in corneal disorders. We have received approval for an Investigational New Drug (IND) application to FDA to perform a Phase I/II study to treat corneal blindness with the stem cells. This therapy is not currently available for use in patients, in the U.S.