New England Eye Center
Affiliated with Tufts University School of Medicine
at TUFTS MEDICAL CENTER

800 Washington Street, #450
Boston, MA 02111
Tel 617 636-4600
800 231-3316
Fax 617 636-4866
www.neec.com

11 April 2017

Executive Vice President
American Ophthalmological Society

Re: Pedram Hamrah, MD, FACS, FARVO
Department of Ophthalmology,
Tufts Medical Center, Room T207
15 Kneeland Street
Tufts University School of Medicine
Boston, MA 02111

Office phone: 1 617 636 5321
e-Address: pedram.hamrah@tufts.edu

Dear Executive Vice President:

As a long time AOS member, now Emeritus, I have enjoyed the opportunity to witness the career development of many academic ophthalmologists. Thus, the opportunity to recommend my colleague, **Pedram Hamrah, MD,** for AOS membership is especially appreciated, as I have known few others who exemplify the role of Clinician Scientist at such a high level, while still at a relatively early stage of their academic career.

Having initially met Pedram during his Mass Eye & Ear Infirmary (MEEI) Cornea Fellowship years in 2006-2008, I have had more than a decade to observe closely his career development and extraordinary contributions, first at MEEI/Harvard and since 2015, as an Associate Professor and full time member of our Cornea Service and research faculty at Tufts / New England Eye Center. During these past two years, we have frequently engaged and enjoyed interactions with respect to clinical management, research interests and fellow training. Above all, Pedram is a consummate clinician, a focused researcher and a dedicated teacher. Already broadly recognized in our field internationally, extending from leadership within our department and projecting to his international presence, Pedram accomplishes all against a foundation of exemplary character plus rigorous personal, scientific and ethical standards, while maintaining a stable family life.

With respect to clinical practice, Dr Hamrah has attained particular focus, both figuratively and literally. Having initiated an Ocular Surface Imaging Center, first at MEEI and now at Tufts, his clinical efforts concentrate on ocular surface disorders with particular relevance to the applications of *in vivo* confocal microscopy for the assessment of inflammatory, infectious, neurotrophic and neuropathic disorders. His numerous published contributions in these respects have significantly influenced understanding of the pathogenesis, as well as management strategies of these important disorders. A master of clinical trials, he continues to organize and

conduct multiple research protocols and also utilizes such for the learning benefit of numerous research and clinical fellows.

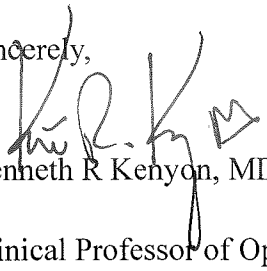
Dr Hamrah's scientific productivity can only be described as prodigious, having founded the Tufts Medical Center, Center for Translational Ocular Immunology, an active basic and translational research center devoted to neuro-immunology with several full-time research staff as well as research fellows and students, having continued NIH R01 and R21 plus extensive non-federal grant support, and having generated high quality peer reviewed publications.

Pedram's educational and administrative efforts are also legion. Continuously training medical students, residents and both clinical as well as research fellows, his choreographic capabilities are remarkable, especially within the context of frequent invited meeting and lecture participations, plus the demands of continuous NIH study sections and numerous editorial boards.

In summary, I am privileged to recommend Pedram Hamrah, MD for AOS membership in the highest possible terms. Proud to say "I knew him when", I am all the more privileged to boast "I know him now." Pedram is already en exceptional academic ophthalmologist who has made substantive contributions as a focused clinical scientist. I am certain he will be both a contributor and a credit to the AOS.

Please contact me directly via kenrkenyon@cs.com or 1 508 496 5063 as needed.

Sincerely,



Kenneth R Kenyon, MD

Clinical Professor of Ophthalmology
Tufts University School of Medicine

Harvard Medical School

Schepens Eye Research Institute

KRK:pdq
Doc. PHamrah.AOS.04.17 (k2PS)

Director, Cornea and Refractive Surgery
243 Charles St., Boston, MA 02114
Tel: 617.573.4331
Fax: 617.573.4300
Email: reza_dana@meei.harvard.edu
http://eye.hms.harvard.edu/rezadana

REZA DANA, MD, MSc, MPH, FARVO
Claes Dohlman Professor of Ophthalmology
Vice Chairman & Associate Chief for Academic Programs
Director, Harvard-Vision Clinical Scientist Development Program

Senior Scientist and Director
Laboratory of Immunology
20 Staniford Street, Boston, MA 02114
Tel: 617.912.7401
Fax: 617.912.0117
www.schepens.harvard.edu/dana

April 24, 2017

Execute Vice President
American Ophthalmological Society

Re: Pedram Hamrah, MD, Tufts Medical Center, Room T207
15 Kneeland Street, Boston, MA 02111
Work phone: 1 617 888 3363; e-mail: pedram.hamrah@tufts.edu

Dear Executive Vice President,

It is with the highest enthusiasm that I support the nomination of Pedram Hamrah, MD, for membership the AOS. I have had the distinct pleasure to known Pedram now for over 17 years, since I first supervised him as my postdoctoral research fellow in my laboratory at the Schepens Eye Research Institute, and subsequently during his clinical fellowship in Cornea and Refractive Surgery, as the service director at the Massachusetts Eye & Ear Infirmary. After his training, I was successful in recruiting him to stay on as a faculty member. Since 2015, he is an Associate Professor at Tufts/New England Eye Center and the Director of the Center for Translational Ocular Immunology and Director of Anterior Segment Imaging at the Boston Image Reading Center. At his stage of his professional career, Dr. Hamrah has an outstanding record of achievement in research and clinical investigation, which has significantly impacted and will further impact vision science and patient care. What sets him further apart, are his seminal contributions to not only basic sciences, but also to clinical research and practice, as well as the highest ethical standards, superb leadership qualities, and exemplary character.

Pedram is a true clinician-scientist and has developed national and international recognition for his work in ocular surface imaging, and corneal immunology. He has been a pioneer in the novel field of corneal immuno-and neuro-imaging. He was the founding director of the Ocular Surface Imaging Center at MEEI, and performed numerous translational research projects and clinical trials, involving the use of confocal microscopy in various types of infectious keratitis and dry eye disease, with focus on the corneal dendritic cells he once identified in mice. These studies have yielded important findings in regards to corneal innervation and inflammation, impacting their clinical management. His clinical work has led to three seminal papers in *Ophthalmology* as well as the first paper on potential corneal nerve/immune interactions in *Investigative Ophthalmol & Visual Sciences*. As a clinician and surgeon, his practice focuses on patients with severe ocular surface disease, where he has developed a particular interest in neuropathic corneal pain.

During his post-doctoral time in my laboratory, he discovered several resident populations of antigen presenting cells in the normal cornea, including dendritic cells through hard work and determination. Pedram then demonstrated that these uniformly immature cells undergo maturation and become activated after corneal transplantation and inflammation. These findings have already had a momentous impact and have transformed the field, by focusing attention on the cornea as a participant in immune

and inflammatory responses, rather than being essentially a collagenous tissue. He has recently identified another unique bone marrow-derived cell population in the cornea, called plasmacytoid dendritic cells, and has shown that these cells mediate the inflammatory response in the cornea, are neurotrophic and crucial to corneal nerve maintenance and regeneration, and are angiostatic and important players in keeping the cornea avascular. This work has resulted in two R01 and one R21 grants that the NIH has awarded him. Further, his academic productivity resulted in 90 published or accepted original peer-reviewed articles in superb journals, 38 reviews and book chapters, and over 240 abstracts, testament of his accomplishments to date. Moreover, his broad expertise has led to his appointments to 14 journal editorial boards, and he is sought widely as and ad hoc reviewer on numerous grant panels, including numerous clinical and basic science NIH study section panels.

Pedram has a passion for teaching. He has served as a preceptor for a large number of clinical, surgical and research fellows in the Cornea Service and his laboratory. He has been an instructor at the AAO and leading programs in advanced corneal surgery, dry eye therapy, in vivo confocal microscopy, and management of meibomian gland dysfunction for many years. At ARVO, he served on the members-in-training (MIT), Professional Development and Educational, and Ethics and Regulations in Human Research committees at ARVO. In addition he has served on several clinical and scientific committees at both MEEI and Tufts/NEEC. His citizenship has earned him numerous awards, including the AAO achievement award, and Gold Fellow at ARVO.

Existing cultural barriers between the worlds of clinical and basic research, along with the ever-increasing complexities involved in the conduct of clinical research, make it challenging to translate new knowledge to the clinic and back again to the bench. These challenges have to some degree limited professional interest in the field by young investigators and hamper clinical research at a time when it should be expanding. Pedram's outstanding accomplishments have demonstrated his qualities as a leading clinician-scientist in academic ophthalmology. I endorse his nomination as a worthy member to AOS wholeheartedly.

Sincerely yours,

Reza Dana, MD, MSc, MPH, FARVO

HealthPartners
8170 33rd Avenue South
Bloomington, MN 55425

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Mailing Address:
PO Box 1309
Minneapolis, MN 55440-1309

April 24, 2017

Execute Vice President
American Ophthalmological Society

Re: Pedram Hamrah, MD, FACS, FARVO
Tufts Medical Center, Room T207
15 Kneeland Street, Boston, MA 02111
Work phone: 617-888-3363
e-mail: pedram.hamrah@tufts.edu

Dear Executive Vice President,

I write to you in strong support for the nomination of Dr. Pedram Hamrah to become a member to the American Ophthalmological Society. Dr. Hamrah graduated from the University of Cologne, School of Medicine, Germany, in 1999. After medical school, he spent two years as a postdoctoral research fellow at the Schepens Eye Research Institute in Ocular and Transplantation Immunology with Dr. Reza Dana, followed by a second post-doctoral fellowship in Ocular Immunology at the University of Louisville with Dr. Henry Kaplan. Following his residency and chief residency in Ophthalmology at the University of Louisville, he performed a two-year advanced fellowship in Cornea & Refractive Surgery at the Massachusetts Eye and Ear Infirmary (MEEI) of Harvard Medical School. He was then recruited as a faculty member via the Harvard–Vision Clinical Development program, where he led an independent laboratory and active clinical practice and clinical research program, until he was recruited by Tufts Medical Center. He is currently Associate Professor of Ophthalmology at Tufts and Director of the Center for Translational Ocular Immunology. I have known Dr. Hamrah for over many years, but recently, in the past two years, have worked closely with him in my capacity as Editor-in-Chief of *The Ocular Surface*, where I recruited him to serve as Section Editor for both the Clinical Research and Clinical Practice Sections of the journal. As one of the clinical leaders in ocular surface disease and clinical research in Ophthalmology, he has demonstrated a tremendous depth and breadth of knowledge, as well as remarkable fairness in managing manuscripts for the journal.

His highly developed skills in clinical (confocal) imaging of the ocular surface, combined with the foremost techniques in imaging of immune cells in the murine cornea have positioned Dr. Hamrah uniquely as the foremost leader in ocular anterior segment imaging. Through the efforts and expertise of Dr. Hamrah and his predecessors in ocular imaging technology, future ophthalmologists will be able to distinguish disease processes in the anterior eye at the cellular and perhaps the molecular level. Dr. Hamrah's current research represents a further extension of his clinical focus on imaging and immunology in the cornea, with emerging synergy between laboratory and clinical studies. His work as led to ninety peer-reviewed publications. He has been the recipient of over thirty grants, and numerous awards.

During his postdoctoral fellowship with Dr. Reza Dana at the Schepens Eye Research Institute, Dr. Hamrah was able to identify at least four novel cell populations in the cornea, including dendritic cells, refuting longstanding dogma in the cornea literature that the cornea is immune-privileged due to lack of bone marrow-derived cells. These findings have already had a significant impact on the field. It is fair to say that these discoveries have revolutionized the immunobiology of the cornea, and of corneal transplantation. More recently, Dr. Hamrah has

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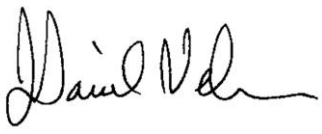
Minneapolis, MN 55440-1309

discovered an additional cell population in the cornea, which the study of their function is subject of his current research and NIH funding. Despite his relatively young professional career, he is extremely well recognized and respected within the field and currently serves as the Section Editor for Clinical Science and Clinical Practice of *The Ocular Surface,* Cornea Section Editor of *Eye*, Assistant Editor of *Ocul Immunol Inflamm*, as well as serving on the editorial boards of a dozen journals. He has been asked to review for over 60 journals. He has served on 9 NIH study sections in the past 2 years alone, in addition to numerous other national and international prestigious grant review panels. He currently has funding through three independent NIH grants, as well as numerous additional foundation grants and industry support, in the field of neuro-immune crosstalk of the cornea.

Dr. Hamrah organized and moderated the Clinician-Scientist Forum at ARVO for close to ten years, chaired the members-in-training committee at ARVO for two years, served on the Young Ophthalmologist Committee of AAO, with the express intent of closing the gap between clinical and basic science in Ophthalmology. In addition he has been an instructor for one to three courses every year at the AAO for the past nine years. For his national work he received the AAO achievement award and the ARVO Gold Fellow Medal. Dr. Hamrah has been involved extensively in teaching locally and served as a preceptor for numerous clinical and surgical fellows at the Cornea Services at both MEEI and Tufts/NEEC, and has mentored more than a dozen students in the laboratory and mentored over thirty research fellows and clinical research fellows during the past nine years.

Dr. Hamrah has shown the intellectual capacity and necessary enthusiasm to expand a new methodology that will impact both clinical and translational science as a leader in academic ophthalmology. He has shown he can conduct independent researchd is an original thinker capable of seeing past current dogma. He has had an excellent scientific preparation and background and has published in the most prestigious scientific journals commensurate with the ground breaking nature of his work, and is completely committed to biomedical research. Dr Hamrah is a dedicated clinician-scientist with a strong commitment to teaching, research and clinical care, who has and will have an impact in ophthalmology. It is on this basis that I strongly recommend Dr. Hamrah for a membership to AOS.

Respectfully,



J Daniel Nelson MD, FACS, FARVO

Senior Medical Director
HealthPartners Specialty Care
HealthPartners Orthopaedic Services
Physicians Neck and Back
Bloomington, MN

Professor of Ophthalmology
University of Minnesota
Minneapolis, MN

Date Prepared: March 1, 2017

CURRICULUM VITAE

Pedram Hamrah, M.D.

Associate Professor
Department of Ophthalmology,
Tufts University School of Medicine, Boston

CITIZENSHIP: U.S.A

OFFICE ADDRESS: New England Eye Center, Cornea Service, Tufts Medical Center, 800 Washington St., Box 312, Boston, MA, 02111

Tufts Medical Center, Room T207, 15 Kneeland St., Tufts University School of Medicine, Boston, MA, 02111

WORK PHONE: Admin. Assistant (617) 636-5720
Direct/Voicemail: (617) 888-3363

WORK E-MAIL: Academic: pedram.hamrah@tufts.edu
Clinical: phamrah@tuftsmedicalcenter.org

WORK FAX: Clinical Admin. (617) 636-4866
Laboratory (617) 636-1466

PLACE OF BIRTH: Datteln, Germany

EDUCATION

Undergraduate

1992	Certified Computer Science Assistant in Software Engineering	B.I.B International College, Bergisch Gladbach, Germany

Medical School and/or Graduate School

1999	Doctor of Medicine (M.D.)	University of Cologne, School of Medicine, Cologne, Germany
2008	Certification (Program in Clinical Effectiveness)	Harvard School of Public Health, Boston

POSTDOCTORAL TRAINING

Internship and Residency

07/2001-06/2002 Intern in Medicine, Good Samaritan Hospital, Cincinnati

07/2003-06/2006 Resident in Ophthalmology, University of Louisville, Louisville

07/2005-06/2006 Chief-Resident, Department of Ophthalmology, University of Louisville, Louisville

Fellowships

06/1999-10/1999 Research Associate, Department of Cell & Neurobiology (Cheryl Craft/Hans-Jürgen Fülle), Doheny Eye Institute, University of Southern California, Los Angeles

10/1999-06/2001 Postdoctoral Research Fellow, Ocular & Transplantation Immunology (Reza Dana), Schepens Eye Research Institute, Department of Ophthalmology, Harvard Medical School, Boston

09/2002-06/2003 Research Associate, Ocular Immunology (Henry J. Kaplan), Department of Ophthalmology & Visual Sciences, University of Louisville, Louisville

07/2006-06/2008 Rotating Fellow, Surgical Services, Massachusetts General Hospital, Harvard Medical School, Boston

07/2006-06/2008 Clinical Fellow, Cornea & Refractive Surgery, Massachusetts Eye & Ear Infirmary and Department of Ophthalmology, Harvard Medical School, Boston

LICENSURE AND CERTIFICATION

1996	United States Medical Licensing Examination, Step I -Passed
1999	United States Medical Licensing Examination, Step II-Passed
1999	Clinical Skill Assessment (CSA)-Passed
1999	ECFMG Certificate
2003	United States Medical Licensing Examination, Step III-Passed
2007	Diplomat, American Board of Ophthalmology

Medical Licenses

2001-2002	State of Ohio medical license	OH 57-00-4718
2003-2006	State of Kentucky medical license	KY IP690/R0833
2006-	State of Massachusetts medical license	MA 227252

ACADEMIC APPOINTMENTS

2008-2009 Instructor, Department of Ophthalmology, Harvard Medical School, Boston

2009-2015 Assistant Professor, Department of Ophthalmology, Harvard Medical School, Boston

2015- Associate Professor, Department of Ophthalmology, Tufts University School of Medicine, Boston

2015-	Faculty Member, Immunology Graduate Program, Sackler School of Graduate Biomedical Sciences, Tufts University School of Medicine, Boston
2015-	Faculty Member, Neuroscience Graduate Program, Sackler School of Graduate Biomedical Sciences, Tufts University School of Medicine, Boston
2016-	Faculty Member, Cell, Molecular and Developmental Biology Graduate Program, Sackler School of Graduate Biomedical Sciences, Tufts University School of Medicine, Boston

HOSPITAL APPOINTMENTS

Past

1993-1995	Teaching Assistant, Department of Anatomy (Neuro-Anatomy), University of Cologne, Germany
1994-1998	Research Assistant, Department of Ophthalmology, University of Cologne, Germany
1997-1998	Research Assistant, Department of Medicine, University of Cologne, Germany
2006-2008	Assistant in Ophthalmology, Associate Staff, Massachusetts Eye & Ear Infirmary, Harvard Medical School, Boston, MA
2008-2009	Courtesy Medical Staff, Department of Ophthalmology/Surgery, UMass Memorial Medical Center, University of Massachusetts, Worcester, MA
2008-2009	Visiting Instructor, von Andrian Laboratory, Immune Disease Institute, Program in Cellular and Molecular Medicine at Children's Hospital, Harvard Medical School, Boston, MA
2009-2012	Visiting Scientist, von Andrian Laboratory, Immune Disease Institute, Program in Cellular and Molecular Medicine at Children's Hospital, Harvard Medical School, Boston, MA
2008-2013	Assistant in Ophthalmology, Active Staff, Massachusetts Eye & Ear Infirmary, Harvard Medical School, Boston
2008-2015	Attending Physician and Surgeon, Cornea & Refractive Surgery Service, Massachusetts Eye & Ear Infirmary, Harvard Medical School, Boston
2008-2015	Attending Physician and Surgeon, Cornea & Refractive Surgery Service, Massachusetts Eye & Ear Infirmary, Harvard Medical School, North Suburban Center, Stoneham, MA
2008-2015	Founder and Director, Ocular Surface Imaging Center, Massachusetts Eye & Ear Infirmary, Harvard Medical School, Boston, MA
2010-2014	Henry Allen Cornea Scholar, Massachusetts Eye & Ear Infirmary, Harvard Medical School, Boston, MA
2012-2015	Assistant Scientist, Schepens Eye Research Institute, Harvard Medical School, Boston, MA

Current

2009-	Clinical Associate, Department of Surgery, Massachusetts General Hospital, Harvard Medical School, Boston, MA
2009-	Associate Surgeon, Department of Surgery, Brigham and Women's Hospital, Harvard Medical School, Boston, MA

2013-	Associate Surgeon, Massachusetts Eye & Ear Infirmary, Harvard Medical School, Boston
2015-	Attending Physician and Surgeon, Cornea Service, New England Eye Center, Tufts Medical Center, Boston, MA
2015-	Attending Physician and Surgeon, Cornea Service, New England Eye Center, Wellesley Hills, MA
2015-	Director, Anterior Segment Imaging, Boston Image Reading Center, Tufts Medical Center, Boston, MA
2016-	Founder and Director, Center for Translational Ocular Immunology, Tufts Medical Center, Boston, MA

Practice Activities

Cornea, Ocular Surface, Corneal Pain, and External Diseases
-Full-time hospital-based patient practice
-New England Eye Center
-Three clinical sessions per week divided between the Boston and Wellesley Hills sites
-One session every other week in operating room, Cornea and Cataract Surgery
-I am involved in clinical research focused on *in vivo* imaging of the corneal and ocular surface

Clinical Innovations

Application of *in vivo* laser confocal microscopy in diagnosis and treatment of corneal and ocular surface diseases. I was the founder and director of the Ocular Surface Imaging Center at the Massachusetts Eye & Ear Infirmary until 2015. I am currently the director of anterior segment imaging of the Boston Image Reading Center at Tufts Medical Center. I have initiated numerous translational research projects that include the use of *in vivo* confocal microscopy and anterior segment OCT, including its use in diagnosis and the monitoring of treatment in various types of infectious keratitis. These studies have already yielded important findings in regards to corneal innervation and inflammation in studied patients, affecting both disease and pain management. These studies have led to the use of this technology in numerous clinical trials, including two multi-center trial, studying the effect of contact lens solutions on the corneal immune system and the role of preservatives on the ocular surface. Our research has led in the initiation of image-guided therapy for patients with infectious keratitis, corneal neuropathy, and ocular surface disorders with improvement in patient outcome. Our studies have resulted in an issued patent for the use of in vivo confocal microscopy to visualized immune dendritic cells to assess the level of inflammation in corneal inflammatory diseases and to use this approach to guide anti-inflammatory therapy.

OTHER PROFESSIONAL POSITIONS

1997-1998	Principal Investigator, "Comparison between recovery periods in the flash ERG and VEP in multi flash evoked responses", Department of Ophthalmology, University of Cologne, Cologne, Germany
2002	Visiting Scientist, Schepens Eye Research Institute & Department of Ophthalmology, Harvard Medical School, Boston
2004-	Consultant in Ocular Immunology and Dry Eye, The Council of Healthcare Advisors, Gerson Lehrman Group, New York
2009	Member, AzaSite® National Advisory Board, Inspire Pharmaceuticals

2011	Member, Clinical Advisory Board, Fovea Pharmaceuticals
2011	Member, Scientific Advisory Board, Bausch + Lomb
2012-	Consultant in Ophthalmic Surgery and Dry Eye, L.E.K consulting, Los Angeles, CA
2012-	Member, Medical Avisor's Board, Revision Optics
2012	Member, Advisory Board For Ophthalmology, Hylozyme Therapeutics
2014	Member, Advisory Board, Advanced Medical Optics, Lod, Israel
2014	Member, Advisory Board for Dry Eye Disease, Bausch + Lomb
2015	Member, Advisory Board for Lifitigrast, Shire Pharmaceuticals
2015-	Member, Advisory Board, Novabay
2015-	Member, Scientific Advisory Board, Stemnion
2015-	Consultant, Aerie Pharmaceuticals
2015-	Consultant, Dompe Pharmaceuticals
2016-	Member, Advisory Board, Allergan
2016-	Member, National Scientific Advisory Board, Shire Pharmaceuticals

AWARDS AND HONORS

1992-1999	Dean's List (every semester), University of Cologne, Germany
2000	Conference Travel Award, Third International Conference on the Lacrimal Gland, Tear Film and Dry Eye Syndromes: Basic Science and Clinical Relevance, Maui
2001	Young Investigator Award, Tear Film and Ocular Surface Society, Association of Vision in Research and Ophthalmology, Ft. Lauderdale
2001	Conference Travel Award, Federation of Clinical Immunology Societies, Boston
2002	Conference Travel Award, Tear Film and Ocular Surface Society, Association for Vision in Research and Ophthalmology, Ft. Lauderdale
2002	National Eye Institute Travel Award, Association for Vision in Research and Ophthalmology, Ft. Lauderdale
2003	Young Pathologist Fellowship, American Society of Investigative Pathology, Experimental Biology, San Diego
2003	Conference Travel Award, Tear Film and Ocular Surface Society, Association for Research in Vision and Ophthalmology, Ft. Lauderdale
2003	Cornea Conference Research Award, Biennial Cornea Conference, Boston
2004	Association of University Professors of Ophthalmology/Research to Prevent Blindness (AUPO/RPB) Resident and Fellow Research Award, Sarasota
2004	Storm Eye/American Society for Cataract and Refractive Surgery Excellence in Research Resident & Fellow Scholarship Award
2005	Storm Eye/American Society for Cataract and Refractive Surgery Excellence in Research Resident & Fellow Scholarship Award

2007	Claes Dohlman Society Award *(Awarded to the outstanding Cornea and Refractive Surgery Fellow in the Unites States)*
2009-	Listed in "Guide to America's Top Ophthalmologists"- Consumers' Research Council of America
2010	Clinical Scientist Development Award (NIH)
2011	Harvard Medical School Leadership Development Program for Physician and Scientists
2011	Research to Prevent Blindness (RPB) Career Development Award
2011	NIH LRP Award
2011	Harvard Catalyst Leadership Strategies for the Researcher
2012	Achievement Award, American Academy of Ophthalmology (AAO)
2013	Fellow, American College of Surgeons (FACS)
2015	ARVO Silver Fellow
2015	Clinical Research Award in Cornea and Ocular Surface Science, European Association for Vision and Eye Research (EVER)
2015	Keynote Speaker, Kyoto Cornea Club, Japan
2017	ARVO Gold Fellow

HOSPITAL, MEDICAL SCHOOL, OR UNIVERSITY COMMITTEE ASSIGNMENTS

Schepens Eye Research Institute, Harvard Medical School, Boston

2001	Internal Communications Committee, Member

University of Louisville, Louisville

2005-2006	Ophthalmology Residency Selection Committee, Member
2005-2006	Medical Council of the School of Medicine, Resident Representative
2005-2006	University House Staff Council, Ophthalmology House Staff Representative

Massachusetts Eye & Ear Infirmary

2008-2015	Member, Cornea Fellowship Committee
2009-2015	Member, Clinical Research Leadership Committee

Department of Ophthalmology, Harvard Medical School

2008-2009	Member, Organizing Committee, Harvard Department of Ophthalmology

Biennial Cornea Research Conference

2012 Member, Planning Committee, Harvard Department of Ophthalmology Cornea Retreat

2012-2013 Member, Organizing Committee, Harvard Department of Ophthalmology Biennial Cornea Research Conference

2013-2014 Member, Organizing Committee, Harvard Department of Ophthalmology Cornea Retreat

2014-2015 Member, Organizing Committee, Harvard Department of Ophthalmology Biennial Cornea Research Conference

New England Eye Center, Tufts Medical Center

2015- Member, Clinical Research Committee

Tufts University School of Medicine

2015-2016 Member, Tufts Inflammation Day Organizing Committee

OTHER MAJOR COMMITEE ASSIGNMENTS

National

2015 Member, Steering Committee of Prospective Evaluation of Mechanisms Underlying Post-LASIK Symptomatology (PEMUPS)

International

2004-2008 Co-Chair, Associate Advisory Board, Tear Film and Ocular Surface Society

2012-2013 Member, "Neurobiology of Discomfort and Pain" subcommittee, TFOS International Workshop on Contact Lens Discomfort (CLD).

2015- Member, "Pain & Sensation" subcommittee, TFOS Dry Eye Workshop II.

MAJOR ADMINISTRATIVE LEADERSHIP POSITIONS

Local

2005-2006 Chief Resident, Department of Ophthalmology, University of Louisville

2008-2015 Founder and Director, Ocular Surface Imaging Center, Massachusetts Eye & Ear Infirmary, Harvard Medical School

2009-2015 Co-Chair, Organizing Committee, Harvard Department of Ophthalmology, Monthly "New Frontiers in Corneal Research"

2013-2015 Chair, Ocular Immunology and Inflammation Focus Group, Schepens Eye Research Institute/Massachusetts Eye and Ear, Department of Ophthalmology, Harvard Medical School

2015- Director, Anterior Segment Imaging, Boston Eye Reading Center, Tufts Medical Center

2016- Founder and Director, Center for Translational Ocular Immunology

National

2009	Course Director, Instruction Course, "In Vivo Confocal Microscopy in Medical and Surgical Management of Ocular Surface and Refractive Surgery", American Academy of Ophthalmology (AAO), San Fransisco, CA
2010, 2011	Co-Organizer and Co-Moderator, Special Interest Group, "Intravital imaging of immune responses in the ocular surface", ARVO, Ft. Lauderdale, FL
2010-2013	Organizer, "YO ARVO! Happy Hour: Exploring careers in research", jointly sponsored by AAO and ARVO, Chicago, IL
2015	Course Director, Instruction Course, "New Treatments for Meibomian Gland Dysfunction", American Academy of Ophthalmology (AAO), Las Vegas, NV
2016	Course Director, Instruction Course, "New Treatments for Meibomian Gland Dysfunction", American Academy of Ophthalmology (AAO), Chicago, IL

TRAINING OF GRADUATE STUDENTS/POST DOCTORAL FELLOWS

Undergraduate Students

2015-	Aakash Gupta, currently undergraduate student Boston University
2016 (summer)	Adam Khan, currently undergraduate student, Tulane University
2016 (summer)	Adam Tanaka, currently medical student, Tufts University

Medical Students

2008 (summer) 2010 (summer)	Laura-Marie Hoesl, currently Ophthalmology resident at University of Erlangen, Germany (published 1 manuscript; co-authored 2 manuscripts)
2008 (summer) 2010 (summer)	Wolfgang Schrems, currently Ophthalmology resident at University of Erlangen, Germany (co-authored 2 manuscripts)
2009 (summer)	Parambir Keila Singh, currently student at Queen's University Faculty of Health Sciences, Canada (co-authored 1 manuscripts)
2011 (winter) 2012 (summer)	Erik A. Samayoa, currently Ophthalmology resident at Universidad Francisco Marroquin, Guatemala City, Guatemala
2012 (summer)	Berit Kolbinger, currently student at University of Ulm Medical School, Germany
2012 (summer)	Philipp Becks, currently student at University of Ulm Medical School, Germany
2012 (summer)	Sarosh Khan, currently student at Aga Khan University, Karachi, Pakistan (co-authored 1 manuscript)
2013 (summer)	Michael Arnoldner, currently student at Medical University of Vienna, Austria (published 1 manuscript, co-authored 2 manuscripts)
2016 (summer)	Luca Schwarzenbacher, currently medical student University of Vienna, Austria
2016 (summer)	Adam Khan, currently medical student, Tulane University
2016-	Adam Tanaka, currently medical student, Tufts University School of Medicine
2016-	Navneet Krishna Ramesh, currently medical student, Tufts University School of Medicine

PhD Graduate Student, Immunology

2016- Abdo Abou-Slaybi, PhD Graduate Student in Immunology, Sackler School of Graduate Biomedical Sciences, Tufts University School of Medicine. "Neuronal Regulation of Plasmacytoid Dendritic Cells"

Post-doctoral Fellows/Residents

2008-2009 Bashar Shahatit, M.D., Post-doctoral Research Fellow, Massachusetts Eye & Ear Infirmary. "*In Vivo* Confocal Microscopy Study of Corneal Nerve Changes in Patients with Corneal Allodynia". Currently in Clinical Practice, Lassen Medical Group, Red Bluff, CA
Co-authored 6 manuscripts.

2008-2009 Shiva Alipour, M.D., Post-doctoral Research Fellow, Massachusetts Eye & Ear Infirmary. "Effect on Pain Control with Gabapentin in Patients with Infectious Corneal Ulcers and Severe Refractory Pain". Currently Assistant Professor, Tehran University of Medical Scienes, Iran.
Co-authored 1 manuscript.

2008-2009 Hasan Ali Bayhan, Post-doctoral Research Fellow, Massachusetts Eye & Ear Infirmary, "Epidemiology of Herpetic Keratitis". Currently, Assistant Professor, Department of Ophthalmology, Faculty of Medicine, Bozok University, Yozgat, Turkey.
Co-authored 5 manuscripts.

2008-2009 Kristina Kurbanyan, M.D., Resident in Ophthalmology, Massachusetts Eye & Ear Infirmary, "In Vivo Confocal Microscopy of Corneal Nerve Alterations in Acute Acanthamoeba and Fungal Keratitis". Currently in Clinical Practice, Lancaster, CA.
Published 1 manuscript.

2009-2010 Dimosthenis Mantopoulos, M.D., Post-doctoral Research Fellow, Massachusetts Eye & Ear Infirmary/Immune Disease Institute, "The role of selectins in dendritic cell homing to the cornea". Currently, Ophthalmology Resident, Ohio State University, Columbus, OH
Published 1 manuscript, co-authored 2 manuscripts. *Winner of the Outstanding Poster Award, 2009 IDI Annual Research Retreat*

2009-2011 Andrea Cruzat, M.D., Post-doctoral Research Fellow, Massachusetts Eye & Ear Infirmary, "Role of corneal dendritic cells in infectious keratitis". Currently Instructor, Harvard Medical School, Boston, MA
Published 5 manuscripts, co-authored 12 manuscripts. *Winner of Young Investigator Travel Award, International Society for Eye Research Meeting, 2012.*

2009-2011 Lixin Zheng, O.D., M.D., Research Associate, "Characterization of corneal neuropeptides in immune and inflammatory diseases of the cornea". Immune Disease Institute, Boston, MA. Currently, Optometrist, Cambridge Health Alliance, Cambridge, MA.
Co-authored 4 manuscripts.

2009-2011 Hyunjoo Lee, M.D., Ph.D., Resident in Ophthalmology, Boston University Medical Center, Boston, MA, "Patient Outcome with In Vivo Confocal Microscopy in Diagnosis and Management of Acanthamoeba Keratitis". Currently, Assistant Professor, Cornea & External Diseases, Boston University, Boston, MA

2009-2010	Radhika Kumar Chandoke, M.D., Clinical Fellow, Advisor for Claes Dohlman Visiting Professorship fellow research project "Current State of In Vivo Confocal Microscopy in Management of Microbial Keratitis", Mass. Eye & Ear Infirmary, Boston MA. Currently in Clinical Practice, Cincinnati, OH. Published 1 manuscript.
2009-2012	Aslihan Turhan, Ph.D., Senior Research Fellow, Massachusetts Eye & Ear Infirmary/Immune Disease Institute, "Recruitment mechanisms of corneal dendritic cells". Currently, Associate Professor, University of Gaziantep, Turkey Co-authored 1 manuscript.
2010-2013	Kai Hu, M.D., Senior Research Fellow, Massachusetts Eye & Ear Infirmary/ Immune Disease Institute, "Role of Corneal Dendritic Cells in Pathogenesis and Transmission of Herpes Simplex Keratitis". Currently, Associate Professor, Department of Ophthalmology, Zhong Da Hospital, School of Medicine, Southeast University, Nan Jing, China. Published 1 manuscript. Co-authored 1 manuscript.
2010-2011	Neda Bani-Asadi, M.D., Research Fellow, Massachusetts Eye & Ear Infirmary/Immune Disease Institute, "Characterization of Human Corneal Antigen Presenting Cells". Currently, Research Fellow, Anesthesiology Service, MEEI. Co-authored 2 manuscript.
2010-2015	Yureeda Qazi, M.D., Research Fellow, Massachusetts Eye & Ear Infirmary, "The effect of contact lens solutions on corneal immune cells". Published 6 manuscripts, co-authored 3 manuscript. *Winner of ARVO Knights Templar Travel Award 2015*
2011-2012	Albert Alhatem, M.D., M.Sc., Senior Research Fellow, Massachusetts Eye & Ear Infirmary/Immune Disease Institute, "Distribution of corneal antigen presenting cells". Currently, Postdoctoral Fellow, University of Mississippi, Memphis, TN. Published 1 manuscript.
2011-2013	Bernardo M. Cavalcanti, M.D., Clinical Research Fellow, Massachusetts Eye & Ear Infirmary, "Identification of imaging biomarkers for ocular allergic disease". Currently, Attending Physician and Surgeon, Hospital de Olhos de Pernambuco, Recife, Brazil Published 2 manuscripts, co-authored 8 manuscripts.
2011-2013	Takefumi Yamaguchi, M.D., Research Fellow, Massachusetts Eye & Ear Infirmary/Immune Disease Institute, "In vivo imaging of the immune response mechanisms in corneal transplantation". Currently, Assistant Professor, Keio University, Tokyo, Japan. Published 3 manuscripts. Co-authored 4 manuscripts. *Winner of Bausch & Lomb/MEEI fellowship 2011; winner of Japanese Eye Bank Research Grant 2012; winner of Uehara Memorial Foundation Research Grant 2012; winner of Japanese Society for the Promotion of Science Overseas Research Grant 2012.*
2011	Anita Nathan Shukla, M.D., Clinical Fellow, Advisor for Claes Dohlman Visiting Professorship fellow research project "In vivo confocal microscopy of corneal dystrophies", Massachusetts Eye & Ear Infirmary, Boston MA. Currently, Clinical Practice, Boston, MA Published 1 manuscript.

2011-2013 Gargi Khare Vora, M.D., Resident in Ophthalmology, Massachusetts Eye & Ear Infirmary, "Image-guided therapy for limbal stem cell deficiency". Currently, Clinical Cornea Fellow, Duke University, Durham, NC.

2012-2014 Shruti Aggarwal, MD, Clinical Research Fellow, Massachusetts Eye & Ear Infirmary, "Immuno-imaging and the role of corneal dendritic cells in herpetic keratitis". Currently, Ophthalmology Resident, University of Virginia, Charlottesville, VA.
Published 4 manuscripts. Co-authored 3 manuscripts.
Winner of ARVO/National Eye Institute Travel Grant 2013; Winner Eye Bank Association of America Research Grant 2013; Winner of Travel Grant, Tear Film and Ocular Surface Society 2013.

2012-2013 Jae Young (Jane) You, M.D., Research Fellow, Massachusetts Eye & Ear Infirmary, "Central and peripheral corneal nerve distribution in a population of normal subjects". Currently, Cornea Fellow, Johns Hopkins University, Baltimore, MD.

2013- Maria Jose Lopez de Paz, M.D., Postdoctoral Research Fellow, Tufts Medical Center/Schepens Eye Research Institute/Massachusetts Eye and Ear, "The role of corneal nerves in corneal transplantation". *Winner of ARVO/National Eye Institute Travel Grant 2014.*
Co-authored 1 manuscript

2013- Hamidreza Moein, M.D., Postdoctoral Research Fellow, Tufts Medical Center/Schepens Eye Research Institute/Massachusetts Eye and Ear, "Role of Integrins MAdCAM-1 and VCAM-1 in Corneal Transplantation".
Winner Eye Bank Association of America Research Grants 2013. Winner Eye Bank Association of America Research Grant 2014. Winner of ARVO/Tear Film and Ocular Surface Society Travel Grant 2015. Winner Eye Bank Association of America Research Grant 2015. Winner Young Investigator Award IAMA-MA 2015. Winner Travel Award Tearfilm and Ocular Surface Society 2016.

2013-2015 Rodrigo Müller, M.D., Clinical Research Fellow, Tufts Medical Center/Massachusetts Eye & Ear Infirmary, "Corneal Nerve Alterations in Infectious Keratitis and Herpetic Eye Diseases".
Published 2 manuscripts, co-authored 2 manuscripts.

2013- Arsia Jamali, M.D., M.P.H, Postdoctoral Research Fellow, Tufts Medical Center/Schepens Eye Research Institute/Massachusetts Eye and Ear, "Trafficking mechanism of corneal plasmacytoid dendritic cells".
Co-authored 3 manuscripts.
Winner Eye Bank Association of America Research Grant 2014. Winner Eye Bank Association of America Research Grant 2015. Winner Young Investigator Award IAMA-MA 2015. Winner Travel Award Tearfilm and Ocular Surface Society 2016.

2013- Victor Sendra, Ph.D., Postdoctoral Research Fellow, Tufts Medical Center/Schepens Eye Research Institute/Massachusetts Eye and Ear. "The role of plasmacytoid dendritic cells in herpes simplex keratitis".
Co-authored 1 manuscript.
Winner Eye Bank Association of America Research Grant 2016.

2014-2016 Xiodan Huang, M.D., Postdoctoral Research Fellow, Tufts Medical Center/Schepens

Eye Research Institute/Massachusetts Eye and Ear. "Regulation of corneolimbal adhesion molecules by corneal nerves". Currently, Assistant Professor, Department of Ophthalmology, Zhejiang University, Hangzhou, China

2014- Yashar Seyed-Razavi, Ph.D., Postdoctoral Research Fellow, Tufts Medical Center/Schepens Eye Research Institute/Massachusetts Eye and Ear. "The role of corneal nerves in immune cells trafficking and function".
Co-authored 1 manuscript.
Winner Best Poster Award, Tufts Medical Center CMDI Retreat 2015. Winner Eye Bank Association of America Research Grant 2016.

2015-2016 Chareenun Chirapapaisan, M.D., Clinical Research Fellow, Massachusetts Eye & Ear Infirmary. "Use of Cellular Biomarkers in Early Diagnosis and Response Monitoring in Corneal Graft Rejection*"*. Currently, Assistant Professor, Department of Ophthalmology, Mahidol University, Bangkok, Thailand

2015-2016 Alessandro Abbouda, M.D., Clinical Research Fellow, Tufts Medical Center. "New anterior segment applications for en-face OCT".
Published 1 manuscript.
Currently, Clinical Research Associate, Department of Ophthalmology, Moorfields Hospital, London, United Kingdom

2016- Tomas Blanco, Ph.D., Postdoctoral Research Fellow, Tufts Medical Center. "Regulation of vascular endothelial cells by the sympathetic nervous system".

2016- Zeina Salem, M.D., Clinical Research Fellow, Tufts Medical Center. "Diagnostic Markers of Corneal Neuropathic Pain".

2016- Gabriella Dieckmann, M.D., Clinical Research Fellow, Tufts Medical Center. "Development of new imaging diagnostic tools for dry eye and ocular surface disease".

2016- Paula Kataguiri, M.D., Clinical Research Fellow, Tufts Medical Center, "Assessment of peripheral corneal and conjunctival inflammatory changes in patients with dry eye disease by in vivo confocal microscopy".

2016- Anam Akhlaq, M.D., Clinical Research Fellow, Tufts Medical Center, "Development of functional corneal nerve electrophysiology for the clinic".

2016- Ricardo Nose, M.D., Clinical Research Fellow, Tufts Medical Center, "OCT angiography of the anterior segment"

Clinical Fellows

2008-2009 Joseph Ciolino, M.D., Assistant Professor, Harvard Medical School, Boston, MA
2008-2009 Sangita Patel, M.D., Ph.D., Assistant Professor, University of Buffallo, Buffallo, NY
2008-2009 Mira Lim, M.D., Oakland, CA
2008-2009 Pauline Lim, M.D., Monrovia, CA
2008-2009 Jessica Ciralsky, M.D., Assistant Professor, Cornell University, New York, NY
2009-2010 Aisha Traish, M.D., Assistant Professor, University of Illinois Chicago, Chicago, IL
2009-2010 Tasha Tanheko, M.D., Sinai Hospital, Baltimore, MD
2009-2010 Anne Keating, M.D., Fargo, ND
2009-2010 Radhika Kumar, M.D., Cincinnati, OH

2009-2010	Ginny Kullman, M.D., Assistant Professor, Louisiana State University, New Orleans, LA
2010-2011	Janie Yoo, M.D.
2010-2011	Richard Townley, M.D., Air Force, San Antonio, TX
2010-2011	Kristen Hawthorne, M.D., Austin, TX
2010-2011	John Clements, M.D.
2010-2012	Houman Hemmati, M.D., Ph.D., Allergan, Irvine, CA
2011-2012	Zhonghui Luo, M.D., Ph.D., Instructor, Harvard Medical School, Boston, MA
2011-2012	Sahar Kohanim, M.D., Instructor, Harvard Medical School, Boston, MA
2011-2012	Christina Prescott, M.D., Ph.D., Assistant Professor, Johns Hopkins University, Baltimore, MD
2011-2013	Anita Nathan Shukla, M.D., Clinical Practice, Boston, MA
2011-2013	Ronny Sayegh, M.D., Assistant Professor, Case Western Reserve University, School of Medicine, Cleveland, OH
2012-2013	Yan-Ying Peggy Chang, M.D., Instructor, Harvard Medical School, Boston, MA
2012-2013	Hyunjoo Lee, M.D., Ph.D., Assistant Professor, Boston University, Boston, MA
2013-2014	Sara Bozorg, M.D., Private Practice, Manchester, NH
2013-2014	Ramez Haddadin, M.D., Cook County Health and Hospital Systems, Chicago, IL
2013-2014	Cecily H. Hamil, M.D., Ph.D., Private Practice, Brookline, MA
2013-2014	Deepika Shah, M.D., Private Practice, New York, NY
2014-2015	Mary-Claude Robert, M.D., University of Montreal, Montreal, QC
2014-2015	Sunali Goyal, M.D., University of Arkansas, Little Rock, AK
2014-2015	Duna Raouf, M.D., Private Practice, Laguna Beach, CA
2014-2015	Haumith R. Khan-Farooqi, M.D., Private Practice, Austin, TX
2015-2016	Alan Pusateri, M.D., Private Practice, Tampa, FL
2015-2016	Nisreen Mesiwala, M.D., Private Practice, San Francisco, CA
2016-	Benjamin Strauss, M.D.
2016-	Daniel Corbett, M.D.

Dissertation Advisory Committee:

2012-2015	Wei-Sheng Chen, Ph.D. student Program in Cell, Molecular and Developmental Biology, Tufts University, Boston, MA
2017-	Michael Hyde, Ph.D. student Program in Cell, Molecular and Developmental Biology, Tufts University, Boston, MA

TEACHING RESPONSIBILITY

Teaching of Students in Courses:

1993-1995	Tutor, Neuroanatomy class, Department of Anatomy, University of Cologne, Germany 2nd year medical students, Five hours weekly
2009-2015	Faculty member, NIH/NEI T32 EY007145 Postdoctoral Training Program in Molecular Bases of Eye Disease (PI: P D'Amore)

2010 Patient Doctor II—Introduction to Eye Examination; IN 761
2nd Year Medical Students, 4-hour session

2010-2015 Course OP501, Elective Clerkship in Basic Ophthalmology
4th Year Medical Students, Forty hours per year

2010-2015 Course OP502, Advanced Ophthalmology Elective
4th Year Medical Students, Forty hours per year

2015- Faculty Member, Immunology Graduate Program, Sackler School of Graduate Biomedical Sciences, Tufts University School of Medicine, Boston

2015- Faculty Member, Neuroscience Graduate Program, Sackler School of Graduate Biomedical Sciences, Tufts University School of Medicine, Boston

Formal Teaching of Residents, Clinical Fellows and Research Fellows (post-docs)

2005 **Ophthalmology Lecture Series, Department of Ophthalmology & Visual Sciences, University of Louisville**
"Corneal Trauma and Burns"
Residents; One-hour lecture

2007 **Research Seminar, Department of Pathology, Harvard Medical School**
"Corneal Antigen-Presenting Cells"
Research Fellows; One hour lecture

2009 **Ophthalmology Lecture Series, Massachusetts Eye & Ear Infirmary**
"Ocular Surface Trauma and Burns"
Residents, Clinical Fellows; One-hour lecture

2009-2015 **Bi-Monthly Ocular Surface Imaging Club, Massachusetts Eye & Ear Infirmary**
Clinical Fellows, Clinical Research Fellows, Residents; One-hour seminar

2010 **Ophthalmology Lecture Series, Massachusetts Eye & Ear Infirmary**
"Corneal Imaging"
Residents, Clinical Fellows; One-hour lecture

2012 **Ophthalmology Lecture Series, Massachusetts Eye & Ear Infirmary**
"Diagnostic Corneal Imaging"
Residents, Clinical Fellows; One-hour lecture

2013 **Ophthalmology Lecture Series, Massachusetts Eye & Ear Infirmary**
"Corneal Imaging in Diagnosis and Management of Diseases"
Residents, Clinical Fellows; One-hour lecture

2015- **Corneal Lecture Series, New England Eye Center, Tufts Medical Center**
"Corneal Imaging"
Residents, Clinical Fellows; One-hour lecture

Corneal Lecture Series, New England Eye Center, Tufts Medical Center
"Herpetic Eye Diseases"
Residents, Clinical Fellows; One-hour lecture

Clinical Supervisory and Training Responsibilities

Past

2006-2008 Clinical Preceptor, Emergency Ward, Massachusetts Eye & Ear Infirmary
-Twenty-four sessions per year, residents and medical students

2008-2015 Attending Physician, Cornea and Refractive Surgery Services, Massachusetts Eye & Ear Infirmary
-Two sessions per week, clinical fellows, residents, and medical students

Current

2015- Attending Physician, Cornea Service, New England Eye Center, Tufts Medical Center
-Two sessions per week, clinical fellows, residents, and medical students

Laboratory and Other Research Supervisory and Training Responsibilities

2008- Supervision of post-doctoral research fellows
-Daily mentorship

2008- Supervision of medical students
-Daily mentorship

Report of Education of Patients and Service to the Community

Activities

1993 Volunteer, Department of Surgery, Mercy Hospital, Sacramento, CA
1996-1997 Volunteer Staff, Department of Public Health, University of Cologne, Germany
2009 "Our Eyes—A Window into Our Health". Podcast interview, Legacy for Life
2009 "Revolutionizing Treatments to Save Vision from Corneal Disease", Massachusetts Eye & Ear Infirmary, Harvard Medical School, Boston, MA
2009 "Sun can produce growth on eyes". Interview with Florida Today, Florida.
2010 Volunteer Staff, The Vision Coalition

Educational Material for Patients and the Lay Community

Books, Monographs, Articles and Presentations in other media

2008-2010 Cornea and External Diseases clinical and research pages, Massachusetts Eye & Ear Infirmary new website, co-author

Major Teaching and Curriculum Offerings

2009-present **American Academy of Ophthalmology**
Instructor, "Surgery for Severe Corneal Ocular Surface Disease".

Course provided surgical skills in the management of severe corneal and ocular surface disease, including amniotic membrane transplantation, limbal stem cell transplantations and keratoprosthesis.

2009 **American Academy of Ophthalmology**
Senior Instructor, "In Vivo Confocal Microscopy in Medical and Surgical Management of Ocular Surface and Refractive Surgery Diseases".
Course provided overview of regarding the present and novel applications of in vivo confocal microscopy in the management of patients with infectious disease, keratoconus, after collagen cross-linking and refractive surgery procedures.

2015, 2016 **American Academy of Ophthalmology**
Instructor, "Step-by-Step Management of Dry Eye Disease".
This course provides up to date therapeutic measures and step-by-step algorithms for dry eye patients.

2015, 2016 **American Academy of Ophthalmology**
Senior Instructor, "New Treatments for Meibomian Gland Dysfunction".
This course provides thorough knowledge of the new treatment options for MGD and will provide a practical algorithm for the management of MGD based on its severity.

2016 **American Academy of Ophthalmology**
Instructor, "Ocular Surface Pain – Principles and Practice".
This course provides thorough knowledge of the principles and management of ocular surface pain

PROFESSIONAL SOCIETIES

1998-	Association of Research in Vision and Ophthalmology (ARVO)
1999-2001	Society for Leukocyte Biology
1999-2001, 2008-	Ocular Microbiology and Immunology Group
2000-	Tear Film and Ocular Surface Society
2001-2002	American College of Medicine-American Society of Internal Medicine
2001-2005	Federation of Clinical Immunology Society
2002-	American Academy of Ophthalmology
2002-2005	American Society of Investigative Pathology
2003-2006	Jefferson County Medical Society
2003-2006	Kentucky Medical Association
2004-	International Society of Dacryology and Dry Eye
2004-	American Academy of Ophthalmic Executives
2004-	American Society of Cataract and Refractive Surgery
2005-	Deutsche Oftalmologische Gesellschaft (German Society of Ophthalmology)
2008-	The Cornea Society
2009-	Contact Lens Association of Ophthalmologists
2012-	American College of Surgeons
2012-2013	*Associate Fellow*
2013	*Initiate*

2013- *Fellow, American College of Surgeons*
2012- New England Ophthalmological Society

OFFICE AND COMMITTEE ASSIGNMENTS IN PROFESSIONAL SOCIETIES

Association of Research in Vision and Ophthalmology (ARVO)

2003-2012	Member, Members-in-Training Committee
2004-2013	Organizer & Moderator Clinician-Scientist Forum
2008-2010	Chair, Members-in-Training Committee
2009	Co-Chair and Co-Organizer, Members-in-Training Workshop, "Getting Published—Advice and admonitions"
2010	Co-Organizer, Pizza with an Expert, ARVO
2011-2014	Member, Professional Development and Education Committee
2016-	Member, Ethics and Regulations in Human Research Committee

Tear Film and Ocular Surface Society

2004-2008	Co-Chair, Associate Advisory Board
2012-2013	Member, "Neurobiology of Discomfort and Pain" subcommittee, TFOS International Workshop on Contact Lens Discomfort (CLD).
2015-	Member, "Pain & Sensation" subcommittee, TFOS Dry Eye Workshop II.

American Academy of Ophthalmology

2008-2012	Member, YO Info Board, Young Ophthalmologist Sub-Committee
2009-2015	Member, Cornea/External Disease Committee, The Ophthalmic News & Education (O.N.E.) Network
2015-	Section Editor, Cornea/External Disease, *EyeWiki*

American Academy of Ophthalmic Executives

2008-2011	Member, Young Ophthalmologist (YO) Committee

MAJOR RESEARCH INTERESTS

I am an ophthalmologist, scientist, educator, and software engineer, with a current basic research focus on corneal immunology and intravital imaging. My interests in corneal disease, immunology, neuroscience, imaging and computers, together with my desire to combine these passions, naturally has led me to the novel area of immuno-imaging and neuro-immune crosstalk. The primary goals of my research are to dissect the ocular neuro-immune crosstalk, to study the mechanisms of corneal pain, and to study cornea-specific cellular mechanisms involved in normal and disease-specific leukocyte trafficking, with particular interest in antigen-presenting cells (APC) and their interface with the nervous system. To understand the functional properties of corneal nerves, we have developed a unique murine model of neurotrophic keratopathy (*PLoS One* 2013). I began studying the migratory behavior of APC and T cells in the cornea, in collaboration with Dr. Ulrich von Andrian, and had served as a liaison between the Cornea Service at the Massachusetts Eye & Ear Infirmary and the Immune Disease Institute. I then moved to my own laboratory at the Schepens Eye Research Institute/Mass Eye and Ear, where we had setup the first intravital microscopy facility in the country dedicated to ocular studies. More recently, I have moved my laboratory and intravital microscopy facility to Tufts Medical Center. We have dissected the cellular mechanisms involved in APC homing to and their migration within the cornea, by applying corneal intravital two-photon and epifluorescent microscopy developed by my group, as well as in vitro techniques on mice that are genetically deficient in specific adhesion and chemokine pathways or express fluorescent proteins.

These models allowed the dissection of the trafficking behavior of APC at a resolution and specificity that could otherwise not be achieved. Some of the current specific projects include a) dissecting molecular mechanisms involved in corneal APC recruitment into normal and inflamed corneas; b) dissecting molecular mechanisms involved in corneal APC egress from the cornea; c) determining mechanisms involved in T cell recruitment and function in the cornea; and studying the interaction of APC and T cells in the cornea and draining lymph node in vivo after cornea transplantation. To this end, we have developed an intravital multi-photon imaging model of the submandibular lymph node, which serve as the draining lymph node to the cornea. More recently, we have identified a novel population of resident immune cells in the cornea, termed plasmacytoid dendritic cells, and are studying their role in corneal immunity and in herpes simplex keratitis. Our most recent data, puts these cells at the center of the maintenance of corneal homeostasis, as we have demonstrated both their neurotrophic and angiostatic roles in the cornea. Our long-term goal is the development of novel highly specific immunomodulatory strategies for pharmacological intervention in inflammatory, infectious and autoimmune corneal diseases, through modulation of APC and T cell migration and function. In addition, we are currently developing autologous cell-based therapeutic intervention with the use of plasmacytoid dendritic cells.

Antigen presenting cells have always been the focus of my research activities. I trained in Ocular and Transplantation Immunology at the Schepens Eye Research Institute at a momentous time. During our initial studies, my collaborators had noted that draining lymph nodes of corneal allografts from transgenic green fluorescent protein (GFP)-expressing donors contain cells of unknown origin carrying the GFP marker. It was about the same time when we then unexpectedly discovered several distinct populations of bone marrow-derived resident immature dendritic cells and macrophages in the central normal cornea, which we then identified as the source of the GFP^+ cells in these lymph nodes (*J Exp Med* 2002). However, in contrast to other solid organs, both the epithelial Langerhans cells and the CD11b+ stromal dendritic cells that we had discovered, failed to express MHC class II molecules (*IOVS* 2002 and 2003), although they are able to undergo maturation during inflammation and present antigen after corneal transplantation. These findings refute a previous long-standing dogma, namely that the cornea is immune privileged due to the absence of bone marrow-derived cells and due to antigenic sequestration, and subsequently resulted in a paradigm shift in corneal immunology. Our more recent data demonstrates the clear interplay of the immune and nervous systems in the cornea, which were once thought to function independently. We demonstrated that corneal nerves are required for maintenance of immune privilege and tolerance in the cornea (manuscript under review), as well as the requirement for plasmacytoid dendritic cells in corneal nerve maintenance and regeneration through nerve growth factor (ARVO 2015, manuscript under preparation).

Naturally, we then set out to study the migration mechanism of corneal APCs from the cornea to draining lymph nodes. It was during these studies, when we made the second startling discovery that resident corneal dendritic cells and conjunctival monocytic cells express vascular endothelial growth factor receptor-3 (VEGFR-3)(*Am J Pathol* 2003 and *Exp Eye Res* 2004), thought to be expressed only by the lymphatic endothelium at the time. We demonstrated that VEGFR-3 mediates the chemotactic mobilization of APC into lymphatics. More importantly, we demonstrated that blockade of this pathway can suppress the trafficking of APCs from the cornea to regional lymph nodes and prevent corneal transplant rejection (*Nat Med* 2004). In addition, we demonstrated the constitutive expression if VEGFR-3 by the corneal epithelium, which serves as a "sink" mechanism for VEGF-C/D, a critical mechanism in maintaining corneal avascularity (*PNAS* 2006). This research has now culminated in our recent studies, demonstrating the direct neuronal regulation of lymphangiogensis in the cornea.

My basic research is complemented with extensive translational bench to bedside and bedside to bench

research activities. My initial clinical research efforts that I began as the founding director of the Ocular Surface Imaging Center at the Massachusetts Eye & Ear Infirmary and am now continuing at the New England Eye Center of Tufts Medical Center have focused on studying cellular and nerve alterations in herpes simplex keratitis, herpes zoster ophthalmicus, and ocular surface diseases by *in vivo* confocal microscopy. Our studies led to the unexpected finding that not only do the clinically affected eyes present with a loss of the subbasal nerve plexus, but also the contralateral unaffected eyes demonstrate a significant decrease in subbasal nerve density and length (*Ophthalmology* 2010 and 2013). In addition, profound herpetic-induced changes in the superficial epithelium, as demonstrated by increase in cell size, decrease in cell density, and squamous metaplasia, are present, correlating with the degree of nerve loss (*Ophthalmology* 2012, *Am J Ophthalmol* 2015). Moreover we recently demonstrated that the loss of corneal nerves in infectious keratitis is inversely related to increased presence of corneal dendritic cells (*IOVS* 2011), which also corresponds with increase of pro-inflammatory cytokines in tears (*IOVS* 2014), suggesting a potential interplay between the immune and nervous system in the cornea. Several randomized clinical trials are currently underway and we have manuscripts under preparation that demonstrate the use of this technology in the diagnosis and management of infectious diseases and ocular surface diseases.

Report of Technological and Other Scientific Innovations

- Inflammatory Eye Disorders
  U.S. Patent Application, PCT/US2013/027181, filed February 21, 2013
  Developed novel imaging markers through the use of in vivo confocal microscopy for evaluating efficacy of a treatment in a subject having eye inflammation and selecting a subject for participation in a clinical study.

- Meibomian Gland Dysfunction
  U.S. Patent Application, PCT/US2013/027177, filed February 21, 2013
  Developed novel imaging markers for diagnosing meibomian gland dysfunction (MGD), determining the severity of meibomian gland dysfunction in a subject, evaluating efficacy of treatment of MGD in a subject, selecting a subject for treatment of MGD, and selecting a subject for participation in a clinical study.

- Methods for Treating Corneal and Conjunctival Inflammation and Inflammatory Disorders
  U.S. Patent Application, PCT/US2013/027172, filed February 21, 2013
  Developed therapeutic targets and methods for reducing corneal inflammation by targeting MadCAM-1, α4β7 integrin, L-selectin, and E- selectin.

- Conjunctival Diseases
  U.S. Provisional Patent Application, 61/783,659, filed March 14, 2013
  Developed novel non-invasive methodology to treat conjunctival diseases, including conjunctivochalasis through the use of collagen crosslinking.

- Methods of Reducing Corneal Endothelial Cell Loss
  U.S. Patent Application, PCT/US2014/066551, filed November 20, 2014
  Developed novel methodology to assess decreased nerve density in patients at risk for endothelial cell loss and preventing endothelial cell loss through neuropeptide based therapies.

- Adoptive Transfer of Plasmacytoid Dendritic Cells to Prevent or Treat Ocular Diseases and Conditions
  U.S. Provisional Patent Application, 62/447,279, filed January 17, 2017
  Developed a novel cell based approach to treat ocular angiogenesis and neurotrophic diseases through local adoptive transfer of plasmacytoid dendritic cells

RESEARCH SUPPORT

Current

2013-2018 NIH R01-EY022695: PI $1,250,000
Role of Plasmacytoid Dendritic Cells in Corneal Immunity
To dissect molecular mechanisms involved in recently identified corneal plasmacytoid dendritic cells and their role in herpes simplex keratitis.

2014-2017 GlaxoSmithKline, Sponsored Investigator Initiated Research: PI $251,926.74
An In Vivo Confocal Microscopy Study to Determine the Efficacy of Topical Steroid Treatment in Dry Eye Patients.
To determine the effects of topical steroid administration over a treatment period of 6 weeks, using novel methods of detecting efficacy by in vivo confocal microscopy

2014-2017 Allergan, Sponsored Investigator Initiated Research Program: PI $207,880.51
Ocular Surface Immune Response in Dry Eye Disease: Analysis of Conjunctival and Peripheral Corneal Immune Cell Alterations by In Vivo Confocal Microscopy and Clinical Correlation
To study the cellular inflammation in dry eye patients in the peripheral cornea and conjunctiva by in vivo confocal microscopy.

2015-2019 NIH U10-EY022879/EY022881: Site PI
(PI: M. Maguire/P. Asbell)
The Dry Eye Evaluation And Management (DREAM) Study
To study the efficacy of Omega-3 fatty acids in the management of dry eye

2015-2016 Dompé Farmaceutici S.p.A.: Site PI
An 8-week phase II, multicenter, randomized, double-masked, vehicle controlled parallel group study with a 24 or 32 week follow-up period to evaluate the efficacy of a formulation containing anti-oxidant of recombinant human nerve growth factor (rhNGF) 20 µg/ml eye drops solution versus vehicle containing anti-oxidant in patients with Stage 2 and 3 Neurotrophic Keratitis
To study the efficacy of topical recombinant nerve growth factor in the treatment of neurotrophic keratopathy

2015-2016 Allergan: Site PI
A Phase 2, Vehicle-controlled, Randomized, Dose-ranging Study of the Safety, Efficacy, Tolerability, and Systemic Pharmacokinetics of AGN-223575 Ophthalmic Suspension in Patients With Dry Eye Disease
To study the safety and efficacy of 3 concentrations of a new glucocorticoid receptor agonist in the treatment of dry eye disease.

2016-2017 TissueTech: PI $28,273
Efficacy of BTGel in Corneal Epithelial Healing
Assess the efficacy of novel BTGel in promotion of epithelial healing

2016-2018 NIH R21-EY025393-01: PI $275,000
Role of Plasmacytoid Dendritic Cells in Corneal Nerve Maintenance and Regeneration
To study the mechanism by which plasmacytoid dendritic cells maintain and regenerate corneal nerves

2016-2018 CooperVision Science and Technology Translational Award: PI $119,647.44
Assessment of cellular and soluble mediators in contact lens discomfort

2016-2017 Shire, Sponsored Research Program: PI $151,287.00
Mechanisms of Action of the LFA-1 Antagonist Lifitegrast in Dry Eye Disease.
To elucidate the specific mechanism of action of Lifitegrast in the blockade of T cell recruitment to the ocular surface in a mouse model of dry eye disease

2016-2017 Dompé Farmaceutici S.p.A.: PI $39,403.00
Partial Ciliary Nerve Injury as a Murine Model for Corneal Neuropathic Pain
To develop a novel murine model of corneal neuropathic pain

2016-2017 Eye Bank Association of America: Mentor $4,983
Role of Corneal Nerves in Modulating Alloimmunity
To study the role of corneal nerves in the maintenance of immune privilege and to test the efficacy of neuro-regenerative therapy to prevent corneal graft rejection.

2016-2017 Eye Bank Association of America: Mentor $4,900
Determining and Characterizing Corneal Plasmacytoid Dendritic Cells in Human Corneas.
To assess the presence, distribution and phenotype of plasmacytoid dendritic cells in human corneas and to assess if they are able to induce tolerance.

2016-2017 Allergan: PI $53,579.50
The utility of anterior segment imaging to assess goblet cell and meibomian gland alterations after Oculeve Intranasal Neurostimulation.
To assess if Oculeve neurostimulation results in goblet cell and meibomian gland secretion.

2016-2017 Bausch & Lomb: Site-PI
A Phase 3, Multi-Center, Double-Masked, Vehicle-Controlled, Randomized, Parallel-Group Study to Assess Loteprednol Etabonate Ophthalmic Gel, 0.38% (BID and TID) versus Vehicle Gel for the Treatment of Ocular Inflammation and Pain Following Cataract Surgery.
To assess the efficacy of preservative free Loteprednol Etabonate for treatment of pain and ocular inflammation after cataract surgery.

2013-2018 NIH R01-EY022695-S1: PI $127,008
Role of Plasmacytoid Dendritic Cells in Corneal Immunity
To dissect molecular mechanisms involved in recently identified corneal plasmacytoid dendritic cells and their role in herpes simplex keratitis.

2017-2021 NIH R01-EY026963: PI $1,000,000
Role of Plasmacytoid Dendritic Cells in Ocular Angiogenesis

Past

2008-2010 Harvard-Vision Clinical Scientist Development Award, through NIH K12-EY016335
Immunobiology of Corneal Antigen-Presenting Cells
To dissect molecular mechanisms involved in corneal antigen-presenting cell and T cell trafficking in the cornea.

2009-2010 Massachusetts Lions Eye Research Fund: PI
Use of In Vivo Confocal Microscopy in Diagnosis, Management and Monitoring of Malignant Melanoma of the Conjunctiva
To validate the use of in vivo confocal microscopy in early detection and management of malignant melanoma and primary acquired melanosis of the conjunctiva in a multicenter study.

2009-2010 Harvard Catalyst: co-PI (PI: Dr. D. Schaumberg)
Development of an Innovative Test of Sustained Visual Function.
The goal of this research project is to develop a Sustained Visual Function Test (SVFT) that could be useful in assessing the visual impairment in dry eye patients.

2008-2011 New England Corneal Transplant Research Fund: PI
Long-term Alterations in Corneal Nerve Density and Function in Neurotrophic Herpetic Keratopathy.
To study long-term corneal nerve and cellular changes in patients with herpes simplex virus keratitis and herpes zoster keratitis

2010-2011 Fight for Sight Grant-in-Aid: PI
In Vivo Imaging of Immune Cells in Corneal Transplantation—Mechanisms and Consequences
To identify critical mechanisms involved in leukocyte migration and subsequent generation of the corneal alloimmune response.

2011-2012 Massachusetts Lions Eye Research Fund: PI
Elucidation of the Immunobiology of Corneal Transplantation by In Vivo Imaging
To elucidate the mechanisms involved in the recruitment of T cells to the cornea after corneal transplantation, and generate a comprehensive picture of APC and T cells migration in corneal transplantation.

2010-2013 Alcon, Sponsored Research Program: PI
Effect of Contact Lens Solution on Immune Cell Density and Morphology of the

Ocular Surface of Patients: A Laser In Vivo Confocal Microscopy Study
A multicenter randomized study to assess the density and morphology of dendritic and non-dendritic corneal immune cells in new contact lens wearers over time by laser in vivo confocal microscopy.

2011-2013 NIH Loan Repayment Program Award (Clinical Research): PI
Immunobiology of Corneal Antigen Presenting Cells

2012-2013 Allergan, Sponsored Investigator Initiated Research Program: PI
Corneal Immune Response in Dry Eye Disease: Analysis of Epithelial Immune Cell Alterations by In Vivo Confocal Microscopy and Clinical Correlation
To validate the use of corneal immune cells as seen by in vivo confocal microscopy, as a marker for inflammation through correlation with clinical signs and symptoms.

2010-2014 NIH K08-EY020575, PI
Immunobiology of Corneal Antigen Presenting Cells.
To dissect molecular mechanisms involved in corneal antigen-presenting cell and T cell trafficking in the cornea.

2013-2014 Eye Bank Association of America: Mentor
Role of Integrins MAdCAM-1 and VCAM-1 in Corneal Transplantation
To study the functional role of integrins in corneal allograft rejection.

2013-2014 Eye Bank Association of America: Mentor
Corneal Re-innervation after Corneal Transplantation Using Erythropoetin
To study the use of erythropoietin to accelerate corneal nerve regeneration

2009-2015 Falk Medical Foundation: co-PI $250,000
Imaging Inflammation to Study Corneal Immune Cell Activity
Using non-invasive imaging we aim to develop a systematic in vivo approach to determine the tissue, cellular and molecular factors involved in the recruitment, turnover, egress and function of the immune cells in the cornea.

2011-2015 Research to Prevent Blindness Career Development Award: PI $250,000
Therapeutic modulation of immune cell trafficking to prevent corneal graft rejection.
To identify critical mechanisms involved in leukocyte migration and subsequent generation of the corneal alloimmune response.

2012-2015 Department of Defense: Co-Investigator (PI: Dr. R. Dana)
Safety and Efficacy of Bevacizumab in High-Risk Corneal Transplant Survival
To study if subconjunctival anti-VEGF inhibitor Bevacizumab is able to prolong corneal transplantation survival in high-risk corneal transplants.

2014-2015 Eye Bank Association of America: Mentor
Role of Plasmacytoid Dendritic Cells in Corneal Transplantation
To study the functional role of plasmacytoid dendritic cells in corneal graft survival

2014-2015 Eye Bank Association of America: Mentor

Integrin Blockade in High-Risk Corneal Transplantation
To study the functional role of integrins in high-risk corneal allograft rejection.

2010-2015 Alcon, Sponsored Investigator Initiated Research Program: PI
In Vivo Effects of Antiglaucomatous Prostaglandin Therapy on Immune Cells, Epithelium, and Nerves of the Ocular Surface: A Laser In Vivo Confocal Microscopy Study.
To study the effect of preservative in glaucoma drops on the ocular surface in patients

2015-2016 Eye Bank Association of America: Mentor
Plasmacytoid Dendritic Cell Therapy for Corneal Graft Survival
To study the cell-based therapy with plasmacytoid dendritic cells for promotion of corneal graft survival

2015-2016 Eye Bank Association of America: Mentor
VIP to Enhance Endothelial Survival in Corneal Transplantation
To study the efficacy of vasointestinal peptide to enhance endothelial cell survival after corneal transplantation.

Funding Pending

2017-2019 Alcon, Sponsored Research Program: PI
Long-Term Effect of Contact Lens and Care Regimen Combinations on Corneal Immune Cell Density and Morphology: A Laser In Vivo Confocal Microscopy Study
To assess long-term alterations in corneal immune cells in new contact lens care regimen combinations contact lens users by laser in vivo confocal microscopy

2017-2022 NIH-R01: Co-PI
Intravitreal silk-based drug delivery for prophylaxis and treatment following ocular trauma
To assess the utility of silk-based delivery of antibiotic and steroids for management of patients with ocular trauma

EDITORIAL BOARDS AND ACTIVITY

Editorial Roles

2003-present Assistant Editor, *Ocular Immunology and Inflammation*
2005-2011 Editorial Board Member, *Graefe's Archives of Clinical and Experimental Ophthalmology*
2007-present Editorial Board Member, *Journal of Ophthalmic and Vision Research*
2008-2011 Editorial Board Member, American Academy of Ophthalmology, Young Ophthalmologist *YO Info*
2008-present Section Editor for Cornea/Refractive Surgery, *Eye*
2009-2015 Editorial Board Member, *The Ocular Surface*
2012-present Editorial Board Member, *ISRN Inflammation*
2012-present Editorial Board Member, *Open Journal of Ophthalmology*
2012-present Specialty Editor, *Webmed Central Plus*
2012-present Editorial Board Member, *Dataset Papers in Medicine,* Ophthalmology Section

2013-present Expert Board Member, *International Journal of Ophthalmology*
2013-2014 Editorial Board Member, *ISRN Ophthalmology*
2014-present Editorial Board Member, *International Scholarly Research Notices*
2014-present Editorial Board Member, *Eye & Contact Lens*
2014-present Editorial Board Member, *Journal of Clinical Research and Ophthalmology*
2015-present Section Editor, Cornea/External Disease, *EyeWiki*, AAO
2015-present Editorial Board Member, *Ophthalmology and Therapy*
2015-present Section Editor, Clinical Science, *The Ocular Surface*
2015-present Associate Editor, Corneal and External Diseases Section, *BMC Ophthalmology*
2015-present Associate Editor, Ophthalmology Section, *BMC Research Notes*
2016-present Section Editor, Cornea Transplantation, *Current Ophthalmology Reports*

Ad hoc Reviewer

2003- *Investigative Ophthalmology & Visual Science*
2003- *Ocular Immunology and Inflammation*
2004- *Graefe's Archives of Clinical and Experimental Ophthalmology*
2004 *Medical Science Monitor*
2004- *Expert Opinion on Therapeutic Targets*
2005- *Cornea*
2005- *Ophthalmology*
2005- *Journal of Immunology*
2005- *Archives of Ophthalmology,* now *JAMA Ophthalmology*
2006- *Current Eye Research*
2006- *Ophthalmic Research*
2006- *Eye*
2006- *Molecular Vision*
2007- *The Veterinary Journal*
2007- *British Journal of Ophthalmology*
2007- *Journal of Cataract and Refractive Surgery*
2007- *Digital Journal of Ophthalmology*
2007- *BioTechniques*
2007 Oxford University Press
2008- *American Journal of Ophthalmology*
2008- *Experimental Eye Research*
2008- *American Journal of Transplantation*
2009- *New England Journal of Medicine*
2010- *Expert Opinion in Ophthalmology*
2010- *Indian Journal of Ophthalmology*
2010- *Clinical and Experimental Ophthalmology*
2011- *BMC Ophthalmology*
2011- *PLoS One*
2011- *Ophthalmologica*
2011- *Clinical Ophthalmology*
2011- *Journal of Clinical and Cellular Immunology*
2011- *Middle East African Journal of Ophthalmology*
2011- *Acta Ophthalmologica*
2011- *Journal of Ocular Pharmacology and Therapeutics*
2011- *Survey of Ophthalmology*

2012-	*Open Journal of Ophthalmology*
2012-	*Bone Marrow Transplantation*
2012-	*Eye & Contact Lens*
2012-	*Clinics and Practice*
2012-	*International Journal of Ophthalmology*
2013-	*Ophthalmology and Therapy*
2013-	*Stem Cells*
2013-	*Pain*
2014-	*Infection and Immunity*
2014-	*US Ophthalmic Review*
2014-	*PLoS Pathogens*
2014-	*Mucosal Immunology*
2014-	*European Journal of Ophthalmology*
2014-	*International Journal of Molecular Sciences*
2015-	*Journal of Diabetes Research*
2015-	*BMC Research Notes*
2015-	*Bioscience Reports*
2015-	*Optometry & Vision Science*
2015-	*Scientific Reports*
2016-	*Cell Death & Disease*
2016-	*Translational Vision Science & Technology*
2017-	*Expert Review in Ophthalmology*

GRANT REVIEW ACTIVITIES

2010, 2012	Ad hoc reviewer, Fight for Sight, United Kingdom
2010, 2017	Ad hoc reviewer, Wellcome Trust Grants, United Kingdom
2010	Ad hoc reviewer, The Health Research Board and Science Foundation Ireland, Translational Research Award Programme, Dublin, Ireland
2010	Ad hoc reviewer, Agency for Science, Technology and Research—Biomedical Research Council Translational Clinical Research Partnership, Singapore
2011	Ad hoc reviewer, Research Foundation Flanders (FWO), Brussels, Belgium
2012	Ad hoc reviewer, Massachusetts Life Sciences Center's Massachusetts-Israel Innovation Partnership (MIIP) Grant Program
2012	Ad hoc reviewer, Medical Research Council, United Kingdom
2012, 2013, 2014	Member, FDA office of orphan disease development (OOPD) grant panel for rare ophthalmic diseases
2012, 2015	Ad hoc reviewer, Massachusetts Life Sciences Center Accelerator Loan Program, Massachusetts
2013, 2014	Ad hoc reviewer, US Army Medical Research Materiel Command (USAMRMC) grant program
2014	Ad hoc reviewer, The Health Research Board, Dublin, Ireland
2014	Ad hoc reviewer, Auckland Medical Research Foundation, Auckland, New Zealand
2014	NIH, National Eye Institute Special Emphasis Panel, ZEY1 VSN (04), Ad hoc member
2015	NIH, National Eye Institute, DPVS study section, Ad hoc member
2015	NIH, National Eye Institute Special Emphasis Panel, ZEY1 VSN (02)

2016	NIH, National Eye Institute Special Emphasis Panel, 2016/06 ZEY1 VSN (04) 1; NEI Mentored Basic Research and Pathways to Independence Award Applications, Ad hoc member
2016	NIH, National Eye Institute Special Emphasis Panel, 2016/06 ZRG1 BDCN-W (04) M, Ad hoc member
2016	Ad hoc reviewer, Physician Services Incorporated Foundation, Ontario, Canada
2016	NIH, National Eye Institute Special Emphasis Panel, 2016/10 ZEY1 VSN (04) 1; NEI Mentored Basic Research and Pathways to Independence Award Applications, Ad hoc member
2016	NIH, National Eye Institute Special Emphasis Panel, 2016/10 ZRG1 BDCN-J (91) S; Ocular Surface, Cornea, and Refractive Error, Ad hoc member
2017	NIH, National Eye Institute, Clinical Research Review Panel, 2017/05 ZEY1 VSN (01) 1, Ad hoc member
2017	NIH, National Eye Institute Special Emphasis Panel, Ocular Surface, Cornea, and Refractive Error, Ad hoc member
2017	Fight for Sight, Scientific Review Committee, Anterior Segment Panel
2017	Deutche Forschungsgemainschaft/German Research Foundation Clinical Trials Program, Ad hoc member
2017	The Eversight Center for Eye and Vision Research Grant Review Committee, Ad hoc member

EVALUATION OF INDIVIDUALS FOR PROMOTION, TENURE & AWARDS

Department of Ophthalmology, Harvard Medical School
Department of Ophthalmology, Case Western Reserve University, School of Medicine

BIBLIOGRAPHY

Peer Reviewed Publications

1. Dana MR, Qian Y, **Hamrah P**. Twenty-Five Year Panorama of Corneal Immunology: Emerging Concepts in the Immunopathogenesis of Microbial Keratitis, Peripheral Ulcerative Keratitis, and Corneal Transplant Rejection. *Cornea,* 2000; 19:625-643.

2. Liu Y,[*] **Hamrah P,**[*] Zhang Q, Taylor AW, Dana MR. Draining Lymph Nodes of Corneal Transplant Hosts Exhibit Evidence for Donor Major Histocompatibility Complex (MHC) class II-positive Dendritic Cells Derived from MHC class II-negative Grafts. *J Exp Med,* 2002; 195:259-268.
([*] co-first Author)

3. **Hamrah P**, Zhang Q, Liu Y, Dana MR. Novel Characterization of MHC class II-negative Population of Resident Corneal Langerhans Cell-type Dendritic Cells. *Invest Ophthalmol Vis Sci,* 2002; 43:639-646.

4. Qian Y, **Hamrah P**, Boisgérault F, Yamagami S, Vora S, Benichou G, Dana MR. Mechanisms of Immunotherapeutic Intervention by Anti-CD154 (CD40L) Antibody in High-Risk Corneal Transplantation. *J Interferon Cytokine Res*, 2002; 22:1217-1225.

5. **Hamrah P,** Liu Y, Zhang Q, Dana MR. The Corneal Stroma is Endowed with Significant Numbers of Resident Dendritic Cells. *Invest Ophthalmol Vis Sci*, 2003; 44:581-589.

6. **Hamrah P**, Chen L, Zhang Q, Dana MR. Novel Expression of Vascular Endothelial Growth factor Receptor (VEGFR)-3 and VEGF-C on Dendritic Cells in the Cornea. *Am J Pathol*, 2003; 163:57-68.

7. Gockel I, Lord RV, Bremner CG, Crookes PF, **Hamrah P**, DeMeester TR. The Hypertensive Lower Esophageal Sphincter: A Motility Disorder With Manometric Features of Outflow Obstruction. *J Gastrointest Surg*, 2003; 7:692-700.

8. **Hamrah P**, Huq SO, Liu Y, Zhang Q, Dana MR. Corneal Immunity is Mediated by Heterogeneous Population of Antigen-Presenting Cells. *J Leukoc Biol,* 2003; 74:172-178.

9. **Hamrah P**, Liu Y, Zhang Q, Dana MR. Alterations in Corneal Stromal Dendritic Cell Phenotype and Distribution in Inflammation. *Arch Ophthalmol*, 2003; 121:1132-1140.

10. Chen L, **Hamrah P**, Cursiefen C, Zhang Q, Jackson DG, Streilein JW, Dana MR. Vascular endothelial growth factor receptor-3 mediates induction of corneal alloimmunity. *Nat Med,* 2004; 10:813-815.

11. **Hamrah P,** Chen L, Cursiefen C, Zhang Q, Joyce NC, Dana MR. Expression of Vascular Endothelial Growth Factor Receptor-3 (VEGFR-3) on Monocytic Bone Marrow-Derived Cells in the Conjunctiva. *Exp Eye Res,* 2004; 79:553-562.

12. Yamagami S, **Hamrah P,** Dekaris I, Miyamoto K, Miyazaki D, Dawson T, Lu B, Gerard C, Dana MR. The CCR5 Chemokine Receptor Mediates Corneal Langerhans Cell Recruitment. *Invest Ophthalmol Vis Sci*, 2005; 46:1201-1207.

13. Yamagami S, **Hamrah P**, Zhang Q, Liu Y, Huq S, Dana MR. Early Ocular Chemokine Gene Expression and Leukocyte Infiltration after High-risk Corneal Transplantation. *Mol Vis.* 2005; 11:632-640.

14. **Hamrah P**, Ritterband D, Seedor J, Eiferman RA. Ocular Infection Secondary to Gemella. *Graefe's Arch Clin Exp Ophthalmol*, 2006;1:1-2

15. Cursiefen C, Chen L, Saint-Geniez M, **Hamrah P**, Jin Y, Rashid S, Pytowski B, Persaud K, Wu Y, Streilein JW, Dana R. Nonvascular VEGFR-3-Expression by Corneal Epithelium Maintains Avascularity and Vision. *Proc Natl Acad Sci USA*, 2006; 103:11405-11410.

16. **Hamrah P**, Yamagami S, Liu Y, Zhang Q, Vora SS, Lu B, Gerard CJ, Dana MR. Deletion of the Chemokine Receptor CCR1 Prolongs Corneal Allograft Survival. *Invest Ophthalmol Vis Sci*. 2007; 48:1228-1236.

17. Jin Y, Chen LL, Chong EV, **Hamrah P**, Chen L, Dana MR. The chemokine receptor CCR7 mediates corneal antigen presenting cell trafficking. *Mol Vis*. 2007; 13:626-634

18. Chen L, **Hamrah P**, Cursiefen C, Zhang Q, Pytowski B, Streilein JW, Dana MR. Vascular endothelial growth factor receptor-3 mediates induction of corneal alloimmunity. *Ocul Immunol Inflamm*. 2007; 15:275-278.

19. Thiagalingam S, Tarangoy P, **Hamrah P**, Lobo AM, Nagao K, Barsam C, Bellows R, Pineda R. Complications of Cosmetic Iris Implants. *J Cataract Refract Surg*. 2008; 34:1222-1224.

20. Dastjerdi MH, Al-Arfaj KM, Nallasamy N, **Hamrah P**, Jurkunas UV, Pineda II R, Pavan Langston D, Dana R. Topical Bevacizumab in the Treatment of Corneal Neovascularization: Results of a Prospective, Open-label, Non-comparative Pilot Study. *Arch Ophthalmol*. 2009; 127:381-389.

21. **Hamrah P**, Haskova Z, Taylor AW, Zhang Q, Ksander BR, Dana MR. Local treatment with alpha-melanocyte stimulating hormone reduces corneal allorejection. *Transplantation*. 2009; 88:180-187.

22. Dastjerdi MH, **Hamrah P**, Dana R. High-frequency Topical Cyclosporine 0.05% in the Treatment of Severe Dry Eye Refractory to Twice-daily Regimen. *Cornea*. 2009; 28:1091-1096.

23. **Hamrah P**, Singh PS, Hoesl LM, Tezel TH. Development of Crystalline Keratopathy After Intravitreal Injections of Pegaptanib. *Eye*. 2010; 24:1527-1528.

24. **Hamrah P**, Cruzat A, Dastjerdi MH, Zheng L, Shahatit B, Bayhan HA, Dana R, Pavan-Langston D. Corneal Sensation and Subbasal Nerve Alterations in Patients with Herpes Simplex Keratitis: An *In Vivo* Confocal Microscopy Study. *Ophthalmology*. 2010; 117:1930–1936.

25. Allen MJ, **Hamrah P**, Mott KR, Chentoufi AA, Gate DM, Mantopoulos D, Zheng L, BenMohamed L, Town T, Freeman GJ, Sharpe AH, Wechsler SL, Ware CF, Ghiasi H. The role of LAT in increased CD8+ T cell exhaustion in trigeminal ganglia of mice latently infected with herpes simplex virus type 1. *J Virol.* 2011; 85:4184-4197.

26. Smolyar AE, **Hamrah P**. Bilateral Posterior Ischemic Optic Neuropathy in a Patient with Severe Diabetic Ketoacidosis. *Case Report Ophthalmol*. 2011; 2:91-94.

27. Cruzat A, Witkin D, Baniasadi N, Zheng L, Jurkunas UV, Ciolino JB, 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.

28. **Hamrah P**, Alipour F, Jiang S, Sohn JH, Lorenz D, Foulks GN. Optimizing Evaluation of Lissamine Green parameters for Ocular Surface Staining. *Eye*. 2011; 25:1429-1434.

29. Kurbanyan K, Hoesl LM, Schrems WA, **Hamrah P**. Corneal Nerve Alterations in Acute *Acanthamoeba* and Fungal Keratitis: An *in vivo* Confocal Microscopy Study. *Eye*. 2012; 26:126-132.

30. Sahin A, **Hamrah P**. Acute Herpetic Keratitis: What is the Role for Gangciclovir Ophthalmic Gel? *Ophthalmology and Eye Diseases*. 2012; 4:23-34.

31. **Hamrah P**, Sahin A, Dastjerdi MH, Shahatit BM, Bayhan HA, Dana R, Pavan-Langston D. Cellular Changes of the Corneal Epithelium and Stroma in Herpes Simplex Keratitis: An In *Vivo* Confocal Microscopy Study. *Ophthalmology*. 2012; 119:1791-1797.

32. Cheng S, Dastjerdi M, Ferrari G, Okanobo A, Bower K, Ryan D, Amparo F, Stevenson W, **Hamrah P**, Nallasamy N, Dana R. Short-Term Topical Bevacizumab in the Treatment of Stable Corneal Neovascularization. *Am J Ophthalmol.* 2012; 154:940-948.

33. **Hamrah P**, Cruzat A, Dastjerdi MH, Prüss H, Zheng L, Shahatit BM, Bayhan HA, Dana R, Pavan-Langston D. Unilateral Herpes Zoster Ophthalmicus Results in Bilateral Corneal Nerve Alteration: An *In Vivo* Confocal Microscopy Study. *Ophthalmology* 2013; 120: 40-47 [Epub ahead of print Sep 19 2012] (on Cover Image)

34. Hoesl LM, Schrems WA, Cruzat A, Shahatit BM, Bayhan HA, Jurkunas UV, **Hamrah P**. Cellular and Subbasal Nerve Alterations in Early Fuchs' Endothelial Corneal Dystrophy: An in Vivo Confocal Microscopy Study. *Eye* 2013; 27:42-49.

35. Amparo F, Dastjerdi MH, Okanobo A, Ferrari G, Smaga L, **Hamrah P**, Jurkunas UV, Schaumberg D, Dana R. Topical Interleukin-1 Receptor Antagonist for Treatment of Dry Eye Disease. *JAMA Ophthalmology* 2013; 131:715-723.

36. Cheng SF, Dastjerdi MH, Ferrari G, Okanobo A, Amparo F, Stevenson W, **Hamrah P**, Nallasamy N, Dana R, Bower KS, Ryan DS. Reply: To PMID 22967868. *Am J Ophthalmol*, 2013; 56:204-205.

37. Yamaguchi T, Harris D, Hu K, von Andrian UH, **Hamrah P**. Bilateral Nerve Alterations in a Unilateral Experimental Neurotrophic Keratopathy Model: A Lateral Conjunctival Approach for Trigeminal Axotomy. *PLoS One*, 2013; Aug 14;8(8):e70908.

38. Stapleton F, Marfurt CF, Golebiowski B, Rosenblatt MI, Bereiter DA, Begley C, Dartt DA, Gallar J, Belmonte C, **Hamrah P**, Willcox M, and the members of the TFOS International Workshop on Contact Lens Discomfort. The International Workshop on Contact Lens Discomfort: Report of the Subcommittee on Neurobiology. *Invest Ophthalmol Vis Sci*. 2013; 54:71-97.

39. Qazi Y, **Hamrah P.** Corneal Allograft Rejection: Immunopathogenesis to Therapeutics. *J Clin Cell Immunol*; 2013, 28:287-300

40. Amparo F, Jin Y, **Hamrah P**, Schaumberg DA, Dana R. What is the Value of Incorporating Tear Osmolarity Measurement in Assessing Patient Response to Therapy in Dry Eye Disease? *Am J Ophthalmol.* 2014*;* 157:69-77.

41. Villani E, Baudouin C, Efron N, **Hamrah P**, Kojkoj T, Patel S, Pflugfelder S, Zhivov A, Dogru M. In vivo confocal microscopy of the ocular surface: from bench to bedside. *Curr Eye Res*. 2014; 39:213-231.

42. Mott KR, Allen SJ, Zandian M, Akbari O, **Hamrah P**, Maazi H, Sharpe AH, Wechsler SL, Freedman GJ, Ghiasi H. Inclusion of CD80 in HSV Targets the Recombinant Virus to PD-L1 on DCs and Allows Productive Infection and Robust Immune Responses. *PLoS One*. 2014; Jan 27; 9(1): e87617.

43. Amparo F, **Hamrah P**, Schaumberg DA, Dana R. The value of tear osmolarity as a metric in evaluating the response to dry eye therapy in the clinic and in clinical trials. *Am J Ophthalmol*. 2014; 157:915-916.

44. Qazi Y, Aggarwal S, **Hamrah P**. Image-Guided Evaluation of Monitoring of Treatment Response in Patients with Dry Eye Disease. *Graefe's Arch Clin Exp Ophthalmol*. 2014; 252:857-872.

45. Arnolder MA**,** Kheirkhah A, Jakobiec FA, Durand ML, **Hamrah P**. Successful Treatment of *Paecilomyces Lilacinus* Keratitis with Oral Posaconazole. *Cornea*. 2014; 33:747-749.

46. Aggarwal S, Jakobiec FA, **Hamrah P**. Bilateral Adult Epibulbar Xanthogranulomas Suspicious for Erdheim-Chester Disease. *Cornea*. 2014; 33:1113-1117.

47. Yamaguchi T, Calvacanti BM, Cruzat A, Qazi Y, Ishikawa S, Osuka A, Lederer J, **Hamrah P**. Correlation between Human Tear Cytokine Levels and Cellular Corneal Changes in Patients with Infectious Keratitis by *In Vivo* Confocal Microscopy. *Invest Ophthalmol Vis Sci.* 2014; 55:7457-7466.

48. Kheirkhah A, Dohlman TH, Amparo F, Arnoldner MA, Jamali A, **Hamrah P**, Dana R. Effects of Corneal Nerve Density on the Response to Treatment in Dry Eye Disease. *Ophthalmology*. 2015;122:662-668.

49. **Hamrah P**, Sahin A, Dastjerdi MH, Shahatit BM, Bayhan HA, Dana R, Pavan-Langston D. *In Vivo* Confocal Microscopical Changes of the Corneal Epithelium and Stroma in Patients with Herpes Zoster Ophthalmicus. *Am J Ophthalmol*, 2015; 159:1036-1044.

50. Aggarwal S, Kheirkhah A, Cavalcanti BM, Cruzat A, Colon C, Brown E, Borsook D, Prüss H, **Hamrah P**. Autologous Serum Tears for Treatment of Photoallodynia in Patients with Corneal Neuropathy: Efficacy and Evaluation with *In Vivo* Confocal Microscopy. *The Ocular Surface*. 2015; 13:250-262.

51. Sugaya S, Chen WS, Cao Z, Kenyon KR, Yamaguchi T, Omoto M, **Hamrah P**, Panjwani N. Comparison of Galectin Expression Signature in Rejected and Accepted Murine Corneal Allografts. *Cornea*. 2015; 34:675-678.

52. Kheirkhah A, Abud TB, Dohlman TH, Arnoldner MA, **Hamrah P**, Dana R. Reduced Corneal Endothelial Cell Density in Dry Eye Disease. *Am J Ophthalmol*. 2015; 159:1022-1026.

53. Qazi Y, Kheirkhah A, Blackie C, Cruzat A, Trinidad M, Williams C, Korb DR, **Hamrah P**. *In Vivo* Detection of Clinically Non-Apparent Ocular Surface Inflammation in Patients with Meibomian Gland Dysfunction-Associated Refractory Dry Eye Symptoms. *Eye*. 2015; 29:1099-1110.

54. Theophanous C, Jacobs DS, **Hamrah P**. Corneal Neuralgia after LASIK. *Optometry and Vision Science*. 2015; 92:e233-240.

55. **Hamrah P**, Sahin A, Pavan-Langston D. Reply, *In Vivo* Confocal Microscopy Demonstrate Changes of the Corneal Epithelium in Patients with Herpes Zoster Ophthalmicus. *Am J Ophthalmol*. 2015; 160:398-399.

56. Müller R, Pourmirzaie R, Pavan-Langston D, Cavalcanti BM, Aggarwal S, Colón C, Jamali A, Cruzat A, **Hamrah P**. *In Vivo* Confocal Microscopy Demonstrates Bilateral Loss of Endothelial Cells in Unilateral Herpes Simplex Keratitis. *Invest Ophthalmol Vis Sci.* 2015; 56:4899-4906.

57. Lagali N, Poletti E, Patel D, McGhee C, **Hamrah P**, Kheirkhah A, Tavakoli M, Petropoulos I, Malik R, Utheim T, Zhyvov A, Stachs O, Falke K, Peschel S, Guthoff R, Chao C, Golebiowski B, Stapleton F, Ruggeri A. Focused Tortuosity Definitions Based on Expert Clinical Assessment of Corneal Subbasal Nerves. *Invest Ophthalmol Vis Sci.* 2015; 56:5102-5109.

58. Müller R, Abedi F, Cruzat A, Witkin D, Baniasadi N, Cavalcanti BM, Jamali A, Chodosh J, Dana R, Pavan-Langston D, **Hamrah P**. Degeneration and Regeneration of Subbasal Corneal Nerves after Infectious Keratitis: A Longitudinal In Vivo Confocal Microscopy Study. *Ophthalmology*. 2015; 122:2200-2209.

59. Kheirkhah A, Müller R, Mikolajczak J, Ren A, Kadas EM, Zimmermann H, Prüss H, Paul F, Brandt AU, **Hamrah P**. Comparison of Standard versus Wide-field Composite Images of the Corneal Subbasal Layer by *In Vivo* Confocal Microscopy. *Invest Ophthalmol Vis Sci.* 2015; 56:5801-5807.

60. Hu K, Harris DL, Yamaguchi T, von Andrian UH, **Hamrah P**. A Dual Role for Corneal Dendritic Cells in Herpes Simplex Keratitis: Local Suppression of Corneal Damage and Promotion of Systemic Vital Dissemination. *PLoS One.* 2015 Sep 2; 10(9):e0137123.

61. Cruzat A, Schrems WA, Schrems-Hoesl LM, Cavalcanti BM, Baniasadi N, Witkin D, Pavan-Langston D, Dana R, **Hamrah P**. Contralateral Clinically Unaffected Eyes of Patients with Unilateral Infectious Keratitis Demonstrate a Sympathetic Immune Response. *Invest Ophthalmol Vis Sci.* 2015; 56:6612-6120.

62. Kheirkhah A, Rahimi Darabad R, Cruzat A, Hajrasouliha AR, Witkin D, Wong N, Dana R, **Hamrah P**. Corneal Epithelial Immune Dendritic Cell Alterations in Subtypes of Dry Eye Disease: An *In Vivo* Confocal Microscopic Study. *Invest Ophthalmol Vis Sci.* 2015; 56: 7179-7185.

63. Annunziata R, Kheirkhah A, **Hamrah P**, Trucco E. Combining Efficient Hand-Crafted Features with Learned Filters for Fast and Accurate Corneal Nerve Fibre Centreline Detection. Conf Proc IEEE Eng Med Biol Soc. 2015; 2015:5655-5683.

64. Demirkilinc Biler E, Guven Yilmaz S, Palamar M, Hamrah P, Sahin A. In Vivo Confocal Microscopy and Anterior Segment Optic Coherence Tomography Findings in Ocular Ochronosis. *Case Rep Ophthalmol Med*. 2015; 592847.

65. Dohlman TH, Di Zazzo A, Omoto M, Hua J, Ding J, **Hamrah P**, Chauhan SK, Dana R. E-selectin Mediates Immune Cell Trafficking in Corneal Transplantation. *Transplantation*. 2016;100:772-80.

66. Goyal S, **Hamrah P**. Understanding Neuropathic Corneal Pain- Gaps and Current Therapeutic Approaches. *Semin Ophthalmol*. 2016; 31:59-70.

67. Annunziata R, Kheirkhah A, Aggarwal S, Cavalcanti BM, **Hamrah P**, Trucco E. Two-Dimensional Plane for Multi-Scale Quantification of Corneal Subbasal Nerve Tortuosity. *Invest Ophthalmol Vis Sci.* 2016; 57:1132-1139.

68. Muakkassa NW, Klein KA, **Hamrah P**, Reichel E. Subconjunctival Bevacizumab for the Treatment of Keratoprosthesis-Associated Cystoid Macular Edema. *Ophthalmic Surg Lasers Imaging Retina*. 2016; 47:276-279.

69. Cruzat A, **Hamrah P**, Cavalcanti BM, Zheng L, Colby KA, Pavan-Langston D. Corneal Re-innervation and Sensation Recovery in Patients with Herpes Zoster Ophthalmicus: An *In Vivo* and *Ex Vivo* Study of Corneal Nerves. *Cornea*. 2016; 35:619-625.

70. Chen WS, Cao Z, Sugaya S, Lopez MJ, Sendra VG, Laver N, Leffler H, Nilsson UJ, Fu J, Song J, Xia L, **Hamrah P**, Panjwani N. Pathological Lymphangiogenesis is Regulated by Galectin-8-Dependent Crosstalk Between Podoplanin and Integrin-Associated VEGFR-3. *Nat Commun*. 2016; 7:11302.

71. Abud TB, Amparo F, Saboo US, Di Zazzo A, Dohlman TH, Ciolino JB, **Hamrah P**, Dana R. A Clinical Trial Comparing the Safety and Efficacy of Topical Tacrolimus versus Methylprednisolone in Ocular Graft-Versus-Host Disease. *Ophthalmology*. 2016; 123:1449-57.

72. Qazi Y, Hurwitz S, Khan S, Jurkunas UV, Dana R, **Hamrah P**. Validity and Reliability of a Novel Ocular Pain Assessment Survey (OPAS) in Quantification and Monitoring of Corneal and Ocular Surface Pain. *Ophthalmology*. 2016; 123:1458-1468.

73. Annunziata R, Kheirkhah A, **Hamrah P**, Trucco E. A Fully Automated Tortuosity Quantification System with Application to Corneal Nerve Fibres In Confocal Microscopy Images. *Med Image Anal*. 2016; 32:216-232.

74. Crnej A, Kheirkhah A, Ren A, Mullins A, Lavric A, Suri K, **Hamrah P**, Dana R. Patients' Perspectives on Their Dry Eye Disease. *The Ocular Surface*. 2016; 14:440-446.

75. Yamaguchi T, **Hamrah P**, Shimazaki J. Bilateral Alteration in Corneal Nerve, Dendritic Cell and Tear Cytokine Level in Ocular Surface Disease. *Cornea*. 2016; 35 Suppl 1:S65-S70.

76. **Hamrah P**, Seyed-Razavi Y, Yamaguchi T. Translational Immuno- and Neuro-Imaging Demonstrate Corneal Neuro-Immune Cross-Talk. *Cornea*. 2016; 35 Suppl 1:S20-S24.

77. Choi CS, **Hamrah P**, Laver N. Cystic Compound Melanocytic Nevus in a Pediatric Patient. *Ophthalmology*. 2016; 123:2293.

78. Mikolajczak J, Zimmermann H, Kheirkhah A, Kadas EM, Muller RT, Ren A, Prüss H, Paul F, **Hamrah P**, Brandt AU. Patients with Multiple Sclerosis Demonstrate Reduced Corneal Nerve Fibre Density. *Mult Scler*. 2016; Nov 3 [Epub ahead of print].

79. Sahin A, **Hamrah P**. October Consultation #5. *J Cataract Refract Surg*. 2016; 42:1538-1539.

80. Raizman MB, **Hamrah P**, Holland EJ, Kim T, Mah FS, Rapuano CJ, Ulrich RG. Drug-Induced Corneal Epithelial Changes. *Surv Ophthalmol*. 2016; Nov 24 [Epub ahead of print].

81. Birnbaum FA, **Hamrah P**, Jacobs DS, Song BJ. Acquired Corneal Neuropathy and Photoallodynia Associated with Malposition of of an Ex-PRESS Shunt. *J Glaucoma*, 2017; 26:e19-e21

82. Cruzat A, Qazi Y, **Hamrah P**. In Vivo Confocal Microscopy of Corneal Nerves in Health and Disease. *The Ocular Surface*. 2017; 15:15-47.

83. **Hamrah P**, Qazi Y, Shahatit B, Dastjerdi MH, Pavan-Langston D, Jacobs DS, Rosenthal P. Corneal Nerve and Epithelial Cell Alterations in Corneal Allodynia: An In Vivo Confocal Microscopy Case Series. *The Ocular Surface*. 2017; 15:139-151.

84. Kheirkhah A, Satitpitakul V, **Hamrah P**, Dana R. Patients with Dry Eye Disease and Low Subbasal Nerve Density are at High Risk for an Accelerated Corneal Endothelial Cell Loss. *Cornea*. 2017; 36:96-102.

85. Aggarwal S, Yamaguchi T, Dana R, **Hamrah P**. Exophiala Phaeomuriformis Fungal Keratitis-Case Report and In Vivo Confocal Microscopy Findings. *Eye Contact Lens*. 2017; 43:e4-e6.

86. Tighe S, Moein HR, Chua L, Cheng A, **Hamrah P**, Tseng SCG. Topical Cryopreserved Amniotic Membrane and Umbilical Cord Eye Drops Promote Re-epithelialization in a Murine Corneal Abrasion Model. *Invest Ophthalmol Vis Sci*. 2017; 58:1586-1593.

87. Aluri HS, Edman MC, Hawley DR, Janga SR, Meng Z, Samizadeh M, Sendra VG, **Hamrah P**, Kublin CL, Hamm-Alvarez SF, Zoukhri D. Delivery of Bone Marrow-Derived Mesenchymal Stem Cells Improves Tear Production in a Mouse Model of Sjögren's Syndrome. *Stem Cells Int*. 2017; 3134543.

88. **Hamrah P**, Sahin A, Oaklander AL. Widespread Effects of Clinically Unilateral Focal Nerve Injuries. 2017; *Pain*, in press.

89. Kheirkhah A, Crnej A, Ren A, Mullins A, Satitpitakul V, **Hamrah P**, Dana R. Patients' Perceived Treatment Efficacy in Dry Eye Disease. *Cornea*. 2017; in press.

90. Villani E, Massaro D, Scaramuzzi M, **Hamrah P**, Medeiros F, Nucci P. Decade-long Profile of Imaging Biomarkers Use in Ophthalmic Clinical Trials. *Invest Ophthalmol Vis Sci.* 2017; in press.

91. **Hamrah P**[*], Ecoiffier T, Grimaldo S, Wei J, Li G, Sessa R, Truong T, Zheng L, Yuen D, Lin B, Chen S, Harris D, Alhatem A, Tran C, von Andrian UH, Chen L. Nerve Growth Factor Mediates Lymphangiogenesis. *Nature Medicine*, Under Revision
([*]co-first and co-corresponding Author)

92. Aggarwal S, Cavalcanti BM, Regali L, Cruzat A, Trinidad M, Williams C, Jurkunas UV, **Hamrah P**. Laser *In Vivo* Confocal Microscopy Demonstrates Diminishment of Subbasal Corneal Nerves and Altered Corneal Immune Response in Fuchs' Endothelial Corneal Dystrophy. Submitted

93. John T, Tseng SCG, Tighe S, Cheng AMS, Wang MX, Rock ND, Salem Z, **Hamrah P**, Sheha H. Corneal Nerve Regeneration after Self-Retained Cryopreserved Amniotic Membrane in Dry Eye Disease. Submitted.

94. Yamaguchi T, Harris DL, Turhan A, Zheng L, Ecoiffier, Ishikawa S, Lederer J, Chen L, Higa K, Shimazaki J, Alvarez D, von Andrian UH, **Hamrah P**. Neurogenic Immune Homeostasis: Peripheral Nerves Maintains Corneal Immune Privilege. Submitted.

95. **Hamrah P**, Hu K, Jamali A, Qazi Y, Zheng L, Turhan A, von Andrian UH. Characterization of Resident Corneal Plasmacytoid Dendritic Cells and Their Pivotal Role in Herpes Simplex Keratitis. Submitted.

96. Amparo F, Yin J, Di Zazzo A, Abud T, Jurkunas UV, **Hamrah P**, Dana R. Evaluating Changes in Ocular Redness Using a Novel Automated Method. Submitted.

Proceedings of meetings or other non-peer reviewed research publications

97. Dana MR, Yamagami S, **Hamrah P**, Dekaris I, Zhu S. Inflammatory cytokines and cytokine receptors in corneal inflammation and immunity. *Proceedings of the International Society for Eye Research,* Volume XIV, 2000: S184.

98. Dana MR, **Hamrah P**. Role of Immunity and Inflammation in Corneal and Ocular Surface Disease Associated with Dry Eye Syndromes. *Adv Exp Med Biol,* 2002; 506:729-738.

99. **Hamrah P**, Zhang Q, Dana MR. Expression of Vascular Endothelial Growth Factor Receptor-3 (VEGFR-3) in the Conjunctiva. *Adv Exp Med Biol,* 2002; 506:851-858.

100. Annunziata R, Kheirkhah A, Cavalcanti BM, Aggarwal S, **Hamrah P**, Trucco M. Tortuosity Classification of Corneal Nerves Images Using a Multiple-Scale-Multiple-Window Approach. In: Chen X, Garvin MK, Liu JJ editors. *Proceedings of the Ophthalmic Medical Image Analysis First International Workshop, OMIA 2014, Held in Conjunction with MICCAI 2014, Boston, Massachusetts, September 14, 2014.* Iowa Research Online; 2014, p.113-120, available from: http://ir.uiowa.edu/omia/2014_Proceedings/2014/15/

101. Annunziata R, Kheirkhah A, **Hamrah P**, Trucco M. Scale and Curvature Invariant Ridge Detector for Tortuous and Fragmented Curvilinear Structures. In: Medical Image Computing and Computer Assisted Interventions (MICCAI), LNCS. 2015: pp 588-595.

102. Annunziata R, Kheirkhah A, **Hamrah P**, Trucco M. Boosting Hand-Crafted Features for Curvilinear Structure Segmentation by Learning Context Filters. In: Medical Image Computing and Computer Assisted Interventions (MICCAI), LNCS. 2015: pp 596-603.

Reviews, chapters, monographs and editorials

103. **Hamrah P**, Huq SO, Gulati A, Dana MR. Mechanisms of the Ocular Surface Immune Response. In: Pflugfelder SC, Beuerman RW, Stern ME. *Dry Eye and Ocular Surface Disease*. Chapter 6, pp 111-142. New York: Marcel Dekker, 2004.

104. **Hamrah P**. High-Risk Penetrating Keratoplasty [Editorial]. *Arch Soc Esp Oftalmol,* 2005; 80(1):5-8.

105. Djalilian AR, **Hamrah P**, Pflugfelder SC. Dry Eye. In: Krachmer JH, Mannis MJ, Holland EJ. *Cornea*. 2nd ed. Vol 1, Chapter 42, pp 521-540. St. Louis: Mosby, 2005.

106. **Hamrah P**, Djalilian AR, Stulting RD. Immunologically High-Risk Penetrating Keratoplasty. In: Krachmer JH, Mannis MJ, Holland EJ. *Cornea*. 2nd ed. Vol 2, Chapter 133, pp 1619-1635. St. Louis: Mosby, 2005.

107. Dana MR, **Hamrah P**. Corneal Antigen-Presenting Cells (APC): Function and Identity. In: Zierhut M, Sullivan DA, Stern ME. *Immunology of the Lacrimal Gland & Ocular Surface*. pp 141-150. London, UK: Taylor & Francis, 2005.

108. **Hamrah P**, Dana R. Corneal Antigen-Presenting Cells. In: Niederkorn JY, Kaplan HJ (eds): *Immune Response and the Eye. Chem Immunol Allergy.* 92:58-70. Basel: Karger, 2007.

109. **Hamrah P**, Pavan-Langston D. Ocular Examination Techniques and Diagnostic Tests. In: Pavan-Langston D. *Manual of Ocular Diagnosis and Therapy.* 6th ed., Chapter 1, pp 1-35. Philadelphia: Lippincott Williams & Wilkins, 2008.

110. Pavan-Langston D, **Hamrah P**. Burns and Trauma. In: Pavan-Langston D. *Manual of Ocular Diagnosis and Therapy.* 6th ed., Chapter 2, pp 36-51. Philadelphia: Lippincott Williams & Wilkins, 2008.

111. **Hamrah P,** Pavan-Langston D, Dana R. Herpes Simplex Keratitis and Dendritic Cells at the Crossroads—Lessons from the Past and a View into the Future. *Int Ophthalmol Clin.* 2009; 49:53-6

112. **Hamrah P**, Eiferman RA. Corneal Trauma and Burns. In: Trattler WB, Majmudar PA, Luchs JI, Schwartz T, eds. *Cornea Handbook.* Chapter 11, pp 191-200. Thorofare: Slack Incorporated, 2010.

113. **Hamrah P**, Dana R. Antigen-Presenting Cells in the Eye and Ocular Surface. In: Darlene A. Dartt, editor. *Encyclopedia of the Eye,* Vol 1, pp 120-127. Oxford: Academic Press, 2010.

114. **Hamrah P,** Amesburry E, Eiferman RA. Corneal Endothelium in Health and Disease. In: John T. *Corneal Endothelial Transplant: DSAEK, DMEK & DLEK*. 2010, Panama City: Jaypee-Highlights Medical Publishers.

115. **Hamrah P**, Mantopoulos D, Akhtar J, Djalilian AR. Immunologically High-Risk Penetrating Keratoplasty. In: Krachmer JH, Mannis MJ, Holland EJ. *Cornea*. 3rd ed., pp 1495-1510. St. Louis: Mosby, 2010.

116. Nassiri N, Djalilian AR, **Hamrah P**, Pflugfelder SC. Dry Eye. In: Krachmer JH, Mannis MJ, Holland EJ. *Cornea*. 3rd ed., pp 425-443. St. Louis: Mosby, 2010.

117. Lee HJ, Kurbanyan K, **Hamrah P**. Systemic Conditions Related to the Cornea. In: Boyd S. *Atlas of Corneal Pathology and Surgery.* Panama City: Jaypee-Highlights Medical Publishers, 2010.

118. Kumar R, **Hamrah P**. Current State of In Vivo Confocal Microscopy in Management of Microbial Keratitis. *Semin Ophthalmol*. 2010; 25(5-6):166-170.

119. Cruzat A, Pavan-Langston, D, **Hamrah P**. In Vivo Confocal Microscopy of Corneal Nerves: Analysis and Clinical Correlation. *Semin Ophthalmol*. 2010; 25(5-6):171-177.

120. Mantopoulos D, Cruzat A, **Hamrah P**. In Vivo Imaging of Corneal Inflammation: New Tools for Clinical Practice and Research. *Semin Ophthalmol*. 2010; 25(5-6):178-175.

121. **Hamrah P**, Dana R. Antigen-Presenting Cells in the Eye and Ocular Surface. In: Darlene A. Dartt, Peter Bex, Patricia D'Amore, Reza Dana, Linda McIoon, Jerry Niederkorn, eds. *Ocular Periphery and Disorders.* pp 373-380. Oxford: Academic Press, 2011.

122. Qazi Y, Turhan A, **Hamrah P**. Trafficking of Immune Cells in the Cornea and Ocular Surface. In: Rummelts S, editor. *Ophthalmology.* Chapter 5, pp 79-104. Rijeka: InTech, 2012.

123. Sahin A, **Hamrah P**. Clinically Relevant Biometry. In: Cataract surgery and lens implantation. *Curr Opin Ophthalmol*. 2012; 23:47-63.

124. Cavalcanti B, Romano A, **Hamrah P**. Cornea and Anterior Segment "En Face" Optical Coherence Tomography. In: Lumbroso B, Huang D, Rispoli M, Romano A, Coscas G, eds. *Clinical "En Face" OCT Atlas.* Chapter 6, pp 61-76. New Delhi: Jaypee Brothers, 2012.

125. Shukla AN, Cruzat A, **Hamrah P**. In Vivo Confocal Microscopy of Corneal Dystrophies. *Semin Ophthalmol*. 2012; 27:107-116.

126. Alhatem A, Cavalcanti B, **Hamrah P**. In Vivo Confocal Microscopy in Dry Eye Syndrome. *Semin Ophthalmol*. 2012; 27:143-153.

127. Yamaguchi T, **Hamrah P.** Immunotherapy of Ocular Surface Diseases and Graft Rejection. In: Copland R, Afshari NA, eds. *Copeland and Afshari's Principles and Practice of Cornea.* Chapter 49, pp 580-600. New Delhi: Jaypee Brothers, 2013.

128. **Hamrah P**, Sahin A. Limbus and Corneal Epithelium. In: Holland EJ, Mannis MJ, Lee B, eds. *Ocular Surface Disease: Cornea, Conjunctiva and Tear Film.* Chapter 5, pp 29-34. London: Elsevier, 2013

129. Qazi Y, **Hamrah P**. Gene Therapy in Corneal Transplantation. *Seminars in Ophthalmology*. 2013; 28:287-300.

130. Qazi Y, **Hamrah P**. Objective Metrics of Ocular Surface Disease in Contact Lens Wearers: Meibography. *Current Ophthalmology Reports*, 2015; 3:122-131.

131. Grob S, Kheirkhah A, **Hamrah P**. Dry Eye Therapy. In: Zhang K, eds. *Ophthalmic Disease Mechanisms and Drug Discovery*. Chapter 7. Singapore: World Scientific Publishing Company, 2016.

132. Farooq AV, **Hamrah P**, Movahedan A, Djalilian AR. Immunologically High-Risk Penetrating Keratoplasty and Large Diameter Corneal Grafts. In: Krachmer JH, Mannis MJ, Holland EJ. *Cornea*. 4rd ed., Elsevier Canada, 2016, In press.

133. Abbouda A, Khaksari B, **Hamrah P**. Anterior Segment Diseases. In: Duker JS, Liang MC. *Anti-VEGF Use in Ophthalmology*. Chapter 17, pp197-209. Slack Incorporated. 2017, *In press*.

134. Abbouda A, Pondelis N, Hamrah P. Image-guided evaluation and monitoring of treatment response in patients with Ocular Surface Disease. In: Djalilian A. Ocular Surface Disease: A Case-Based Update. Cham: Springer, 2017, *In press*.

135. Goyal S, Abbouda A, Pondelis N, Hamrah P. Neuropathic Corneal Pain. In: Djalilian A. Ocular Surface Disease: A Case-Based Update. Cham: Springer, 2017, *In press*.

Professional Educational Materials or Reports, in print or other media

136. **Hamrah P**, Dana R. Vernal Keratoconjunctivitis. In: UpToDate, Basow, DS (Ed), UpToDate, Waltham, MA, 2010.

137. **Hamrah P**, Dana R. Atopic Keratoconjunctivitis. In: UpToDate, Basow, DS (Ed), UpToDate, Waltham, MA, 2010.

138. **Hamrah P**, Dana R. Giant Papillary Conjunctivitis. In: UpToDate, Basow, DS (Ed), UpToDate, Waltham, MA, 2010.

139. **Hamrah P**, Dana R. Toxic Conjunctivitis. In: UpToDate, Basow, DS (Ed), UpToDate, Waltham, MA, 2010.

140. **Hamrah P**, Dana R. Allergic Conjunctivitis: Clinical Manifestations and Diagnosis. In: UpToDate, Basow, DS (Ed), UpToDate, Waltham, MA, 2014.

141. **Hamrah P**, Dana R. Allergic Conjunctivitis: Management. In: UpToDate, Basow, DS (Ed), UpToDate, Waltham, MA, 2014.

142. **Hamrah P**, Kheirkhah A. IVCM an Emerging Tool from Research into Clinic. *Ophthalmology Times,* Anterior Segment Column, April 2014.

143. Werner A, **Hamrah P**. Persistent Infectious Keratitis in a Contact Lens Wearer— In Vivo Confocal Microscopy was Used to Visualize the Cornea to Make a Diagnosis. *Ocular Surgery News,* in press.

Abstracts (Excludes 71 abstracts already published as manuscripts)

1. **Hamrah P**, Wang Y, Kaplan HJ, Bora NS. Corneal Inflammation is Mediated by the Complement System. *Invest Ophthalmol Vis Sci.* 2004; 45: ARVO E-Abstract 3445.

2. **Hamrah P**, Wang Y, Kaplan HJ, Bora NS. The Complement System Mediates Corneal Inflammation through Complement Regulatory Proteins. *Clinical and Investigative Medicine.* 2004; 27(4), Suppl: 205A.

3. **Hamrah P**, Wang Y, Kaplan HJ, Bora NS. Chronic Complement Activation Exists in the Cornea and is Regulated by Complement Regulatory Proteins. *The Ocular Surface.* 2004, 3(1) Suppl:S72.

4. **Hamrah P**, Foulks GN. Characteristics of Optical Aberrations in Dry Eye Patients with Increasing Blink Intervals. *The Ocular Surface.* 2004, 3(1) Suppl:S72.

5. **Hamrah P**, Bodek E, Kaplan HJ, Bora NS. Corneal Dendritic Cells Can Be Actively Maintained in an Immature State by Soluble Factors in the Aqueous Humor. *Invest Ophthalmol Vis Sci.* 2006*;* 47: ARVO E-Abstract 5869.

6. **Hamrah P**, Dastjerdi MH, Dana MR, Pavan-Langston D. Corneal Sensation and Corneal Nerve Morphology Alterations with *In Vivo* Confocal Microscopy: A Comparison between Herpes Simplex Keratitis and Herpes Zoster Ophthalmicus. *2007 Biennial Cornea Conference Abstracts.*

7. Dastjerdi MH, **Hamrah P**, Al-Arfaj L, Dana R. Corneal Nerve Alterations between the Two Eyes in Dry Eye Patients with Asymmetric Ocular Surface Manifestations: In Vivo Confocal Microscopy Study. *Invest Ophthalmol Vis Sci*. 2008; 49: ARVO E-Abstract 5315.

8. **Hamrah P**, von Andrian U, Dana R. Corneal Antigen-Presenting Cells. 2008; *Immune Disease Institute Annual Retreat Abstracts.*

9. Schrems WA, Hoesl LM, Dastjerdi MH, Dana R, Pavan-Langston D, **Hamrah P**. In Vivo Confocal Microscopy Comparison of the Anterior Human Corneal Structures by Laser Scanning and White Light Systems in Normal and Diseased Corneas. *Invest Ophthalmol Vis Sci*. 2009; 50: ARVO E-Abstract 3710.

10. Mantopoulos D, Zheng L, von Andrian U, **Hamrah P**. Bone Marrow-Derived Cell Populations and their Migratory Kinetics in the Cornea. 2009; *Immune Disease Institute Annual Retreat Abstracts*. *(winner of outstanding poster award).*

11. Zheng L, Mantopoulos D, von Andrian U, **Hamrah P**. Expression of Neuropeptides and their Receptors in Corneal Inflammation. 2009; *Immune Disease Institute Annual Retreat Abstracts*.

12. Ghafourian H, Cruzat A, Okanobo A, Dastjerdi MH, Dana R, **Hamrah P**. In Vivo Confocal Microscopy Study of Epithelial Cell Changes and Nerve Alterations in Patients with Dry Eye Syndrome. 2009; *26th Biennial Cornea Conference Abstracts*.

13. Mantopoulos D, Zheng L, von Andrian U, **Hamrah P**. Epifluorescent Intravital Imaging of Dendritic Cell Homing to the Cornea. 2009; *26th Biennial Cornea Conference Abstracts.*

14. **Hamrah P**, Mantopoulos D, Zheng L, von Andrian U. In Vivo Migratory Kinetics and Mechanisms of Corneal Bone Marrow-Derived Cells. 2009; *26th Biennial Cornea Conference Abstracts.*

15. **Hamrah P**, Alipour F, Pavan-Langston D. Effective Pain Control with Gabapentin in Patients with Infectious Corneal Ulcers and Severe Refractory Pain. 2009; *Cornea Society/EBAA Fall Educational Conference Abstracts.*

16. **Hamrah P**, Mantopoulos D, Zheng L, von Andrian U. Recruitment Mechanisms of Corneal Dendritic Cell: An In Vivo Epi-fluorescent Microscopy Study. 2010; *World Cornea Congress VI*.

17. **Hamrah P**, Mantopoulos D, Zheng L, von Andrian U. Use of Intravital Multi-Photon Microscopy to Study In Vivo Migratory Kinetics of Corneal Bone Marrow-Derived Cells. 2010; *World Cornea Congress VI.*

18. Lee HJ, Alipour F, Cruzat A, Zheng L, **Hamrah P**. In Vivo Confocal Microscopy in Diagnosis and Management of Acanthamoeba Keratitis Improves Patient Outcome. *Invest Ophthalmol Vis Sci*. 2010; 51: ARVO E-Abstract 2891.

19. Mantopoulos D, Turhan A, von Andrian U, **Hamrah P**. P- and E- Selectin Mediate Dendritic Cell Homing to the Cornea. *Invest Ophthalmol Vis Sci*. 2010; 51: ARVO E-Abstract 1543.

20. **Hamrah P**, Mantopoulos D, Zheng L, Massberg S, von Andrian U. Visualization of Corneal Antigen Presenting Cell Migration by multi-photon Intravital microscopy. *Invest Ophthalmol Vis Sci*. 2010; 51: ARVO E-Abstract 3436.

21. Zheng L, von Andrian U, **Hamrah P**. Identification of Novel Subsets of Plasmacytoid and Conventional Dendritic Cells in the Cornea. *Invest Ophthalmol Vis Sci*. 2010; 51: ARVO E-Abstract 1544.

22. Nallasamy N, Keila PS, **Hamrah P**, Dana R. Rapid Automatic Keratocyte Analysis from In Vivo Confocal Microscopy of the Cornea. *Invest Ophthalmol Vis Sci*. 2010; 51: ARVO E-Abstract 5664.

23. Cruzat A, Witkin D, Hajrasouliha A, Zheng L, **Hamrah P**. Long-term Morphological Alterations of Corneal Dendritic Cells in Infectious Keratitis: An *In Vivo* Confocal Microscopy Study. Abstract 700, International Society of Eye Research (ISER) 2010.

24. **Hamrah P**, Zheng L, von Andrian U. Inflammation and the Nervous System: The Connection in the Cornea. Abstract 975, International Society of Eye Research (ISER) 2010.

25. Cruzat A, Ghaffourian H, Hazin R, Witkin D, Okanobo A, Dastjerdi M, Dana R, **Hamrah P**. *In Vivo* Confocal Microscopy in Dry Eye: Corneal Epithelial Cell and Nerve Alterations. PO325, AAO 2010.

26. Cruzat A, Witkin D, Zheng L, Pavan-Langston D, **Hamrah P**. *In vivo* Confocal Microscopy Reveals Bilateral Increase in Epithelial Dendritic Cells Density in Patients with Unilateral Herpes Simplex Keratitis that is Correlated with Diminishment of Subbasal Nerve Plexus. OMIG 2010.

27. Lee HJ, Alipour F, Cruzat A, Zheng L, **Hamrah P**. *In Vivo* Confocal Microscopy in Diagnosis and Management of *Acanthamoeba* Keratitis Improves Patient Outcome. Cornea Society 2010.

28. Cruzat A, Witkin D, Baniasadi N, Zheng L, **Hamrah P**. Morphological Evolution of Corneal Dendritic Cells in Infectious Keratitis: A Longitudinal *In Vivo* Confocal Microscopy Study. Keystone Symposia, Dendritic Cells and the Initiation of Adaptive Immunity 2011.

29. Turhan A, Mantopoulos D, Cruzat A, Baniasadi N, Hoesl L, von Andrian UH, **Hamrah P**. Bilateral Recruitment of Corneal Dendritic Cells in Unilateral Inflammation. Keystone Symposia, Dendritic Cells and the Initiation of Adaptive Immunity 2011.

30. **Hamrah P**, Zheng L, Mantopoulos D, Turhan A, von Andrian UH. Physiologic Homeostasis and Turnover of Corneal Bone Marrow-Derived Cells: Lessons from the Parabiosis Model. ARVO Abstract 2011, 52:1114.

31. Baniasadi N, Cruzat A, Witkin D, Stacey R, Jakobiec FA, Chodosh J, **Hamrah P**. *In Vivo* Confocal Microscopy for *Paecilomyces Lilacinus* and *Candida Parapsilosis* Fungal keratitis. ARVO Absract 2011, 52:5856.

32. Qazi Y, Cruzat A, Baniasadi N, Zheng L, Witkin D, Critser DB, Watts A, Beyer J, Sindt C, **Hamrah P**. Early Effects of Contact Lens Wear on Immune Cell Density of the Ocular Surface: Preliminary Results of a Laser *In Vivo* Confocal Microscopy Study. ARVO Abstract 2011, 52:6551.

33. Turhan A, Schrems WA, Mantopoulos D, von Andrian UH, **Hamrah P**. Dendritic Cell Recruitment to the Cornea is Differentially Regulated in Steady State and Inflammation. ARVO Abstract 2011, 52:1115

34. Cruzat A, Samayoa E, Bronikowska M, **Hamrah P**. In Vivo Confocal Microscopy in Epidemic Keratoconjunctivitis Demonstrates Increased Corneal Epithelial Dendritic Cells and Loss of the Subbasal Nerve Plexus. OMIG 2011.

35. Turhan A, Mantopoulos D, von Andrian UH, **Hamrah P**. Disection of biomarkers involved in homing and egress of DCs to and from cornea in steady state and in inflammation. Biennial Cornea Conference 2011.

36. **Hamrah P**. Higher Order Aberrations and Corneal Scarring after Pterygium Removal: What to Do? World Ophthalmology Congress 2012.

37. Cruzat A, Cavalcanti B, Trinidad M, Williams C, Dana R, **Hamrah P**. Corneal nerve regeneration with autologous serum eye drops in treatment of severe dry eye syndrome. International Society for Eye Research Biennial Meeting 2012; 109:O320.

38. **Hamrah P**, Turhan A, Yamaguchi T, Mantopoulos D, von Anrdian UH. Dynamic vizualization and mechanisms of immune cell migration. International Society for Eye Research Biennial Meeting 2012; 155:O455.

39. Cavalcanti B, Cruzat A, Qazi Y, Baniasadi N, Trinidad M, Critser DB, Watts A, Beyer J, Sindt CW, **Hamrah P**. Contact Lens/Contact Lens Solution Combinations Determine the Inflammatory Changes on the Ocular Surface: A Laser *In Vivo* Confocal Microscopy Study. ARVO Abstract 2012, 53:6112.

40. Colon C, Cavalcanti B, Qazi Y, Cruzat A, Williams C, Critser DB, Watts A, Beyer A, Sindt CW, **Hamrah P**. *In Vivo* Confocal Microscopy of Immune Cells in the Cornea of Normal Subjects Demonstrates Irregular Peripheral Distribution of Dendritic Cells. ARVO Abstract 2012, 53:94.

41. Williams C, Cavalcanti B, Cruzat A, Trinidad M, Haussler-Sinangin Y, Dana R, **Hamrah P**. *In Vivo* Confocal Microscopy as a Tool to Evaluate Cellular Changes in the Cornea and Conjunctiva in Ocular Allergy and Non-Allergic Ocular Inflammatory Diseases. ARVO Abstract 2012, 53:4016.

42. Qazi Y, Cavalcanti B, Cruzat A, Cheng S, Williams C, Trinidad M, Witkin D, Blackie CA, Korb DR, **Hamrah P**. Immune Response in Meibomian Gland Dysfunction (MGD) and the Effect of Anti-Inflammatory Therapy: An *In Vivo* Confocal Microscopy (IVCM) Study. ARVO Abstract 2012, 53:593.

43. Mahbod M, Cavalcanti B, Cruzat A, Trinidad A, Williams C, **Hamrah P**. *In Vivo* Laser Confocal Microscopic Findings of Palisades of Vogt in Normal Subjects and Patients with Ocular Surface Disease. ARVO Abstract 2012, 53:92.

44. Vora GK, Cavalcanti B, Trinidad M, Williams C, **Hamrah P**. In Vivo Confocal Microscopy Analysis and Image-Guided Therapy of Limbal Stem Cell Insufficiency. ARVO Abstract 2012, 53:3523.

45. Alhatem A, von Andrian UH, **Hamrah P**. Peripheral Antigen Presenting Cells Are Differentially Distributed in Normal and Inflamed Murine Corneas. ARVO Abstract 2012, 53:6183.

46. Turhan A, Yamaguchi T, von Andrian UH, **Hamrah P**. Mucosal Addressin Cell Adhesion Molecule (MAdCAM)-1 Plays a Pivotal Role in Dendritic Cell Recruitment to the Cornea During Inflammation. ARVO Abstract 2012, 53:3140.

47. Prescott CR, **Hamrah P**, Jurkunas U. Regional variability in endothelial cell density in Fuchs Endothelial Corneal Dystrophy; An HRT3 Study. ARVO Abstract 2012, 53:5990.

48. **Hamrah P**, Turhan A, Yamaguchi T, Mantopoulos D, von Andrian UH Dendritic Cell Recruitment to the Cornea during Inflammation is Mediated by Mucosal Addressin Cell Adhesion Molecule (MAdCAM)-1. Gordon Research Conferences—Biology and Pathobiology of the Cornea: Advances In Cornea, Conjunctiva, Meibomian And Lacrimal Gland Research. 2012

49. Cavalcanti BM, Cruzat A, Qazi Y, Baniasadi N, Hu K, Trinidad M, Watts A, Critser D, Leahy C, Sindt CW, **Hamrah P**. Inflammatory Changes on the Ocular Surface with Contact Lens Wear: Results of a Randomized Clinical Trial. AAOPT 2012.

50. Qazi Y, Cavalcanti B, Cruzat A, Williams C, Trinidad M, Blackie CA, Korb DR, **Hamrah P**. *In Vivo* Confocal Microscopy in Meibomian Gland Dysfunction (MGD): A Clinical Tool For Profiling Conjunctival Immune Cellular Changes. OMIG 2012.

51. **Hamrah P**, Cruzat A, Cavalcanti B, Pavan-Langston D. Corneal Nerves Regenerate in Patients with Herpes Zoster Ophthalmicus and may be Accelerated by Treatment with Autologous Serum Tears. OMIG 2012.

52. Qazi Y, Cavalcanti B, Cruzat A, Trinidad M, Williams C, Blackie C, Korb DR, **Hamrah P**. Symptomatic, Clinical, and Imaging Response Following Anti-inflammatory Therapy for Meibomian Gland Dysfunction. AAO 2012 Meeting Abstract #P0056.

53. Cruzat A, Cavalcanti BM, Williams C, Trinidad M, Dana R, **Hamrah P**. Corneal nerve regeneration with autologous serum eye drops for the treatment of severe dry eye syndrome. Cornea Society 2012.

54. Yamaguchi T, Hu K, Harris DL, **Hamrah P**. Intravital Imaging of Corneal Dendritic Cells after Corneal transplantation. Harvard Cornea Center of Excellence Scientific Retreat 2012.

55. Cavalcanti BM, Pavan-Langston D, **Hamrah, P**. *In Vivo* Confocal Microscopy Demonstrates Bilateral Increase in Epithelial Corneal Dendritic Immune Cells in Unilateral Herpes Zoster Ophthalmicus. Harvard Cornea Center of Excellence Scientific Retreat 2012.

56. Hu K, Harris DL, Yamaguchi T, Ghiasi H, von Andrian UH, **Hamrah P**. The role of corneal Plasmacytoid Dendritic Cells in acute herpes simplex virus infection. ARVO Abstract 2013, 54:2158.

57. Sola-del Vale D, Dohlman C, **Hamrah P**. Anterior Segment Optical Coherence Tomography in Patients with Boston Type I Keratoprosthesis Allows Early Detection and Monitoring of Corneal and Scleral Melts. ARVO Abstract 2013, 54:3466.

58. Kheirkhah A, Aggarwal S, Cavalcanti B, Witkin D, Wong N, Trinidad M, Williams C, Dana R, **Hamrah P**. Autologous Serum Tears May Result in Subclinical Changes in Corneal Immunity: An *In Vivo* Confocal Microscopy Study. ARVO Abstract 2013, 54:978.

59. You J, Cavalcanti BM, Cheng S, Trinidad M, Critser D, Watts A, Leahy C, Sindt CW, **Hamrah P**. Laser *In Vivo* Confocal Microscopy Demonstrates a Lower Density of Peripheral Corneal Nerve Fibers Compared to the Central Cornea in Normal Subjects. ARVO Abstract 2013, 54:531.

60. Colon C, Cavalcanti BM, Aggarwal S, Cruzat A, Williams C, Critser D, Watts A, Beyer J, Sindt CW, **Hamrah P**. Morphologic Dendritic Immune Cells Parameters Reveal Differential Characteristics between the Central and Peripheral Cornea: an *In Vivo* Confocal Microscopy Normative Data. ARVO Abstract 2013, 54:2063

61. Yamaguchi T, Hu K, Harris DL, **Hamrah P**. Intravital Multiphoton Microscopy of Corneas and Draining Lymph Nodes Shows Increased Velocity of Dendritic Cells after Corneal Transplantation and Directionality in Corneal Allografts. ARVO Abstract 2013, 54:1288.

62. Harris DL, Yamaguchi T, Turhan A, von Andrian UH, **Hamrah P**. Bilateral Upregulation of Limbal Intravascular Adhesion Molecules Mediates Cell Infiltration into the Cornea after Unilateral Trigeminal Nerve Axotomy. ARVO Abstract 2013, 54:2071.

63. Cavalcanti BM, Cruzat A, Samayoa E, Pavan-Langston D, **Hamrah P**. *In Vivo* Confocal Microscopy Demonstrates Bilateral Increase in Epithelial Corneal Dendritic Immune Cells in Unilateral Herpes Zoster Ophthalmicus. ARVO Abstract 2013, 54:2159.

64. Aggarwal S, Cavalcanti B, Cruzat A, Regali L, Jurkunas UV, **Hamrah P**. Laser *In Vivo* Confocal Microscopy Demonstrates Diminishment of Subbasal Nerve Plexus in Early Stage Fuchs' Endothelial Corneal Dystrophy. ARVO Abstract 2013, 54:2600 (*winner of NEI Travel Award*).

65. **Hamrah P**, Cao Z, Harris D, Thitiprasert T, Zheng L, Chen WS, Schrems W, Yamaguchi T, Panjwani N. Role of Galectins in Corneal Nerve Regeneration. ARVO Abstract 2013: 54, 3907.

66. Qazi Y, Aggarwal S, Cavalcanti B, Cruzat A, Wu L, Rosenthal P, **Hamrah P**. *In Vivo* Confocal Microscopy Demonstrates a Profound Increase in Immune Dendritic Cells and Decrease in Corneal Nerves in Patients with Post-Refractive Surgery Keratoneuralgia. ARVO Abstract 2013, 54:3711.

67. Vora GK, Colon C, Trinidad M, Williams C, **Hamrah P**. Fungal Keratitis: Diagnosis and Management with In Vivo Confocal Microscopy and Corneal Cultures. ISIE/Imaging Conference 2013.

68. Cavalcanti BM, Cruzat A, Pavan-Langston D, Samayoa E, **Hamrah P**. Alteracao Bilateral Do Perfil Imunolgico e Plexo Nervoso Sub-basal em Portadores de Herpes Zoster Oftalmico Unilateral. Pan-American Congress of Ophthalmology 2013.

69. **Hamrah P**, Yamaguchi T, Hu K, Harris D. Corneal Nerves May Mediate Corneal Dendritic Cell Trafficking—An Intravital Multiphoton Microscopy Study. TFOS 2013.

70. Cavalcanti BM, Cruzat A, Pavan-Langston D, Samayoa E, **Hamrah P**. Laser In Vivo Confocal Microscopy detects Bilateral Changes in Corneal Immune Cell and Subbasal Nerve Plexus in Unilateral Herpes Zoster Ophthalmicus. TFOS 2013.

71. Aggarwal S, Kheirkhah A, Cavalcanti B, **Hamrah P**. Correlations Of Clinical Signs In Dry Eye Disease With Corneal Immune Cell Influx: An In Vivo Confocal Microscopy Study. TFOS 2013.

72. Kheirkhah A, Cruzat C, Aggarwal S, Cavalcanti BM, Williams C, Trinidad M, Dana R, **Hamrah P**. Outcome of Autologous Serum Tears with Concurrent Anti-inflammatory Treatment in Ocular Surface Disease. AAO 2013, PO 314.

73. Qazi Y, Aggarwal S, Cavalcanti B, Wu L, Rosenthal P, **Hamrah P**. Understanding Post-Refractive Surgery Keratoneuralgia: Symptomatic, Clinical and Imaging Assessment. AAO 2013, PO421.

74. Qazi Y, Hurwitz S, Khan S, Rosenthal P, Jurkunas UV, Ciolino JB, Chodosh J, Dana R, **Hamrah P**. Validity and Reliability of the New Ocular Pain Assessment Survey (OPAS). 28th Biennial Corneal Conference 2013.

75. Jamali A, Lopez M, Harris DH, **Hamrah P**. The Cornea is Endowed with Resident Plasmacytoid Dendritic Cell Subpopulations, with a Substantial increase of Siglec-H^{low} Subpopulation Following Inflammation. 28th Biennial Corneal Conference 2013.

76. Müller R, Cruzat A, Cavalcanti BM, Jamali A, Ciolino JB, Jurkunas UV, Chodosh J, Dana R, Pavan-Langston D, **Hamrah P**. Laser in Vivo Confocal Microcopy Changes During the Follow-up of Contralateral Clinically Unaffected Eyes of Patients with Infectious Keratitis. 28th Biennial Corneal Conference 2013.

77. Lopez MJ, Yamaguchi T, Harris D, **Hamrah P**. Multi-Photon Intravital Imaging of Corneal Draining Lymph Nodes in Steady State and Inflammation. 28th Biennial Corneal Conference 2013.

78. Kheirkhah A, Aggarwal S, Cavalcanti BM, **Hamrah P.** Clinical Severity of Dry Eye Disease is Correlated with Corneal Immune Cell Alterations by In Vivo Confocal Microscopy. 28th Biennial Corneal Conference 2013.

79. Aggarwal S, Kheirkhah A, Cavalcanti BM, **Hamrah P**. Patients with Similar Clinical Severity of Dry Eye Disease May Have Differential Levels of Corneal Immune Alterations. 28th Biennial Corneal Conference 2013.

80. Müller R, Cruzat A, Cavalcanti BM, Jamali A, Ciolino JB, Jurkunas UV, Chodosh J, Dana R, Pavan-Langston D, **Hamrah P**. Patients with Infectious Keratitis Demonstrate Persistent and Long-term Increase in Immune cells and Diminished Subbasal Corneal Nerves After Cessation of Ant-Microbial Therapy—A Laser *In Vivo* Confocal Microcopy Study. OMIG 2013.

81. Kheirkhah A, Aggarwal S, Cavalcanti BM, **Hamrah P**. Clinical Severity of Dry Eye Disease Correlates with Corneal Immune Cell Alterations as Detected by *In Vivo* Confocal Microscopy. OMIG 2013.

82. Aggarwal S, Kheirkhah A, Cavalcanti B, **Hamrah P**. Clinical Severity of Dry Eye Disease Correlates With Corneal Immune Cell Alterations As Detected by in Vivo Confocal Microscopy. Paper ID 7147, ASCRS Cornea Day 2014.

83. Kheirkhah A, Aggarwal S, **Hamrah P**. Correlation of Corneal Subbasal Nerves with Clinical Severity in Dry Eye Disease. International Ocular Surface Society (IOSS) 2014.

84. Sendra VG, Jamali A, Harris D, **Hamrah P**. Role of plasmacytoid dendritic cell in the immune regulation in sutured inflamed cornea. ARVO Abstract 2014.

85. Jamali A, Lopez MJ, Harris DL, **Hamrah P.** Corneal plasmaytoid dendritic cells subpopulations demonstrate differential expression of the functional Siglec-H receptor that are altered after corneal inflammation. ARVO Abstract 2014, 55:3215.

86. Lopez MJ, Yamaguchi T, Harris D, Jamali A, **Hamrah P**. Multi-Photon Intravital Microscopy of Corneal Draining Lymph Nodes Demonstrates Immune Cell Alterations and Kinetics After Corneal Allotransplantation. ARVO Abstract 2014:55.

87. Müller R, Pourmirzaie R, Aggarwal S, Cavalcanti BM, Jamali A, Pavan-Langston D, **Hamrah P**. Corneal Immune Changes in Central and Peripheral Herpes Simplex Virus Keratitis: An *In vivo* Confocal Microscopy Study. ARVO Abstract 2014, 55:2846.

88. Aggarwal S, Colon C, Kheirkhah A, **Hamrah P**. Efficacy of Autologous Serum Tears for Treatment of Severe Corneal Pain in Patients with Corneal Neuropathy: An *In Vivo* Confocal Microscopy Study. ARVO Abstract 2014, 55:1468.

89. Qazi Y, Kheirkhah A, Dohlman T, Amparo F, Dana R, **Hamrah P**. Relative Efficacy of Loteprednol (Lotemax®) vs. Loteprednol-Tobramycin (Zylet®) on Corneal and Conjunctival Immune Response in Treatment of Meibomian Gland Dysfunction (MGD)-Associated Ocular Surface Inflammation: *In Vivo* Confocal Microscopy Results of a Phase IV Randomized Clinical Trial. ARVO Abstract 2014, 55:45.

90. Harris DL, Yamaguchi T, von Andrian UH, **Hamrah P**. A Novel Mouse Model for Radiation Keratopathy. ARVO Abstract 2014, 55:3223.

91. **Hamrah P**, Qazi Y, Hurwitz S, Chodosh J, Dana R. Impact of Corneal Pain on Quality of Life (QoL): The Ocular Pain Assessment Survey (OPAS) Study. ARVO Abstract 2014, 55:1469.

92. Yamaguchi T, Ziaei A, Cavalcanti BM, Harris D, Hu K, von Andrian UH, Jurkunas UV, **Hamrah P**. Neurogenic Homeostasis of Corneal Endothelial Cells: Peripheral Innervation Maintains Endothelial Cell Survival Through Vasoactive Intestinal Peptide. ARVO Abstract 2014, 55:2077.

93. Kheirkhah A, Dohlman T, Amparo F, Arnoldner M, Jamali A, **Hamrah P**, Dana R. Effects of Corneal Nerve Density on the Response to Treatment in Dry Eye Disease. ARVO Abstract 2014, 55:3648.

94. Moein HR, Kheirkhah A, Harris DL, **Hamrah P**. Herpes Simplex Virus-1 Strain KOS Induces Clinical and Immunological Changes in Acute Herpetic Keratitis. ISER XXI Biennial Meeting 2014.

95. Qazi Y, Kheirkhah A, Dohlman T, Dana R, **Hamrah P**. Symptom and Imaging Assessment of Topical Steroids in Meibomian Gland Dysfunction (MGD)-Associated Inflammation. Abstract #30039297, AAO 2014.

96. Kheirkhah A, Dohlman T, Arnoldner MA, Qazi Y, **Hamrah P**. Effects of Steroid Therapy on Corneal Subbasal Nerves in Dry Eye Disease. Abstract # 30039261, AAO 2014.

97. Müller R, Cruzat A, Cavalcanti B, Jamali A, Pavan-Langston D, **Hamrah P**. Persistence of Ocular Surface Disease After Resolution of Infectious Keratitis. Abstract #30040422, AAO 2014.

98. Kheirkhah A, Aggarwal S, **Hamrah P**. Changes in Corneal Subbasal Nerves in Different Subtypes of Dry Eye Disease. Abstact #0039259. AAO 2014.

99. Aggarwal S, Colon C, Kheirkhah A, **Hamrah P**. Efficacy of Autologous Serum Tears for Treatment of Severe Corneal Pain in Patients with Corneal Neuropathy: An In Vivo Confocal Microscopic Study. Abstract #30040250. AAO 2014.

100. Annunziata R, Kheirkhah A, Cavalcanti BM, Aggarwal S, **Hamrah P**, Trucco M. Tortuosity Classification of Corneal Nerves Images Using a Multiple-Scale-Multiple-Window Approach. International Workshop on Ophthalmic Medical Image Analysis of MICCAI (Medical Image Computing and Computer Assisted Intervention) 2014.

101. Qazi Y, Kheirkhah A, Dohlman T, Dana R, **Hamrah P.** Anti-Inflammatory Effect of Topical Combination Therapy in Meibomian Gland Dysfunction (MGD). OMIG 2014.

102. Müller R, Pavan-Langston D, Kheirkhah A, Cavalcanti BM, Cruzat A, Colon C, Trinidad M, **Hamrah P**. Corneal Nerve Damage in Herpes Zoster Ophthalmicus: Central vs. Peripheral Corneal Involvement. OMIG 2014.

103. Müller R, Cruzat A, Taniguchi E, Cavalcanti B, Dohlman C, **Hamrah P**. Longitudinal Assessment of Boston type 1 Keratoprosthesis/Cornea Interface by Anterior Segment-OCT. Corneal Society Fall Educational Symposium 2014.

104. Abud TB, Amparo F, Saboo US, Ciolino JB, **Hamrah P**, Dana R. A Randomized Clinical Trial Comparing Safety and Efficacy of Topical Tacrolimus vs. Methylprednisolone for Ocular Graft-Versus-Host Disease. Corneal Society Fall Educational Symposium 2014.

105. Huang X, **Hamrah P**. The neurovascular complex of the corneolimbal area is innervated by both sensory and symphatic nerves. Cornea Center of Excellence Faculty Scientific Retreat 2014.

106. Harris DL, Yamaguchi T, von Andrian UH, **Hamrah P**. Radiation Keratopathy – Development of a Novel Mouse Model. Cornea Center of Excellence Faculty Scientific Retreat 2014.

107. Arsia J, Lopez MJ, Harris DL, **Hamrah P**. Novel characterization of subpopulations of corneal plasmacytoid dendritic cells. Cornea Center of Excellence Faculty Scientific Retreat 2014.

108. Seyed-Razavi Y, Chinnery HR, McMenamin PG, **Hamrah P**. Injury and CX_3CR1 deficiency alters the association between resident immune cells and nerves in the murine cornea. Cornea Center of Excellence Faculty Scientific Retreat 2014.

109. Sendra VG, Jamali A, Harris DL, **Hamrah P**. Corneal plasmacytoid dendritic cell regulate immune responses during corneal inflammation. Cornea Center of Excellence Faculty Scientific Retreat 2014.

110. Qazi Y, Kheirkhah A, Dana R, **Hamrah P**. Reliability and Validity of *In Vivo* Confocal Microscopy in Palpebral Conjunctival and Corneal Immune Cell Quantification. Cornea Center of Excellence Faculty Scientific Retreat 2014.

111. Qazi Y, Kheirkhah A, Dohlman T, Dana R, **Hamrah P**. Utility of Corneal Dendritic Cells as Clinical Indicators of Therapeutic Efficacy in Dry Eye-Associated Ocular Surface Inflammation. Cornea Center of Excellence Faculty Scientific Retreat 2014.

112. Kheirkhah A, Müller R, Pavan-Langston D, Cruzat A, **Hamrah P**. Corneal Nerve Damage Due to Herpes Simplex Keratitis and Long-Term Corneal Nerve Regeneration. Word Cornea Congress 2015.

113. Yamaguchi T, Harris DL, Higa K, Shimazaki J, von Andrian UH, **Hamrah P**. Neurogenic Immune Homeostasis: Peripheral Innervation Maintains Avascularity and Immune Privilege of the Cornea. ARVO Abstract 2015. Abstract # 4034.

114. Sugaya S, Chen WS, Cao Z, Kenyon KR, Yamaguchi T, Omoto M, **Hamrah P**, Panjwani N. Comparison of galectin expression signature in rejected and accepted murine corneal allografts. ARVO Abstract 2015.

115. Lopez MJ, Jamali A, Harris DL, **Hamrah P**. The Chemokine Receptor CXCR4 Mediates Recruitment of CD11c+ Dendritic Cells into the Inflammed Murine Cornea. ARVO Abstract 2015.

116. Ecoiffier T, **Hamrah P**, Grimaldo S, Kang GJ, Sessa R, Truong T, Zheng L, Harris D, von Andrian UH, Chen L. Nerve Growth Factor Mediates Corneal Lymphangiogenesis. ARVO Abstract 2015.

117. Qazi Y, Kheirkhah A, Dohlman T, Cruzat A, Cavalcanti B, Colon C, Dana R, **Hamrah P**. Corneal Dendritic Cells as a Surrogate Biomarker of Therapeutic Efficacy in Dry Eye-

Associated Corneal Inflammation. ARVO Abstract 2015 (*Winner Knights Templar Travel Award)*.

118. Huang X, Lopez M, Hamrah P. Effects of Sensory and Sympathetic Innervation on the Corneolimbal Neurovascular Complex. ARVO Abstract 2015.

119. Harris DL, Lopez M, Jamali A, **Hamrah P.** Expression of the Neuropeptide Adrenomedullin and its Receptors in Normal and Inflamed Murine Corneas. ARVO Abstract 2015.

120. Moein, HR, Lopez M, Jamali A, **Hamrah P**. Mucosal Addressin Cell Adhesion Molecule (MAdCAM)-1 and Vascular Cell Adhesion Molecule (VCAM)-1 Mediate Dendritic Cell Trafficking *In Vivo* and are Up-Regulated after Corneal Graft Rejection. ARVO Abstract 2015 (*Winner Tear Film and Ocular Surface Society Travel Award*).

121. Muller R, Cruzat A, Taniguchi E, Cavalcanti B, Dohlman C, **Hamrah P**. Longitudinal Assessment of Boston type 1 Keratoprosthesis/Cornea Interface by Anterior Segment-OCT Allows Detection and Monitoring of Corneal Tissue Melt. ARVO Abstract 2015.

122. Sendra VG, Jamali A, Harris DL, **Hamrah P**. Plasmacytoid Dendritic Cells Mediate Adaptive Immunity in Acute Herpes Simplex Virus Keratitis. ARVO Abstract 2015.

123. Seyed-Razavi Y, **Hamrah P**. CO_2-Induced Corneal Nociceptor Stimulation Reveals Neuropeptide Changes in a Novel Murine Pain Model. ARVO Abstract 2015.

124. Jamali A, Lopez, MJ, Sendra, VG, Harris DL, **Hamrah P**. Plasmacytoid Dendritic Cells Demonstrate Vital Neuro-protective Properties in the Cornea and Induce Corneal Nerve Regeneration. ARVO Abstract 2015.

125. Annunziata R, Kheirkhah A, **Hamrah P**, Trucco M. Scale and Curvature Invariant Ridge Detector for Tortuous and Fragmented Structures. Submitted to Medical Image Computing and Computer Assistet Analysis 2015, Munich, Germany

126. Annunziata R, Kheirkhah A, **Hamrah P**, Trucco M. Boosting Hand-Crafted Features for Curvilinear Structure Segmentation by Learning Context Filters. Submitted to Medical Image Computing and Computer Assistet Analysis 2015, Munich, Germany.

127. Annunziata R, Kheirkhah A, **Hamrah P**, Trucco E. Combining Efficient Hand-Crafted Features with Learned Filters for Fast and Accurate Corneal Nerve Fibre Centreline Detection. 37th Annual International Conference of the IEEE Engineering in Medicine and Biology Society, 2015, Milan, Italy.

128. Mikolajczak J, Zimmermann H, Kadas EM, Kheirkhah A, Muller R, Ren A, Prüß H, Paul F, **Hamrah P**, Brandt AU. Reduced corneal nerve fiber and dendritic cell density in patients with multiple sclerosis. 31st Congress of the European Committee for Treatment and Research in Multiple Sclerosis, 2015, Barcelona, Spain.

129. Chirapapaisan C, Müller RT, Vora GK, Colon C, Trinidad M, Williams C, Behlau I, **Hamrah P**. Diagnosis of Fungal Keratitis by In Vivo Confocal Microscopy Results in Improved Visual Outcomes. Corneal Society Fall Educational Symposium 2015.

130. Chirapapaisan C, Müller RT, Cruzat C, Cavalcanti BM, Jamali A, Pavan-Langston D, **Hamrah P**. Location of Corneal Scarring Predicts the Potential for Corneal Nerve Regeneration in Herpes Simplex Virus Keratitis. Abstract #. AAO 2015.

131. Chirapapaisan C, Müller RT, Cruzat C, Cavalcanti BM, Jamali A, Pavan-Langston D, **Hamrah P**. Effect of Corneal Scar Location in Patients with Herpes Simplex Keratitis on Bilateral Corneal Nerve Alteration: An In Vivo Confocal Microscopy Study. OMIG 2015.

132. Moein HR, Müller RT, Pavan-Langston D, Cavalcanti BM, Colon C, Witkin D, Cruzat A, Hamrah P. Differential Alterations in Dendritic Cell Density and Morphology in Patients with Central and Peripheral Scars from Herpes Simplex Keratitis: A Longitudinal In Vivo Confocal Microscopy Study. ARVO Abstract 2016.

133. Gupta A, Jamali A, Lopez M, Sendra VG, Harris D, Moein HR, Seyed-Razavi Y, Hamrah P. Novel Characterization of Resident Plasmacytoid Dendritic Cells in the Conjunctiva. ARVO Abstract 2016.

134. Yin J, Kheirkhah A, Dohlman TH, Saboo US, **Hamrah P**, Dana R. Comparison of Treatment Efficacy of Low-dose Topical Steroid in Dry Eye Disease With and Without Ocular Graft-Versus-Host-Disease. ARVO Abstract 2016.

135. Suri K, Kheirkhah A, Qazi Y, Arnoldner MA, **Hamrah P**, Dana R. Corneal In Vivo Confocal Microscopy in Ocular Graft versus Host Disease. ARVO Abstract 2016.

136. Kataguiri P, Chen WS, Cao Z, Sendra V, **Hamrah P**, Zoukhri D, Kenyon K, Fini ME, Jeong S, Panjwani NA. Galectin-1 ameliorates dry eye disease. ARVO Abstract 2016.

137. Abbouda A, Chirapapaisan C, Jamali A, Muller R, Cavalcanti BM, Colon C, Witkin D, Dana R, Cruzat C, **Hamrah P**. In Vivo Confocal Microscopy Demonstrates Increased Immune Cell Densities in the Endothelial and Subbasal Layers During Corneal Graft Rejection that Correlate with Clinical Signs and Symptoms of Rejection. ARVO Abstract 2016.

138. Chen WS, Cao Z, Sugaya S, Lopez MJ, Sendra V, Laver NV, **Hamrah P**, Panjwani NA. Pathological lymphangiogenesis is regulated by galectin-8-dependent crosstalk among VEGF-C, podoplanin and integrin pathways. ARVO Abstract 2016.

139. Satitpitakul V, Kheirkhah A, **Hamrah P**, Dana R. Patients with Dry Eye Disease and Low Subbasal Nerve Density are at High Risk for Progressive Corneal Endothelial Cell Loss. ARVO Abstract 2016.

140. Jamali A, Lopez MJ, Sendra V, Harris DL, **Hamrah P**. Plasmacytoid Dendritic Cells Maintain Corneal Heme-Angiogenic Privilege Through Secretion of Anti-Angiogenic Molecules. ARVO Abstract 2016.

141. Sendra V, Jamali J, Lopez MJ, **Hamrah P**. Plasmacytoid Dendritic Cells Mediate T cell Responses by Direct Interaction in Lymph Nodes during Herpes Simplex Virus-1 Keratitis. ARVO Abstract 2016.

142. Seyed-Razavi Y, **Hamrah P**. Stimulation of Corneal Nociceptors Results in Pro-inflammatory Molecular and Cellular Responses. ARVO Abstract 2016.

143. **Hamrah P**, Huang X, Lopez MJ. Sympathetic Corneal Nerves Mediate Contralateral Immune Responses in Unilateral Inflammation. ARVO Abstract 2016.

144. Lopez MJ, Sendra V, Jamali A, Moein HR, Harris DL, **Hamrah P**. The Direct Pathway of T Cell Sensitization Mediate Corneal Graft Rejection in Absence of the Indirect Pathway in Low Risk Murine Allogeneic Corneal Transplantation. ARVO Abstract 2016.

145. Qazi Y, Cruzat A, Cavalcanti BM, Colon C, Witkin D, Chen TC, **Hamrah P**. The In Vivo Effect of Preservative Benzalkonium Chloride on Corneal Immune Cells and Clinical Signs in Glaucoma Therapy. ARVO Abstract 2016.

146. Harris DL, Jamali A, Abbouda A, Moein HR, **Hamrah P**. The Neuropeptide Adrenomedullin as a New Target to Treat Corneal Angiogenesis. ARVO Abstract 2016.

147. Kheirkhah A, Raju VK, **Hamrah P**, Dana R. Ultraviolet A/Riboflavin Collagen Cross-linking for Conjunctiva. ARVO Abstract 2016.

148. Jamali A, Lopez MJ, Sendra VG, Harris DL, **Hamrah P**. Human Cornea Hosts Resident Plasmacytoid Dendritic Cells That May Mediate Corneal Angiogenic Privilege. OMIG 2016 Abstract #16.

149. Moein HR, Dieckmann G, Abbouda A, Pondelis N, Jamali A, Salem Z, **Hamrah P**. In Vivo Confocal Microscopy Demonstrates Diagnostic Utility in the Differentiation of Patients with Corneal Neuropathic Pain from Dry Eye Disease. OMIG 2016 Abstract #19.

150. **Hamrah P**, Kheirkhah A, Ciolino JB. A Randomized Sham-Controlled Trial of Intraglandular Meibomian Gland Probing for Obstructive Meibomian Gland Dysfunction. AAO 2016 Abstract PO050.

151. Lopez MJ, Abbouda A, Pondelis NJ, Khaksari BJ, Salem ZM, **Hamrah P**. Correlation of Symptoms by Ocular Pain Assessment Survey and Signs by In Vivo Confocal Microscopy in Patients With Neuropathic Corneal Pain. AAO 2016 Abstract PO063.

152. **Hamrah P**. "Rationale and mechanisms of neuro-regenerative therapy in patients with ocular surface disease". AOPT 2017.

Report of Local, Regional, National and International Lectures

Local Presentations

2000 **50th Anniversary Scientific Symposium of the Schepens Eye Research Institute**
"Novel Characterization of Resident Antigen Presenting Cells (APCs) in the Corneal Stroma"

Research Seminar, Schepens Eye Research Institute
"Expression of Vascular Endothelial Growth Factor Receptor (VEGFR)-3 in the Cornea and Conjunctiva"

Research Seminar, **Schepens Eye Research Institute**
"Novel Characterization of Resident Antigen-Presenting Cells (APC) in the Corneal Stroma"

2001 **Research Seminar, Schepens Eye Research Institute**
"The Cornea, an Immune Privileged Tissue, is Endowed with Significant Numbers of Resident MHC Class II-negative Dendritic Cells"

2002 **Grand Rounds, Division of Internal Medicine, Good Samaritan Hospital, Cincinnati**
"Eye Care in Elderly Patients"
Residents and faculty

2003 **Research Seminar, Department of Ophthalmology & Visual Sciences, University of Louisville**
"The Heterogeneous Population of Corneal Antigen-Presenting Cells (APC): Function and Identity"

2005 **Resident Research Day, Department of Ophthalmology & Visual Sciences, University of Louisville**
*"*Higher Order Aberrations in Dry Eye Patients with Increasing Blink Intervals"

2008 **Cornea Grand Rounds, Massachusetts Eye & Ear Infirmary**
Case Presentations

Annual Fellows Course, Massachusetts Eye & Ear Infirmary
"52 year old female with ocular pain and blurry vision--Alteration in dendritic cell density"

Immune Disease Institute, Harvard Medical School, Annual Retreat, Falmouth, MA
"Corneal Antigen-Presenting Cells" (abstract)

2009 **Invited Speaker, 2009 Update on Ophthalmology, Department of Ophthalmology, Massachusetts Eye & Ear Infirmary**
"In Vivo Confocal Microscopy of the Cornea in Health and Disease" (abstract)

Invited Speaker, Academic General Neurology Conference, Department of Neurology, Massachusetts General Hospital, Harvard Medical School
"In vivo confocal microscopy of the trigeminal nerve—recent findings from imaging the ophthalmic branch"

2010 **Invited Speaker, New Frontiers in Corneal Research, Department of Ophthalmology, Harvard Medical School**
"*In Vivo* Imaging of Corneal Nerves"

2011 **Invited Speaker, Neurology Interdisciplinary Conference, Department of Neurology, Massachusetts General Hospital, Harvard Medical School**
"In vivo confocal microscopy of inflammation and the trigeminal nerve—the connection in the cornea"

Invited Speaker, Prevention Imaging and Genetic / Bugher Meeting, Stroke Service, Massachusetts General Hospital, Harvard Medical School
"Visualization of Corneal Immune Cells by *In Vivo* Confocal Microscopy-A Window to Assess Stroke-Induced Immunosuppression?"

Invited Speaker, New Frontiers in Corneal Research, Department of Ophthalmology, Harvard Medical School
"Corneal Antigen Presenting Cells: From Bench to Bedside"

2012 **Invited Speaker, Cornea Center for Excellence, Schepens Eye Research Institute, Department of Ophthalmology, Harvard Medical School**
"Image-guided diagnosis and therapy for corneal diseases"

Invited Speaker, GlaxoSmithKline Visit, Massachusetts Eye & Ear Infirmary, Department of Ophthalmology, Harvard Medical School
"Image-guided Patient Stratification and Therapy for Ocular Surface Diseases"

Invited Speaker, New Frontiers in Corneal Research, Department of Ophthalmology, Harvard Medical School
"Corneal Dendritic Cells and Nerves in Herpetic Eye Diseases"

Invited Speaker, Harvard Cornea Center of Excellence Scientific Retreat, Department of Ophthalmology, Harvard Medical School
"Immunobiology of Corneal Antigen Presenting Cells"

Invited Speaker, Harvard Cornea Center of Excellence Scientific Retreat, Department of Ophthalmology, Harvard Medical School
"Corneal Imaging"

2013 **Research Seminar, Schepens Eye Research Institute, Department of Ophthalmology, Harvard Medical School**
"Molecular Trafficking Mechanism, Migratory Kinetics, and Turnover of Corneal Dendritic Cells"

Invited Speaker, New Frontiers in Corneal Research, Department of Ophthalmology, Harvard Medical School
"*Dry Eye Disease—New Lessons from In Vivo Confocal Microscopy Studies"*

Research Faculty Meeting, Massachusetts Eye & Ear Infirmary, Department of Ophthalmology, Harvard Medical School

"Corneal Dendritic Cells Prevent Local Damage and Mediate Systemic Viral Transmission in Acute Herpes Simplex Keratitis"

Invited Speaker, Annual Meeting of the Harvard Department of Ophthalmology
"Clinical Research Resources—Imaging"
200 faculty, staff, and alumni

2014 **Invited Speaker, New Frontiers in Corneal Research, Department of Ophthalmology, Harvard Medical School**
"Immuno- and Neuro-Imaging in Clinical Practice and Clinical Trials"

Research Seminar, Schepens Eye Research Institute, Department of Ophthalmology, Harvard Medical School
"Neurogenic Privilege: Maintenance of Corneal Avascularity and Immune Privilege through Peripheral Innervation"

2015 **Invited Speaker, Cornea Center of Excellence International Videoconference, Department of Ophthalmology, Harvard Medical School**
"In Vivo Confocal Microscopy in Acanthamoeba and Fungal Keratitis"

Research Seminar, Schepens Eye Research Institute, Department of Ophthalmology, Harvard Medical School
"Role of Novel Populations of Plasmacytoid Dendritic Cells in Corneal Immunity"

Research Seminar, Immunology Program, Tufts University School of Medicine
"Corneal Plasmacytoid Dendritic Cells Mediate Immune Responses and are Required for Nerve Maintenance and Regeneration"

Research Seminar, Neuroscience Program, Tufts University School of Medicine
"Peripheral Innervation and Neurogenic Homeostasis Main the Immune Privilege of the Cornea"

Research Seminar, Cell, Molecular & Developmental Biology Program, Tufts University School of Medicine
"The Role of Corneal Nerves and Plasmacytoid Dendritic Cells in the Maintenance of Corneal Avascularity"

2016 **Invited Speaker, Vision Science Retreat, Department of Ophthalmology, Tufts University School of Medicine**
"*Corneal Immunology and Inflammation From Bench to Bedside and Back Again"*

Massachusetts Lions Eye Research, Department of Ophthalmology, Tufts University School of Medicine
"In Vivo Confocal Microscopy—From Clinical Research to Clinical Care"

Research Seminar, Department of Biomedical Engineering, Tufts University
"*Corneal Immuno-Imaging and Neuro-Imaging Demonstrate the Role of Corneal*

Nerves in Maintaining Immune Privilege"

2017 ***Invited Speaker, Neuro-Ophthalmology Rounds, Massachusetts Eye & Ear Infirmary, Department of Ophthalmology, Harvard Medical School***
"*Mechanisms of Corneal Neuropathic Pain*"

Regional

2003 **Invited Speaker, Kentucky Academy of Eye Physicians and Surgeons (KAEPS) Fall Meeting,** Louisville, KY
"New Approaches to Prevent Corneal Graft Rejection"

Research!Louisville 2003, Louisville, KY
"Corneal Inflammation is Mediated by the Complement System" (abstract)

2005 **Invited Speaker, Kentucky Academy of Eye Physicians and Surgeons (KAEPS) Fall Meeting**, Louisville, KY
"Wavefront Analysis"

2007 **25th Biennial Cornea Conference,** Boston, MA
"Corneal Sensation and Corneal Nerve Morphology Alterations with *In Vivo* Confocal Microscopy: A Comparison between Herpes Simplex Keratitis and Herpes Zoster Ophthalmicus" (abstract)

2009 **Invited Speaker, 35th Annual Kevin Hill Seminar in Ophthalmology – Cornea, Colby College,** Waterville, ME
"Viral Keratitis"

Invited Speaker, 35th Annual Kevin Hill Seminar in Ophthalmology – Cornea, Colby College, Waterville, ME
"Corneal Imaging"

Invited Speaker, 26th Biennial Cornea Conference, Boston, MA
"In Vivo Migratory Kinetics and Mechanisms of Corneal Bone Marrow-Derived Cells" (abstract)

Grand Rounds, Department of Ophthalmology, Tufts University, Boston, MA
"Corneal Antigen Presenting Cells—Past, Present, and Future"

2010 **Invited Speaker, Annual Martha's Vinyard Cornea Meeting**, Edgartown, MA
"*In Vivo* Confocal Microscopy and Infectious Keratitis"

2012 **Grand Rounds, Department of Ophthalmology, Brown University**, Providence, RI
"Image-Guided Therapy for Infectious Diseases of the Cornea"

5th Military Vision Symposium on Ocular & Vision Injury
Session Moderator, Ocular Pain & Refractive Surgery

2015 **Invited Speaker, Cambridge Healthtech Institute's 3rd Annual Targeting Ocular Disorders, Envisioning New Therapies**, Boston, MA
"*In Vivo* Confocal Microscopy-Based Imaging Endpoints as Surrogate Markers of Ocular Surface Inflammation"

Invited Speaker, Annual New England Ophthalmological Society Meeting, Boston, MA
"Dry Eye Treatments Don't Work: What's Next? New Diagnostic and Treatment Alternatives"

2016 **Invited Speaker, Annual New England Ophthalmological Society Meeting, Boston, MA**
"Application of Anterior Segment Imaging to Corneal Transplantation"

2017 **Invited Speaker, Annual New England Ophthalmological Society Meeting, Boston, MA**
"Persistent Epithelial Defects and Neurotrophic Keratopathy"

National

1999 **Association for Research in Vision and Ophthalmology (ARVO) Annual Meeting,** Ft. Lauderdale, FL
"PCR to detect Histoplasma Capsulatum in Sub-Retinal Neovascular Membrane (SRNVM) specimens" (abstract)

American Gastroenterology Association (AGA) Annual Meeting, Orlando, FL
"Lower Esophageal Sphincter Relaxation, a Standardized Method of Analysis" (abstract)

1999 **Society for Leukocyte Biology (SLB) Annual Meeting**, Cambridge, MA
"Novel Expression of Vascular Endothelial Growth Factor Receptor-3 (VEGFR-3) on Corneal Dendritic Cells" (abstract)

Annual Meeting of the Ocular Microbiology and Immunology Group (OMIG), Dallas, TX
"Novel Characterization of Resident Antigen Presenting Cells (APCs) in the Corneal Stroma" (abstract)

Annual Meeting of the Castroviejo Corneal Society, Dallas, TX
"Distribution and Density of Novel MHC Class II Negative Langerhans Cells in Normal versus Inflamed Cornea" (abstract)

2001 **Keystone Symposia, Chemokines and Chemokine Receptors,** Taos, NM
"Differential Role of Chemokines in Corneal Alloimmunity" (abstract)

ARVO Annual Meeting, Ft. Lauderdale, FL

"The Cornea, an Immune Privileged Tissue, is Endowed with Significant Numbers of Resident MHC Class II-negative Dendritic Cells" (abstract)

Federation of Clinical Immunology Societies (FOCIS), Boston, MA
"Targeting the Chemokine Receptor CCR1 Suppresses Corneal Alloimmunity and Promotes Allograft Survival" (abstract)

Annual Meeting of the Ocular Microbiology and Immunology Group (OMIG), New Orleans, LA
"Reduction of Corneal Allorejection Mediated by alpha-Melanocyte Stimulating Hormone Treatment" (abstract)

22nd Biennial Cornea Conference, Boston, MA
"Treatment with alpha-MSH Reduces Corneal Allorejection" (abstract)

2002 **ARVO Annual Meeting**, Ft. Lauderdale, FL
"Treatment with Alpha-MSH Reduces Corneal Allorejection" (abstract)

2003 **Experimental Biology Meeting (FASEB),** San Diego, CA
"Novel Expression of Vascular Endothelial Growth Factor Receptor (VEGFR)-3 and VEGF-C on Bone Marrow-Derived Dendritic Cells and Monocytes in the Cornea and Conjunctiva" (abstract)

ARVO Annual Meeting, Ft. Lauderdale, FL
"Phenotypic Changes in Resident Corneal Dendritic Cells in Response to Inflammation" (abstract)

American Uveitis Society (AUS), Ft. Lauderdale, FL
"Corneal Antigen-Presenting Cells (APC): Function and Identity in Inflammation" (abstract)

23rd Biennial Cornea Conference, Boston, MA
"Corneal Inflammation is Controlled by the Complement System" (abstract)

2004 **Association of University Professors of Ophthalmology/Research to Prevent Blindness (AUPO/RPB) Resident and Fellow Research Forum**, Sarasota, FL
"Breaking a Dogma—the Evolving Story of Corneal Antigen Presentation" (abstract)

ARVO Annual Meeting, Ft. Lauderdale, FL
"Corneal Inflammation is Mediated by the Complement System" (abstract)

4th Annual Conference of the Federation of Clinical Immunology Societies (FOCIS*).* "The Complement System Mediates Corneal Inflammation through Complement Regulatory Proteins" (abstract)

2005 **ARVO Annual Meeting**, Ft. Lauderdale, FL
"Evaluation of Ocular Surface Staining with Lissamine Green" (abstract)

2006 **ARVO Annual Meeting**, Ft. Lauderdale, FL

"Corneal Dendritic Cells Can be Actively Maintained in an Immature State by Soluble Factors in the Aqueous Humor" (abstract)

2007 **Invited Speaker, University of California Los Angeles (UCLA),**
Los Angeles, CA
"Corneal Antigen-Presenting Cells. Past, Present and Future"

ARVO Annual Meeting, Ft. Lauderdale, FL
"Comparison of Corneal Nerve Alterations and Corneal Sensitivity in Herpes Simplex Keratitis with *in vivo* Confocal Microscopy" (abstract)

Invited Speaker, Cole Eye Institute, Cleveland Clinic Foundation,
Cleveland, OH
"Immunologically High-Risk Penetrating Keratoplasty"

Annual Meeting of Ocular Microbiology and Immunology Group (OMIG), New Orleans, LA
"In Vivo Morphology of Corneal Nerves and Corneal Sensation in Herpes Simplex Keratitis" (abstract)

Cornea Society/EBAA Fall Educational Conference, New Orleans, LA
"In Vivo Morphology of Corneal Nerves and Corneal Sensation in Herpes Zoster Ophthalmicus—evidence for bilateral disease?" (abstract)

2008 **ARVO Annual Meeting,** Ft. Lauderdale, FL
"Cellular Changes of the Cornea in Herpes Zoster Ophthalmicus: An i*n vivo* Confocal Microscopy Study" (abstract)

Annual Meeting of Ocular Microbiology and Immunology Group (OMIG), Atlanta, GA
"Cellular Changes of the Cornea in Herpes Simplex Keratitis: An *in vivo* Confocal Microscopy Study" (abstract)

American Academy of Ophthalmology (AAO) Annual Meeting, Atlanta, GA
Instructor, "Surgery for Severe Corneal Ocular Surface Disease".
Course provided surgical skills in the management of severe corneal and ocular surface disease, including amniotic membrane transplantation, limbal stem cell transplantations and keratoprosthesis.

2009 **ARVO Annual Meeting,** Ft. Lauderdale, FL
"Corneal Epithelial and Stromal Changes in Patients with Herpes Simplex Keratitis: An In Vivo Confocal Microscopy Study" (abstract)

Cornea Society/EBAA Fall Educational Conference, San Francisco, CA
"Effective Pain Control with Gabapentin in Patients with Infectious Corneal Ulcers and Severe Refractory Pain" (*abstract)*

2010 **Word Cornea Congress VI,** Boston, MA

"Recruitment Mechanisms of Corneal Dendritic Cell: An In Vivo Epi-fluorescent Microscopy Study" (abstract)

ARVO Annual Meeting, Ft. Lauderdale, FL
Special Interest Group co-Organizer and co-Moderator
"Intravital imaging of immune responses in the ocular surface"

ARVO Annual Meeting, Ft. Lauderdale, FL
"Visualization of Corneal Antigen Presenting Cell Migration by multi-photon Intravital microscopy" (abstract)

Invited Speaker, Vistakon, Ft. Lauderdale, FL
"Contact Lens-Induced Corneal Inflammation"

Invited Speaker, Inspire Pharmaceuticals, Cary, NC
"Immune Responses of the Ocular Surface and Eyelids in Immune and Inflammatory Diseases"

Visiting Professor and Grand Rounds, Department of Ophthalmology & Visual Sciences, University of Louisville, Louisville, KY
"Corneal Antigen Presenting Cells—Past, Present, and Future"

Invited Speaker, Department of Ophthalmology & Visual Sciences, University of Louisville, Louisville, KY
"Viral Keratitis"

Invited Speaker, Department of Ophthalmology & Visual Sciences, University of Louisville, Louisville, KY
"Corneal Imaging"

Invited Speaker, Department of Ophthalmology, Emory University, Atlanta, GA
"Immunobiology of Corneal Graft Rejection"

2011 **Invited Speaker, Department of Ophthalmology, Duke University,** Durham, NC
"The Evolving Story of Corneal Antigen Presenting Cells: From Bench to Bedside"

ARVO Annual Meeting, Ft. Lauderdale, FL
Special Interest Group co-Organizer and co-Moderator
"Intravital imaging and Quantification of Pathologic Ocular Neovascularization"

ARVO Annual Meeting, Ft. Lauderdale, FL
Invited Speaker, Special Interest Group
"In-vivo imaging of inflammatory cell-vessel interactions at the ocular surface"

ARVO Annual Meeting, Ft. Lauderdale, FL
Moderator, "Corneal Infection and Immunology" Poster Session

Invited Speaker, Department of Ophthalmology, Duke University, Durham, NC
"Immuno-imaging of the Ocular Surface: Studying Immune System Dynamics *In Vivo"*

Invited Speaker, Allergan, Irvine, CA
"In Vivo Imaging of the Ocular Surface: Studying Immune System Dynamics in Context*"*

Invited Speaker, American Academy of Optometry, Boston, MA
"An Explanation for Refractory Dry Eye Symptoms Despite Significant Improvement in Dry Eye Signs Post-Treatment for Meibomian Gland Dysfunction (MGD)" (abstract)

2012 **ARVO Annual Meeting,** Ft. Lauderdale, FL
Invited Speaker, Special Interest Group, In Vivo Confocal Microscopy of the Ocular Surface: From Bench to Bedside
"IVCM in management of infectious keratitis"

ARVO Annual Meeting, Ft. Lauderdale, FL
Moderator, "Corneal Infection and Immunology" Poster Session

Invited Speaker, Revision Optics, Medical Advisors' Meeting, Chicago, IL
"Inlays and the Cornea"

OMIG Annual Meeting, Chicago, IL
"Corneal Nerves Regenerate in Patients with Herpes Zoster Ophthalmicus and may be Accelerated by Treatment with Autologous Serum Tears" (abstract)

2013 **Invited Speaker, Allergan**, Irvine, CA
"Image –Guided Therapy of Ocular Surface Diseases*"*

ARVO Annual Meeting, Seattle, WA
Session Moderator, "Refractive Surgery"

ARVO Annual Meeting, Seattle, WA
Session Moderator, "Corneal Immunology, Allergy, Neovascularization"

28th Biennial Corneal Conference, Boston, MA
Session Moderator, "New & Emerging Technologies"

Invited Speaker, 28th Biennial Corneal Conference, Boston, MA
"A Dual Role for Corneal Dendritic Cells in Herpes Simplex Keratitis: Local Suppression of Corneal Damage and Promotion of Systemic Viral Dissemination"

2014 **Invited Speaker, Clinician-Scientist Forum, ARVO Annual Meeting**, Orlando, FL, "Perspectives of a Career Development Awardee-Rewards and Pitfalls"

Invited Speaker, ARVO Annual Meeting, Orlando, FL

Minisymposium, Innervation in corneal health and inflammation
"Inflammation and Innervation of the Cornea"

ARVO Annual Meeting, Orlando, FL
Session Moderator, "Corneal Immunology and Vascularization"

ARVO Annual Meeting, Orlando, FL
Invited Expert, Pizza with an Expert, "Clinician Scientists and Grants"

Invited Speaker, Wilmer Eye Institute, Department of Ophthalmology, Johns Hopkins University, Baltimore, MD
"Neurogenic Immune Homeostasis: Peripheral Innervation Maintains Avascularity and Immune Privilege of the Cornea"

Invited Speaker, Scheie Eye Institute, Department of Ophthalmology, University of Pennsylvania, Philadelphia, PA
"Corneal Immuno- and Neuro-Imaging—From Bench to Bedside and Back"

Invited Speaker, Edward S. Harkness Eye Institute, Department of Ophthalmology Columbia University, New York, NY.
"The Role of Corneal Innveration in Inflammation and Adaptive Immunity"

Invited Speaker, Department of Ophthalmology, Boston University Medical Center, Boston, MA
"Inflammation and the nervous system in the cornea-from bench to bedside and back again"

Grand Rounds, Scheie Eye Institute, Department of Ophthalmology, University of Pennsylvania, Philadelphia, PA
"Clinical Applications of *In Vivo* Confocal Microscopy for Ocular Surface Disease, Neurotrophic Keratopathy, and Corneal Neuropathy"

Invited Speaker, Department of Ophthalmology, University of Louisville, Louisville, MA
"Corneal Immune Privilege is Mediated by Neurogenic Immune Homeostasis and Peripheral Innervation"

2015 **ARVO Annual Meeting**, Denver, CO
Session Moderator, "Corneal Angiogenesis"

Grand Rounds, Department of Ophthalmology, University of South Florida, Tampa, FL
"Indications for In Vivo Confocal Microscopy in Clinical Practice

Research Seminar, Department of Ophthalmology, University of South Florida, Tampa, FL
"Innervation and Inflammation of the Cornea--How Neurogenic Homeostasis in the Cornea Maintains Corneal Immune Privilege

2016 **Visiting Scholar, Clinical Research Seminar I, Tissue Tech Inc., Miami, FL**
"Utility of In Vivo Confocal Microscopy in Neuro-Regenerative Therapy for Dry Eye Disease and Corneal Neuropathic Pain"

Visiting Scholar, Clinical Research Seminar II, Tissue Tech Inc., Miami, FL
"Utility of in Vivo Confocal Microscopy for the Assessment of Ocular Surface Inflammation"

Visiting Scholar, Basic Science Seminar, Tissue Tech Inc., Miami, FL
"Corneal Immune Privilege is Maintained by the Peripheral Nervous System"

Visiting Scholar, Tissue Tech Inc., Miami, FL
"Animal Models of Corneal Wound Healing"

Invited Speaker, Santen, Emeryville, CA
"Efficacy of In Vivo Confocal Microscopy for the Assessment of Ocular Surface Inflammation**"**

ARVO Annual Meeting, Seattle, WA
Moderator, "Ocular Surface Neovascularization, Innervation, and Immunology" Paper Session

ARVO Annual Meeting, Seattle, WA
Moderator, "Corneal Nerves, Diabetes, Tear film" Poster Session

ARVO Annual Meeting, Seattle, WA
Moderator, "Corneal Neovascularization and Conjunctival Cell Biology and Surgery" Poster Session

Invited Speaker, Cornea Subspecialty Day, "Cornea 2016: Advancements in Cornea and External Disease: Essential Tools for Success in 2016", American Academy of Ophthalmology, Chicago, IL
"Confocal: How This Helps Me"

2017 **Grand Rounds, Department of Ophthalmology, University of California Los Angeles (UCLA),** Los Angeles, CA
"Corneal Nerves Mediate Inflammation and Immunity"

ARVO Annual Meeting, Ft. Lauderdale, FL
Invited Speaker, Special Interest Group, Nanotechnology for Imaging the Ey
"Potential Applications of Nanotechnology for Immunoimaging and Neuroimaging of the Eye"

ARVO Annual Meeting, Baltimore, MD
Moderator, "Corneal Immunology and Neuropathy" Paper Session

Invited Speaker, 30th Biennial Corneal Conference, Boston, MA

International

2000 **Third International Conference on the Lacrimal Gland, Tear Film and Dry Eye Syndromes: Basic Science and Clinical Relevance,** Maui, HA
"Expression of Vascular Endothelial Growth Factor Receptor-3 (VEGFR-3) in the Conjunctiva" (abstract)

2004 **Fourth International Conference on the Lacrimal Gland, Tear Film, Ocular Surface & Dry Eye Syndromes: Basic Science and Clinical Relevance**, Fajardo, PR
"Characteristics of Optical Aberrations in Dry Eye Patients with Increasing Blink Intervals" (abstract)

Fourth International Conference on the Lacrimal Gland, Tear Film, Ocular Surface & Dry Eye Syndromes: Basic Science and Clinical Relevance, Fajardo, PR
"Chronic Complement Activation Exists in the Cornea and is Regulated by Complement Regulatory Proteins" (abstract)

2009 **Invited Speaker, Solving Dry Eye—An International Symposium,** Sydney, Australia
"Role of Immunity and Inflammation in Dry Eye Syndrome" (abstract)

Invited Speaker, Solving Dry Eye—An International Symposium, Sydney, Australia
"Mechanisms of the Ocular Surface Immune Response" (abstract)

2010 **Invited Speaker, Gordon Research Conferences—Biology and Pathobiology of the Cornea: Advances In Cornea, Conjunctiva, Meibomian And Lacrimal Gland Research**, Ventura, CA
"Intravital Imaging of Immune Responses in the Ocular Surface"

Invited Speaker, World Ophthalmology Congress 2010, Corneal Imaging Symposium, Berlin, Germany
"In Vivo Imaging and Quantification of Corneal Inflammation"

Invited Speaker, XIX Biennial Meeting of the International Society of Eye Research (ISER), "Ocular Pain: From Molecules to the Clinic" Symposium, Montreal, Canada
"Inflammation and the Nervous System: The Connection in the Cornea" (abstract)

2011 **Invited Speaker, Cornea Conference, Farabi Eye Hospital, University of Tehran,** Tehran, Iran
"Immunobiology of High-Risk Penetrating Keratoplasty"

Invited Speaker, Department of Ophthalmology, Farabi Eye Hospital, University of Tehran, Tehran, Iran
"Dry Eye Syndrome: An Overview"

Invited Speaker, Noor Eye Hospital, Tehran, Iran
"Clinical Applications of In Vivo Confocal Microscopy"

Visiting Professor and Grand Rounds, Department of Ophthalmology, Farabi Eye Hospital, University of Tehran, Tehran, Iran
"Image-guided Therapy for Corneal Disease—Are we there yet?"

2012 **Invited Speaker, World Ophthalmology Congress 2012, Pterygium Symposium**, Abu Dhabi, United Arab Emirates.
"Higher Order Aberrations and Corneal Scarring after Pterygium Removal: What to Do?" (abstract)

Invited Speaker, Revision Optics, Advisory Board Meeting, Prague, CZ
"Corneal Inflammation: Preliminary Confocal Analysis"

Invited Speaker, Symposium: External diseases and cornea, 35th International Symposium of Ophthalmology Moacyr Álvaro - SIMASP 2012, Sao Paolo, Brazil
"Diagnostic Corneal Imaging"

Invited Speaker, Advances in the diagnosis of external diseases and cornea, 35th International Symposium of Ophthalmology Moacyr Álvaro - SIMASP 2012, Sao Paolo, Brazil
"Image-Guided Therapy of Corneal Diseases-Ocular Surface Diseases"

Invited Speaker, IT in Ophthalmology, 35th International Symposium of Ophthalmology Moacyr Álvaro - SIMASP 2012, Sao Paolo, Brazil
"Image-Guided Therapy of Corneal Diseases-Infectious Keratitis"

Invited Speaker, XX Biennial Meeting of the International Society of Eye Research (ISER), "In vivo Imaging" Symposium, Berlin, Germany
"Dynamic visualization and mechanisms of corneal immune cell migration"

Organizer and Moderator, **XX Biennial Meeting of the International Society of Eye Research (ISER), "Neurotrophic Keratopathy: Diagnosis and Treatment" Symposium**, Berlin, Germany

Visiting Professor, Department of Ophthalmology, University of Cologne, Cologne, Germany
"Confocal-Guided Diagnosis and Therapy in Corneal Diseases"

Invited Speaker, Department of Ophthalmology, University of Cologne, Cologne, Germany
"The Evolving Story of Corneal Antigen Presenting Cells: Past, Present, and Future"

Invited Speaker, New Frontiers in Eye Diseases, 2nd Meeting of Harvard University and Peking University First Hospital, Beijing, China

"Image-Guided Therapy in Infectious Keratitis and Corneal Diseases"

Invited Speaker, Shanghai Eye and ENT Hospital, Shanghai, China
"Image-guided Therapy in Infectious Diseases and Ocular Surface"

Invited Speaker, 1st Forum of Harvard-Osaka-Xiamen Universities in Ocular Surface and Regenerative Medicine, Xiamen, China
"Corneal Dendritic Cells Prevent Local Damage and Mediate Systemic Viral Transmission in Acute Herpes Simplex Keratitis"

2013 **Invited Speaker, Consensus Meeting, Corneal Nerve Quantification,** Rostock, Germany
"Corneal confocal microscopy analysis in a shared care model of general practitioner, ophthalmologist and optometrist – the real world"

Invited Speaker, Consensus Meeting, Corneal Nerve Quantification, Rostock, Germany
"Clinical research and data analysis technique for corneal nerve quantification"

Invited Speaker, Pan American Congress of Ophthalmology, Special Symposium on OCT, Rio De Janeiro, Brazil
"Corneal and Anterior Segment En Face Optical Coherence Tomography"

International Visiting Professor, Fundacao Altino Ventura and Hospital de Olhos de Permambuco, Recife, Brazil
"Dry Eye Disease—An Up-to-date Overview and New Lessons from Imaging Studies"

International Visiting Professor, Fundacao Altino Ventura and Hospital de Olhos de Permambuco, Recife, Brazil
"Viral Keratitis—Current State and Lessons by In Vivo Confocal Microscopy"

Invited Speaker, International Conference on the Tear Film & Ocular Surface: Basic Science and Clinical Relevance, Taormino, Italy
"Corneal Nerves May Mediate Corneal Dendritic Cell Trafficking—An Intravital Multiphoton Microscopy Study"

International Conference on the Tear Film & Ocular Surface: Basic Science and Clinical Relevance, Taormino, Italy
Session Moderator and Co-Chair, "Macro to Micro: Imaging Approaches for Understanding the Ocular Surface"

2014 **Invited Speaker, International Symposium on Ocular Pharmacology and Therapeutics,** Reykjavik, Iceland
"Anterior Segment Imaging for Inflammation (Confocal) in Dry Eye Disease"

Invited Guest Speaker, Medical Contact Lens and Ocular Surface Association Annual Scientific Meeting, London, United Kingdom

"Inflammation and Innervation of the Cornea"

Invited Guest Speaker, Medical Contact Lens and Ocular Surface Association Annual Scientific Meeting, London, United Kingdom
"Corneal Imaging"

2015 **Invited Speaker, Association for Ocular Pharmacology and Therapeutics Meeting,** Charleston, SC
"Utility of in vivo confocal microscopy-based imaging endpoints for the assessment of ocular surface inflammation"

Session Chair and Moderator, Association for Ocular Pharmacology and Therapeutics, Chareston, SC
"Intravital Imaging in Ocular Diseases"

Invited Speaker, 30th Asia-Pacific Academy of Ophthalmology Congress, "Clinical applications of in vivo confocal microscopy" Session, Ghuangzhou, China
"Corneal Dendritic Cells as Surrogate Biomarkers of Therapeutic Efficacy in Corneal Inflammatory Diseases"

Invited Speaker, Zhongshan Ophthalmic Center of Sun Yat-sen University, Guangzhou, China
"Role of corneal nerves in the maintenance of immune privilege"

Invited Speaker, International Symposium on Ocular Pharmacology and Therapeutics, Berlin, Germany
Symposium on Contact Lenses
"Neurobiology of Contact Lens Discomfort"

Invited Speaker, International Symposium on Ocular Pharmacology and Therapeutics, Berlin, Germany
Anterior Segment Imaging and In- Office testing
"Clinical Indications for In Vivo Confocal Microscopy"

Invited Speaker, International Symposium on Ocular Pharmacology and Therapeutics, Berlin, Germany
Anterior Segment Imaging and In- Office testing
"Clinical Indications for Corneal En-Face OCT"

Invited Speaker, International Symposium on Ocular Pharmacology and Therapeutics, Berlin, Germany
Inflammation/ Wound Healing
"Surrogate Biomarkers for Inflammation in Dry eye Disease to Assess Therapeutic Efficacy"

Session Co-Moderator, "Anterior Segment Imaging and In- Office testing"
International Symposium on Ocular Pharmacology and Therapeutics, Berlin,

Germany

Invited Speaker, Committee on Pain and Sensation, Dry Eye Workshop II, Tear Film and Ocular Surface Society, Paris, France
"Neuro-Regenerative Therapy and the Effect on Dry Eye Symptoms and Corneal Pain"

Invited Speaker, European Association for Vision and Research (EVER), Nice, France
"Corneal Nerves Maintain the Immune Privilege of the Cornea"

Award Lecture, Clinical Research Award in Cornea and Ocular Surface Science, **European Association for Vision and Research (EVER),** Nice, France
"Nerve-Immune Crosstalk in the cornea-from bench to bedside and back again"

Invited Speaker, Department of Ophthalmology, Kyoto Prefectural University of Medicine, Kyoto, Japan
"Plasmacytoid Dendritic Cells Maintain and Regenerate Corneal Nerves and Mediate Corneal Immunity"

Keynote Speaker, Kyoto Cornea Club, Kyoto, Japan
"Corneal Immuno-Imaging and Neuro-Imaging Demonstrate the Critical Role of Peripheral Corneal Nerves in the Maintenance of Immune Privilege"

2016 **Invite Speaker, Dompe Pharmaceuticals,** L'Aquila, Italy
"Utility of In Vivo Confocal Microscopy in Neuro-Regenerative Therapy for Dry Eye Disease and Corneal Neuropathic Pain"

Invite Speaker, Dompe Pharmaceuticals, L'Aquila, Italy
"Clinical Trials with Nerve Growth Factor"

Invite Speaker, Dompe Pharmaceuticals, L'Aquila, Italy
"Utility of Nerve Growth Factor in pre-clinical trials"

Invite Speaker, Dompe Pharmaceuticals, L'Aquila, Italy
"Animal Models for Corneal Diseases"

Invited Speaker, International Symposium on Ocular Pharmacology and Therapeutics, Rome, Italy
Anterior Segment Imaging
"In Vivo Confocal Microscopy in a Shared Model of Clinical Research Practice - The Real World"

Invited Speaker, International Symposium on Ocular Pharmacology and Therapeutics, Rome, Italy
Contact Lens & Eye Pain
"Management of the Patient with Corneal Neuralgia/Neuropathy"

Invited Speaker, International Symposium on Ocular Pharmacology and Therapeutics, Rome, Italy
Improved Outcomes with Corneal Infections
"Degeneration and Regeneration of Corneal Nerves after Infectious Keratitis"

2017 **Invited Symposium Chair, "Ocular Immune Disorders in the Time of Globalized Medicine", Association for Ocular Pharmacology and Therapeutics,** Florence, Italy

Invited Speaker, "Ocular Immune Disorders in the Time of Globalized Medicine", Association for Ocular Pharmacology and Therapeutics, Florence, Italy
"Rationale and mechanisms of neuro-regenerative therapy in patients with ocular surface disease"

Invited Speaker, "New Horizons in OCT Angiography", Sao Paolo, Brazil

Invited Speaker, "Dry Eye, An Inflammatory Disease", 14th International Ocular Inflammation Society, Lausanne, Switzerland
"Utility of in Vivo Confocal Microscopy for the Assessment of Ocular Surface Inflammation in Patients with Dry Eye Disease"

Invited Speaker, "Immune Modulation in Corneal Transplantation", 14th International Ocular Inflammation Society, Lausanne, Switzerland
"Neuron and Corneal Immune Response"

Invited Speaker, EuCornea Symposium "One Decade of Progress in Corneal Inflammation", 14th International Ocular Inflammation Society, Lausanne, Switzerland
"Resident Corneal Leukocytes-Past, Presence, and Future"