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EDUCATION and TRAINING

- 2008-2011** Postdoctoral Research Fellow, Columbia University, College of Physicians and Surgeons, New York, NY
- 2008-2010** M.P.H., Executive Masters of Healthcare Management, Columbia University in the City of New York, Mailman School of Public Health, New York, NY
- 2001-2007** Ph.D., Medical College of Georgia, Augusta, GA
- 1997-2000** B.A., Natural Science, Covenant College, Lookout Mountain, GA

CERTIFICATIONS

- 2013** National Institutes of Health (NIH), National Heart, Lung and Blood Institute (NHLBI) Programs to Increase Diversity among Individuals Engaged in Health-Related Research (PRIDE) 2012-2013: Clinical and Comparative Effectiveness Research PRIDE Program, Columbia University Irving Institute for Clinical and Translational Research
- 2012** Certificate, Columbia Summer Research Institute (CSRI) in Patient Oriented and Translational Research, Columbia University Irving Institute for Clinical and Translational Research
- 2012** Certificate, Core Clinical Research Training (CCRT), South Carolina Clinical and Translational Research Institute, Medical University of South Carolina
- 2011** From Idea to IPO: The Technology Venture, New York Academy of Sciences Venture Capital/Biotechnology Course Certificate
- 2009** ARVO Foundation for Eye Research Clinical Trials Education Series, Continuing Medical Education Certificate, The Association for Research in Vision and Ophthalmology

HONORS and AWARDS

- 2013-2014** National Institutes of Health, National Eye Institute (NEI) Extramural Loan Repayment for Clinical Researchers (LRP-CR)

- 2013** AAMC Minority Faculty Career Development Seminar Nominee and Participant, Medical University of South Carolina
- 2012-2015** National Institutes of Health (NIH), National Heart, Lung and Blood Institute (NHLBI) R25-PRIDE Scholar, First in Clinical and Comparative Effectiveness Research, Columbia University Irving Institute for Clinical and Translational Research
- 2008-2009** National Institutes of Health - NEI Vision Sciences Training Grant, Columbia University, College of Physicians and Surgeons
- 2005** Award for Excellence in Research, Medical College of Georgia
- 2004-2007** National Institutes of Health - Ruth L. Kirschstein Research Service Award, Individual Fellowship
- 2004-2007** Southern Regional Education Board (SREB) Scholar
- 2004** Excellence in Research, Cellular Biology and Anatomy, Medical College of Georgia
- 2003** Association for Research in Vision and Ophthalmology (ARVO) Travel Award

FACULTY APPOINTMENTS

- 2016-present** Assistant Professor, Department of Ophthalmology and Visual Science, Yale School of Medicine, Yale University, New Haven, CT
- 2013-2015** Associate Member Graduate Faculty, College of Graduate Studies, Medical University of South Carolina, Charleston, SC
- 2012-2015** Assistant Professor, Department of Ophthalmology, Medical University of South Carolina, Storm Eye Institute, Charleston, SC
- 2012-2015** Assistant Professor, Department of Regenerative Medicine and Cell Biology, Medical University of South Carolina, Storm Eye Institute, Charleston, SC

OTHER EXPERIENCE

- 2015** National Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) Conference and workshop participant, Washington D.C.
- 2015** Health Data Consortium participant, Health Datapalooza, National Health Data and Patient-centered Outcomes Research workshop, Washington D.C.
- 2015** SCBIO Life Sciences Industry, SCBIO Life Science Startup Workshop, Southeastern Institute of Manufacturing Technology, Greenville, SC
- 2015** Mentor, BioCareers®, Mentor Matching program, Charleston, SC (mentored PhDs and Postdocs regarding career paths)

- 2014** Research mentor for Kiawah Eye Symposium, 2014, Medical University of South Carolina, Charleston, SC (mentored second year ophthalmology resident assisting with project development, experiments, and presentations)
- 2014-2015** Student training mentor, undergraduate student elective, Medical University of South Carolina, Charleston, SC (mentored undergraduate student from the College of Charleston overseeing project development, experiments)
- 2014** Guest facilitator, discussion on cloning/stem cell research at the screening of *Never Let Go* film, Humanities Committee of the Medical University of South Carolina, Charleston, SC
- 2013 -2015** Principal Investigator (PI), *Cell Modeling of Human Retinal Degenerations: Insights using Patient-Specific Human Induced-Pluripotent Stem Cells (iPSCs)*, IRB approval: Pro00023262, Medical University of South Carolina, Storm Eye Institute, Charleston, SC
- 2013** Research sponsor fellowship, Summer Health Professionals Program (SHP), Medical University of South Carolina, Charleston, SC (mentored medical student assisting with project development, experiments, and presentations)
- 2012-2013** Student training mentor, medical student elective, Medical University of South Carolina, Charleston, SC (mentored medical student overseeing project development, experiments)
- 2009-2010** Student training, medical student fellowship, Columbia University, New York, NY (mentored medical student assisting with project development, experiments, and presentations for year-long fellowship in the laboratory of Lucian Del Priore, MD, PhD)
- 2008-2011** Postdoctoral Research Fellow, Columbia University, College of Physicians and Surgeons, New York, NY
- 2004-2006** Teaching Assistant, Medical Neuroscience, Brain and Behavior, Medical College of Georgia School of Medicine, Augusta, GA (assisted in laboratory, delivered lecture to first year medical students entitled “Ventricles and CSF”)
- 2003-2004** Summer Educational Enrichment Program, Medical College of Georgia, Augusta, GA (presented lecture to students on the anatomy of the eye and HSV pathogenesis)
- 2003-2004** Student Training and Research (STAR) program, Medical College of Georgia, Augusta, GA (mentored summer student assisting with project development, experiments, and presentations)
- 2000-2001** Research Assistant, Medical College of Georgia, Augusta, GA

COMMITTEE ASSIGNMENTS

- 2016-present** Pediatric Ophthalmology Search Committee, Yale School of Medicine, Yale University, New Haven, CT

- 2014-2015** Institutional Advisory Committee for the MUSC Post-Baccalaureate Research Education Program (PREP) proposal, Medical University of South Carolina, Charleston, SC
- 2013-2015** Student Progress Appeals Committee, College of Medicine, Medical University of South Carolina, Charleston, SC
- 2013-2015** Human Stem Cell Advisory Group, Medical University of South Carolina, Charleston, SC

GRANTS

- 2016-2020** Yale University, Yale School of Medicine, Faculty Excellence and Diversity Initiative (Title: Treatment of AMD using RPE Derived from Patient-Specific Human Induced-Pluripotent Stem Cells (iPSC) Investigate treatment of AMD using RPE cells derived from patient-specific human induced-pluripotent stem cells)
- 2015-2016** Medical University of South Carolina, Underrepresented in Medicine Faculty Funding Program (Title: Treatment of AMD using RPE Derived from Patient-Specific Human Induced-Pluripotent Stem Cells (iPSC) Investigate treatment of AMD using RPE cells derived from patient-specific human induced-pluripotent stem cells)
- 2013-2015** National Institutes of Health, National Eye Institute. Extramural Loan Repayment for Clinical Researchers (LRP-CR) (Title: Treatment of Age-related Macular Degeneration using RPE Derived from Patient-Specific Human Induced Pluripotent Stem (iPS) Cells)
- 2013-2015** National Institutes of Health, Target Faculty, IDeA Networks of Biomedical Research Excellence (INBRE) INBRE-89521-02, (Title: Reengineering of Human Bruch's Membrane for Repopulation by iPSC-derived RPE)
- 2012-2013** South Carolina Lions Pilot Vision Research Program (Title: Using skin cells to regenerate the retina)
- 2008-2009** National Institutes of Health, National Eye Institute. Training Grant 5T32 EY13933-07, Columbia University, College of Physicians and Surgeons (Title: Embryonic stem cell therapy for macular and retinal reconstruction)
- 2004-2007** National Institutes of Health, Kirschstein Research Service Award. Individual Fellowship Grant 5F31 EY015392-03, (Title: TNF- α after anterior chamber inoculation of HSV-1)

PROFESSIONAL MEMBERSHIPS

Association for Research in Vision and Ophthalmology

American Association for the Advancement of Science

The New York Academy of Sciences

SPEAKER INVITATIONS

Fields M. Use of an in vitro model of aging to study retinal pigment epithelium (RPE) behavior. Storm Eye Institute, Department of Ophthalmology Grand Rounds, Medical University of South Carolina, 2015.

Fields M. Using skin cells to regenerate the retina. Storm Eye Institute Spring Meeting and Alumni Reunion, Charleston, South Carolina, 2015.

Fields M. Using skin cells to regenerate the retina. Hilton Head Chapter of National Federation of the Blind, Hilton Head, South Carolina, 2015.

Fields M. Using skin cells to regenerate the retina. SC BIO Life Sciences Conference, Greenville, South Carolina, 2014.

Fields M. Using skin cells to regenerate the retina. Storm Eye Institute, Department of Ophthalmology Grand Rounds, Medical University of South Carolina, 2014.

Fields M. Using skin cells to regenerate the retina. Biomedical Research Training Core for Undergraduate Minorities (BRTCUM) program, South Carolina State University, 2013.

Fields M. Reengineering of human Bruch membrane for repopulation by iPSC-derived RPE. The South Carolina INBRE Spring Symposium, University of South Carolina, 2013.

Fields M. Reengineering of human Bruch membrane for repopulation by iPSC-derived RPE. The South Carolina COBRE Center of Biomaterials and Tissue Regeneration Annual Meeting, 2013.

Fields M. Using skin cells to regenerate the retina. South Carolina Lions Club International Vision Symposium, 2012.

Fields M. Using skin cells to regenerate the retina. Storm Eye Institute, Board of Directors, 2012.

Fields M. Using skin cells to regenerate the retina. South Carolina Lions Club International, 2012.

Fields M. Using skin cells to regenerate the retina. South Carolina Lions Club of Charleston, SC, 2012.

Fields M. Expression of transcription factors involved in retinal differentiation induces photoreceptor and RPE phenotypes in embryonic stem cells. Columbia Stem Cell Initiative Seminar, 2011.

SERVICE POSITIONS

Peer review committee member, The American Heart Association (AHA), Microbiology Basic Science 1 Committee (2017)

External reviewer, The Medical Science Monitor, International Scientific Information, Inc., Smithtown, NY (2017)

External reviewer, The Federation of American Societies for Experimental Medicine (FASEB journal),

Bethesda, MD (2015)

External reviewer, The Journal of Retinal and Vitreous Diseases (Retina journal), Lippincott Williams & Wilkins, Philadelphia, PA (2015)

External reviewer, Stem Cells International, Hindawi Publishing Corporation, New York, NY (2015)

External reviewer, The European Association for Predictive, Preventive, and Personalized Medicine (EPMA journal), Biomed Central, London, UK (2015)

External grant reviewer, UK Regenerative Medicine Panel, Medical Research Council, London, UK (2013 – 2015)

GUEST LECTURING/TEACHING

2015 Lecturer, Stem Cells and Regenerative Medicine, Biochemistry and Molecular Biology, Summer Review Course (CGS650), College of Graduate Studies, Medical University of South Carolina, Charleston, SC

2014 Guest speaker, Using skin cells to regenerate the retina. Bishop Gadsden, Storm Eye Institute Seminar, Charleston, SC.

2014 Guest speaker, Using skin cells to regenerate the retina. Dataw Island Seminar, Storm Eye Institute, Dataw Island Club, Dataw Island, SC.

2014 Guest facilitator, discussion on cloning/stem cell research at the screening of *Never Let Me Go* film, Humanities Committee of the Medical University of South Carolina, Charleston, SC

2013 Guest speaker, Using skin cells to regenerate the retina. Daniel Island Seminar, Storm Eye Institute, Daniel Island Country Club, Daniel Island, SC.

2013 Guest speaker, Using skin cells to regenerate the retina. Daughters of the Revolution, Storm Eye Institute Seminar, Charleston, SC.

PEER-REVIEWED PUBLICATIONS

Koike T, Yamagishi H, Hatanaka Y, Fukushima A, Chan JW, Xia Y, **Fields M**, Chandler P, and Iwashima M. A novel ERK-dependent signaling process that regulates interleukin-2 expression in a late phase of T cell activation. *J Biol Chem* 278:15685-15692, 2003. PMID: 12595531

Fields M, Zheng M, Zhang M, and Atherton SS. Tumor necrosis factor alpha and macrophages in the brain of herpes simplex virus type-1 infected BALB/c mice. *J Neurovirol* 12:443-455, 2006. PMID: 17162660

Fields M, Zheng M, Wall P, Oberg S, and Atherton SS. Unilateral anterior chamber inoculation of a tumor necrosis factor alpha-expressing recombinant of herpes simplex virus type-1 results in more rapid destruction and increased viral replication in the retina of the

uninoculated eye. *J Virol* 82:5068-5078, 2008. PMID: PMC2346751

Zheng M, **Fields MA**, Liu Y, Cathcart HM, Richter E, and Atherton SS. Neutrophils protect the retina of the injected eye from infection after anterior chamber inoculation of HSV-1 in BALB/c mice. *Invest Ophthalmol Vis Sci* 49:4018-4025, 2008. PMID: PMC4018730

Cathcart HM, **Fields MA**, Zheng M, Marshall B, and Atherton SS. Infiltrating cells and IFN-gamma production in the injected eye after unioocular anterior chamber inoculation of HSV-1. *Invest Ophthalmol Vis Sci* 50:2269-2275, 2009. PMID: PMC4024191

Cai H, **Fields MA**, Hoshino R, and Del Priore LV. Effects of aging and anatomic location on gene expression in the human retina. *Front Aging Neurosci* 4:1-20, 2012. PMID: PMC3364488

Fields MA, Cai H, Bowrey HE, Moreira EF, Beck Gooz M, Kunchithapautham K, Gong J, Vought E, and Del Priore LV. Nitrite-modification of extracellular matrix alters CD46 expression and VEGF release in human retinal pigment epithelium. *Invest Ophthalmol Vis Sci* 56:4231-4238, 2015. PMID: PMC4703405

Fields MA, Gong J, Moreira EF, Bowrey HE, Gooz M, Ablonczy Z, and Del Priore LV. Differentiation of human protein-induced pluripotent stem cells toward a retinal pigment epithelial cell fate. *PLoS One* 10:e143272, 2015. PMID: PMC46659559

Moreira EF, Cai H, Tezel TH, **Fields MA**, and Del Priore LV. Reengineering human Bruch's membrane increases rod outer segment phagocytosis by human retinal pigment epithelium. *Transl Vis Sci Technol* 4:10, 2015. PMID: PMC4633034

Fields MA, Bowrey HE, Gong J, Ablonczy Z, and Del Priore LV. Retinoid processing in induced pluripotent stem cell-derived retinal pigment epithelium cultures. *Prog Mol Biol Transl Sci* 134:477-490, 2015. PMID: 263100172

Fields MA, Cai H, Gong J, and Del Priore LV. Potential of induced pluripotent stem cell (iPSC) for treating age-related macular degeneration (AMD). *Cells* 2016, 5(4), 44; PMID: 27941641

Fields MA, Bowrey HE, Gong J, Moreira EF, Cai H, and Del Priore LV. Extracellular Matrix Nitration Alters Growth Factor Release and Activates Bioactive Complement in Human Retinal Pigment Epithelium. (Manuscript submitted, 2016)

BOOK CHAPTERS

Fields MA, Hwang J, Gong J, and Del Priore LV. The eye as a target organ for stem cell therapy. *IN Stem Cell Biology and Regenerative Medicine in Ophthalmology*, Springer: New York, 1:1-30, 2013.

Fields MA, Bowrey H, Gong J, Ablonczy Z, and Del Priore LV. Retinoid processing in induced pluripotent stem-cell-derived retinal pigment epithelium cultures. *IN Molecular Biology of Eye Disease: Progress in Molecular Biology and Translational Science*, Nickerson, JM, Hejtmancik, JF, Eds., Elsevier: Atlanta, 134:478-487, 2015.

PRESENTATION ABSTRACTS

Fields MA, Archin NM, Zheng M, and Atherton SS. The role of tumor necrosis factor-alpha (TNF- α) in the eyes and brain of HSV-1 infected BALB/c mice. *Invest Ophthalmol Vis Sci* 44:E-Abstract PN 4633, 2003.

Fields MA, Qian H, Zheng M, Patel N, and Atherton SS. The role of tumor necrosis factor-alpha (TNF- α) in the eyes and brain of HSV-1 infected BALB/c mice. Annual Biomedical Research Conference for Minority Students, 2003.

Fields MA, Qian H, Zheng M, Patel N, and Atherton SS. Tumor necrosis factor-alpha (TNF- α) and macrophages in the brain of HSV-1 infected BALB/c mice. *Invest Ophthalmol Vis Sci* 45:E-Abstract PN 2261, 2004.

Fields MA, Qian H, Zheng M, Patel N, and Atherton SS. Tumor necrosis factor-alpha (TNF- α) and macrophages in the brain of HSV-1 infected BALB/c mice. Graduate Research Day, Medical College of Georgia, 2004.

Zheng M, Li H, Qian H, **Fields MA**, Yu FS, and Atherton SS. Involvement of toll-like receptor 7 (TLR7) in the pathogenesis of HSV-1-induced acute retinal necrosis. *Invest Ophthalmol Vis Sci* 45:E-Abstract PN 1649, 2004.

Zheng M, Nnadozie DC, **Fields MA**, and Atherton SS. Toll-like receptor 3, 7, 9 upregulation and TNF- α expression in response to HSV-1 infection in the murine brain. International Herpes Virus Workshop, 2004.

Fields MA, Qian H, Zheng M, Patel N, and Atherton SS. Tumor necrosis factor-alpha (TNF- α) and macrophages in the brain of HSV-1 Infected BALB/c mice. *Invest Ophthalmol Vis Sci* 45:E-Abstract PN 2261, 2004.

Fields MA, Qian H, Zheng M, Patel N, and Atherton SS. Tumor necrosis factor-alpha (TNF- α) and macrophages in the brain of HSV-1 infected BALB/c mice. International Herpes Virus Workshop, 2004.

Atherton SS, **Fields MA**, Zheng M, and Zhang M. TNF-alpha, macrophages, and virus spread in the SCN. *Invest Ophthalmol Vis Sci* 46:E-Abstract PN 3539, 2005.

Fields MA, Zheng, M, Zhang, M, and Atherton SS. Tumor necrosis factor-alpha (TNF- α) and macrophages in the brain of HSV-1 infected BALB/c mice. Graduate Research Day, Medical College of Georgia, 2005.

Zheng M, **Fields MA**, Marshall B, and Atherton SS. Toll-like receptor 4 (TLR4)-mediated cell survival promotes HSV-1-induced murine ARN. *Invest Ophthalmol Vis Sci* 46:E-Abstract PN 2791, 2005.

Zheng, M., **Fields MA**, and Atherton SS. Does toll-like receptor 4 (TLR4) facilitate virus spread following anterior chamber inoculation of HSV-1? International Herpes Virus Workshop, 2005.

Fields MA, Zheng M, Wall P, and Atherton SS. Spread of virus after anterior chamber inoculation of a recombinant of HSV-1 expressing tumor necrosis factor alpha (TNF- α). International

Herpes Virus Workshop, 2005.

Fields MA, Zheng M, Wall P, and Atherton SS. Spread of virus after anterior chamber inoculation of a recombinant of HSV-1 expressing tumor necrosis factor-alpha (TNF- α). *Invest Ophthalmol Vis Sci* 47:E-Abstract PN 3046, 2006.

Zheng M, **Fields MA**, Liu Y, Gilbert G, and Atherton SS. How does toll-like receptor (TLR4) facilitate virus spread following anterior chamber (AC) inoculation of HSV-1? International Herpes Virus Workshop, 2006.

Cathcart HM, **Fields MA**, Zheng M, Marshall B, and Atherton SS. Interferon-gamma (IFN-Gamma) production in the injected eye following anterior chamber inoculation of HSV-1. International Herpes Virus Workshop, 2006.

Zheng M, **Fields MA**, Liu Y, Richter E, Cathcart H, and Atherton SS. Neutrophil-mediated virus spreading after herpes simplex virus Type 1 (HSV-1) infection of the murine anterior chamber. *Invest Ophthalmol Vis Sci* 48:E-Abstract PN 708, 2007.

Fields MA, Zheng M, Wall P, and Atherton SS. Spread of virus after anterior chamber inoculation of a recombinant of HSV-1 expressing tumor necrosis factor-alpha (TNF- α). *Invest Ophthalmol Vis Sci* 48:E-Abstract PN 703, 2007.

Atherton SS, and **Fields MA**, Increased replication and destruction in the retina of eyes infected with a TNF- α expressing recombinant of HSV-1. *Invest Ophthalmol Vis Sci* 49:E-Abstract PN 2827, 2008.

Fields MA, Vickers L, Cai H, Gong J, Tsang S, and Del Priore LV. Identification of transcription factors involved in murine stem cell differentiation into neural retina and photoreceptor cells. *Invest Ophthalmol Vis Sci* 50:E-Abstract PN 483, 2009.

Vickers LA, **Fields M**, Cai H, Gong J, and Del Priore LV. Over-expression of NRL and NeuroD1 induces human RPE transdifferentiation into photoreceptor precursors. *Invest Ophthalmol Vis Sci* 50:E-Abstract PN 1286, 2009.

Atherton SS, Liu Y, Zheng M, **Fields MA**, and Cathcart HM. TNF α expressing HSV-1 recombinant promotes apoptosis in inflammatory and retinal parenchymal cells during acute retinal necrosis. *Invest Ophthalmol Vis Sci* 50:E-Abstract PN 4286, 2009.

Gong J, Cai H, Liu TY, **Fields MA**, and Del Priore LV. Use of Wnt and Nodal inhibitors to induce embryonic stem cell differentiation into retinal pigment epithelium (RPE). *Invest Ophthalmol Vis Sci* 50:E-Abstract PN 1270, 2009.

Cai H, Vickers LA, Gong J, **Fields M**, Cai H, Roh YJ, and Del Priore LV. Identification of transcription factors critical for murine stem cell differentiation into retinal pigment epithelium. *Invest Ophthalmol Vis Sci* 50:E-Abstract PN 1744, 2009.

Fields MA, Vickers L, Cai H, Gong J, Tsang S, and Del Priore L. *Ex vivo* gene expression of retinal differentiation transcription factors induces a photoreceptor phenotype in mouse neural and embryonic stem cells. *Invest Ophthalmol Vis Sci* 51:E-Abstract PN 2661, 2010.

Cai H, **Fields MA**, and Del Priore LV. CD46 transfection leads to changes in the expression of the critical

transcription factor, MITF, in RPE. *Invest Ophthalmol Vis Sci* 51:E-Abstract PN 1678, 2010.

Gong J, **Fields MA**, Tosi J, Kong J, Tsang SH, Cai H, and Del Priore LV. Subretinal murine stem cell transplantation in the PDE6-beta-related mouse model of retinitis pigmentosa. *Invest Ophthalmol Vis Sci* 51:E-Abstract PN 5256, 2010.

Gong J, **Fields MA**, Cai H, Tsang SH, and Del Priore LV. Extracellular matrix promotes embryonic stem cell differentiation toward a retinal progenitor fate. *Invest Ophthalmol Vis Sci* 52:E-Abstract PN 2255, 2011.

Fields MA, Vickers L, Cai H, Gong J, Tsang S, and Del Priore LV. Expression of transcription factors involved in murine stem cell differentiation induces photoreceptor phenotypes in mouse embryonic stem cells. *Invest Ophthalmol Vis Sci* 52:E-Abstract PN 5990, 2011.

Cai H, **Fields MA**, and Del Priore LV. CD46-mediated infection of human retinal pigment epithelium (RPE) with human adenovirus Serotype-3 (HAdV3) induces RPE death. *Invest Ophthalmol Vis Sci* 52:E-Abstract PN 5473, 2011.

Gong J, **Fields MA**, and Del Priore. Differentiation of human protein induced pluripotent stem cells (piPS) toward a retinal pigment epithelium (RPE) Fate. *Invest Ophthalmol Vis Sci* 54:E-Abstract PN 4053, 2013.

Gong J, **Fields MA**, Moreira E, Bowrey H, Kautolos Y, Ablonczy Z, and Del Priore. Functional analysis of human induced pluripotent stem cell-derived retinal pigment epithelium. *Invest Ophthalmol Vis Sci* 55:E-Abstract PN 4053, 2014.

Bowrey HE, Jones EE, Crouch RK, **Fields MA**, Del Priore LV, and Ablonczy Z. (2014). Identification of Bruch's membrane composition by imaging mass spectrometry. The Association for Mass Spectrometry: Applications to the Clinical Laboratory, Salzburg, Austria, 2014.

Del Priore LV, Gong J, Moreira EF, Bowrey H, Ablonczy Z, **Fields MA**. Generation of human stem cells from AMD patients. 38th Annual Macula Society Meeting, 2015.

Fields M, Cai H, Bowrey H, Moreira E, Kunchithapautham K, Gong J, Del Priore LV. Bruch's membrane aging reduces CD46 expression and enhances VEGF secretion in RPE: Implications for age-related macular degeneration. *Invest Ophthalmol Vis Sci* 56:E-Abstract PN 2400, 2015.

Moreira E, Cai H, Tezel TH, **Fields MA**, and Del Prior LV. Reengineering human Bruch's membrane increases rod outer segment phagocytosis by human retinal pigment epithelium. *Invest Ophthalmol Vis Sci* 56:E-Abstract PN 2343, 2015.

Gong J, **Fields MA**, Moreira E, Bowrey H, Kautolos Y, Ablonczy, Z, and Del Priore LV. Mitochondrial metabolism and structural analysis of induced pluripotent stem cell (iPSC) derived RPE from age-related macular degeneration (AMD) patients. *Invest Ophthalmol Vis Sci* 56:E-Abstract PN 3580, 2015.

Del Priore LV, Gong J, Moreira EF, Bowrey H, Ablonczy Z, and **Fields MA**. Characterization of human stem cells generated from AMD patients. *Invest Ophthalmol Vis Sci* 56:E-Abstract PN 3173, 2015.

Bowrey HE, Jones EE, **Fields M**, Crouch RK, Del Priore LV, and Ablonczy Z. Multimodal molecular imaging of Bruch's membrane can predict age and macular degeneration. *Invest Ophthalmol Vis Sci* 56:E-Abstract PN 3992, 2015.

Moreira EF, Gong J, Rosendahl S, Barrett A, **Fields MA**, Ablonczy Z, Rohrer B, Del Priore LV. Altered transepithelial resistance of induced pluripotent stem cell-derived retinal pigment epithelium obtained from age-related macular degeneration (AMD) patients. *Invest Ophthalmol Vis Sci* 56:E-Abstract PN 6034, 2016.

Fields MA, Bowrey HE, Gong J, Moreira EF, Del Priore LV. Extracellular Matrix Nitration Alters Growth Factor Release and Activates Bioactive Complement in Human Retinal Pigment Epithelium. Association for Research in Vision and Ophthalmology (ARVO), Baltimore, MD., May 2017.

Cai H, **Fields MA**, Gong J, Del Priore LV. CFH and CD46 Knockdown Alters Genes Involving Cell Apoptosis, Adhesion, Immune System Processing and Melanin Synthesis in Human Retinal Pigment Epithelium (RPE): a comparative study. Association for Research in Vision and Ophthalmology (ARVO), Baltimore, MD., May 2017.

CURRENT RESEARCH INTERESTS

Currently, there is no sight-restoring therapy available for patients with geographic atrophy (GA) in advanced age-related macular degeneration (AMD). AMD is already a major public health problem in the Western world and will become more of a health problem with the aging of our population. Despite advances in the treatment of wet AMD, there are no effective treatments to reverse the loss of vision in advanced GA. Postmortem studies of eyes with advanced GA demonstrate there is extensive loss of the retinal pigment epithelium (RPE) early in this disease. In patients with advanced GA, reconstruction of the ocular anatomy will require repopulation of the atrophic area with new cells, including RPE cells. In principle there are several potential sources for donor RPE cells, including adult RPE, fetal RPE, immortalized RPE (i.e., ARPE-19 cells), and either embryonic stem cells or induced pluripotent stem cells (iPSC) differentiated towards an RPE fate. Of these choices, only the use of patient-specific iPSC generated from somatic cells of the potential transplant recipients with GA, will circumvent the problem of graft rejection.

The overall purpose of this work is to generate patient-specific iPSCs from individuals with advanced GA, differentiate these iPSCs toward an RPE fate, determine the ability of these iPSC-derived RPE to function as RPE in vitro and restore function in animal models of RPE dysfunction. Initially, iPSCs will be obtained from two sources: commercially available iPSCs that will be used for initial proof of principle studies, and iPSCs generated from skin biopsies of elderly patients with GA to generate patient-specific iPSC-derived RPE for therapeutic transplantation.

In summary, age-related macular degeneration (AMD) is the leading cause of blindness in the United

States and Western Europe and will become more of a health problem as those populations age. There is extensive loss of the native RPE cells in patients with advanced GA and no known treatment to reverse vision loss in this disorder. Restoration of vision in GA will require cell replacement; use of patient specific, iPSC-derived human RPE will avoid graft rejection or the need for systemic immune suppression.