

## CURRICULUM VITAE

LEONID E. LERNER, M.D., PH.D.

### A. PERSONAL INFORMATION

Academic Position: Assistant Professor  
Diseases and Surgery of the Retina and Vitreous  
Departments of Ophthalmology and Biological Chemistry  
University of California, Irvine School of Medicine

Academic Office: Department of Ophthalmology  
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Board Certification: Diplomat, American Board of Ophthalmology, 2005

Foreign Languages: Russian, Spanish

### B. EDUCATION

Moscow Medical & Dental School, Moscow, Russia - M.D., Medicine, 1983 – 1989

UCLA Molecular Biology Institute (EyeSTAR program), Los Angeles, CA – Ph.D., 1996 – 2002

### CLINICAL POSTDOCTORAL TRAINING:

Intern, Department of Internal Medicine, Los Angeles County - University of Southern California Medical Center, University of Southern California School of Medicine, Los Angeles, CA, 1994 – 1995

Resident in Ophthalmology, Jules Stein Eye Institute, UCLA School of Medicine, Los Angeles, CA, 1999 – 2002

Fellow, Vitreoretinal Diseases & Surgery, Cole Eye Institute, Cleveland Clinic Foundation, Cleveland, OH, 2002 – 2004  
Preceptor: Dr. Hilel Lewis (Director, Cole Eye Institute)

### RESEARCH FELLOWSHIPS:

Clinical Electrophysiology, Department of Ophthalmology, California Pacific Medical Center & Smith-Kettlewell Eye Research Institute, San Francisco, CA, 1991 – 1992

Cell Biology, Department of Pathology & Ophthalmology, University of California, San Francisco School of Medicine, San Francisco, CA, 1992 – 1994

Cell Biology, Departments of Pathology & Ophthalmology, University of California, San Francisco School of Medicine, San Francisco, CA, 1995 – 1996

#### **DOCTORAL DISSERTATION:**

“An Array of Transcriptional Components Regulates the Expression of the Rod-Specific cGMP-Phosphodiesterase  $\beta$ -subunit Gene,” University of California, Los Angeles, 2002.

#### **SCHOLASTIC AWARDS (Selected):**

*Specialty Training and Advanced Research Award*, UCLA School of Medicine, Los Angeles, CA 1996

*Best Research Paper by an Ophthalmology Resident in Southern California* – Dr. Henry & Lillian Nesburn Award, Southern California Society of Ophthalmology, 1997

*Jules Stein Eye Institute Resident Recognition Award* – Laboratory Research, UCLA School of Medicine, Los Angeles, CA, 2001

*Molecular Biology Institute Excellence in Graduate Research* (Award Nomination): “An Array of Molecular Events Regulates Rod-Specific cGMP-PDE  $\beta$ -subunit Gene Expression,” University of California, Los Angeles, 2002

#### **CONTRACTS/GRANTS/CLINICAL TRIALS:**

##### **GRANTS (FUNDED):**

1. Research Fellowship Grant, The Chartrand Eye Research Foundation, 1995 – 1996.
2. Primary Investigator, “Non-invasive Approach to Gene Therapy of Retinitis Pigmentosa,” Jules Stein Alumni Association Grant, 1998 – 1999.
3. Primary Investigator, “Transcriptional Regulation of the  $\beta$ -subunit of cGMP-PDE,” NIH K08 EY00367. Mentor: Dr. Debora B. Farber, 1997 – 2000.
4. Co-Primary Investigator, “Phosphodiesterases in Retinal Metabolism and Disease,” NIH R01 EY02651, Primary Investigator: Dr. Debora B. Farber, 1999 – 2004.
5. Mentored Awardee, “Identification of Control Mechanisms for the Retina-Enriched *Sp4* Gene,” NIH K12 EY015398, Mentor: Dr. Eric A. Pierce, Primary Investigator: Dr. Maureen Maguire, 2004 – 2005.
6. Primary Investigator, UC Irvine School of Medicine Funds, 2006 – 2009.

7. Primary Investigator, "Pre-Clinical Evaluation of Safety and Efficacy of Adult Peripheral Blood-Derived CD34+ Stem Cells in Rescuing Retinal Damage", Baxter Healthcare Award, 2008-2009.

## **C. PROFESSIONAL BACKGROUND**

### **FACULTY APPOINTMENTS:**

Instructor in Vitreoretinal Disease and Surgery, Scheie Eye Institute, University of Pennsylvania Medical School, 2004 – 2006

Assistant Professor, Department of Ophthalmology, Gavin Herbert Eye Institute, University of California, Irvine, 2006 – present

Assistant Professor, Department of Biological Chemistry, School of Medicine, University of California, Irvine, 2006 – present

### **STAFF PRIVILEGES:**

Attending Staff, Department of Ophthalmology, University of California, Irvine Medical Center, Orange, California

Attending Staff, Department of Ophthalmology, Veterans Administration Medical Center, Long Beach, California

### **TEACHING EXPERIENCE:**

Organizer and Moderator: Regulation of Gene Expression, Special Interest Group, ARVO, Fort Lauderdale, FL, 2003

Faculty: Gene Therapy of Age-Related Macular Degeneration, 4<sup>th</sup> Annual Retina Summit, Cole Eye Institute, Cleveland Clinic Foundation, Cleveland, OH, 2003

Faculty: Diabetes Control and Diabetic Retinopathy, Update on Diabetic Retinopathy: Current Knowledge, New Developments and Case Presentations, Cole Eye Institute, Cleveland Clinic Foundation, Cleveland, OH, 2003

Moderator: Gene Regulation and Transcription, Paper Session, ARVO, Fort Lauderdale, FL, 2005

Organizer and Moderator: Regulation of Gene Expression in the Eye, Special Interest Group, ARVO, Fort Lauderdale, FL, 2005

Co-moderator: Retinopathy of Prematurity (ROP), Basic Science Course, Scheie Eye Institute, University of Pennsylvania, Philadelphia, PA, 2006

Moderator: University of California, Irvine Colloquium: Cystoid Macular Edema, 2006

Preceptor: Patient-Doctor II Clinic Course, University of California, Irvine School of

Medicine, Irvine, CA, 2007

#### **D. SOCIETY MEMBERSHIPS**

Association for Research in Vision and Ophthalmology, 1994 - present  
American Academy of Ophthalmology, 2001 - present

#### **EDITORIAL POSITIONS:**

Referee, Experimental Eye Research, 1996 – present  
Referee, American Journal of Ophthalmology, 2004 - present  
Referee, Retina, 2005 - present  
Referee, Molecular and Cellular Biology, 2005 – present

#### **E. RESEARCH ACTIVITIES**

##### **RESEARCH AND CLINICAL INTERESTS:**

Age-related macular degeneration  
Diabetic retinopathy  
Retinal reattachment surgery for primary and complicated retinal detachments, macular hole and epiretinal membrane surgery  
Subretinal and intracameral hr-TPA injections  
Medical and surgical treatment of macular edema  
Stem cell biology and retinal/RPE regeneration

#### **F. CORPORATE RELATIONS:**

None

#### **G. PUBLICATIONS (Selected):**

##### **Peer-Reviewed Publications**

1. Di Polo A, **Lerner LE**, and Farber DB: Transcriptional Activation of Human Rod cGMP-Phosphodiesterase  $\beta$ -Subunit Gene is Mediated by an Upstream AP-1 Element, Nucleic Acid Res., Vol. 25(19), 3863-7, 1997.
2. **Lerner LE**, Polansky JR, Howes EL, and Stern R: Hyaluronan in the Human Trabecular Meshwork, Invest. Ophthalmol. Vis. Sci., Vol. 38(6), 1222-1229, 1997.
3. **Lerner LE**, Schwartz DM, Hwang DG, Howes EL, and Stern R: Hyaluronan and CD44 in the Human Cornea and Limbal Conjunctiva, Exp. Eye Res., Vol. 67(4), 481-484, 1998.
4. **Lerner LE**, and Farber DB: Transcriptional Regulation of the cGMP-Phosphodiesterase  $\beta$ -Subunit Gene, Methods Enzymol., Vol. 315, 617-635, 2000.

5. **Lerner LE**, Gribanova YE, Ji M, Knox BE, and Farber DB: Nrl and Sp Nuclear Proteins Mediate Transcription of Rod-Specific cGMP-Phosphodiesterase  $\beta$ -subunit: Involvement of Multiple Response Elements, *J. Biol. Chem.*, Vol. 276(37), 34999-35007, 2001.
6. **Lerner LE**, Gribanova YE, Whitaker L, Knox BE, and Farber DB: The Rod cGMP-Phosphodiesterase  $\beta$ -subunit Promoter is a Specific Target for Sp4 and is not Activated by Other Sp Proteins or CRX, *J. Biol. Chem.*, Vol. 277(29), 25877-83, 2002.
7. Kuchtey R, Perry JD, and **Lerner LE**: Buccal fat pad hemorrhage after retrobulbar injection, *Am. J. Ophthalmol.*, Vol. 137(6):1131-2, 2004.
8. **Lerner LE**, Peng G-H, Gribanova YE, Chen S, and Farber DB: Sp4 is Expressed in Retinal Neurons, Activates Transcription of Photoreceptor-Specific Genes and Synergizes with Crx, *J. Biol. Chem.*, Vol. 280(21), 20642-50, 2005.
9. Gold B, Merriam JE, ... **Lerner LE**, et al.: Variation in the Factor B (BF) and Complement Component 2 (C2) Genes in the MHC Class III Locus is Associated with Age-related Macular Degeneration, *Nat. Genet.*, Vol. 38(4), 458-62, 2006.
10. **Lerner LE**, Piri N, and Farber DB: Transcriptional and Post-transcriptional Regulation of the Rod cGMP-Phosphodiesterase  $\beta$ -subunit Gene. *Recent Advances and Current Concepts*, *Adv. Exp. Med. Biol.*, Vol. 572, 217-29, 2006.

### **Book Chapters**

1. R.L. Stamper and **L.E. Lerner**: Psychophysical Techniques in Glaucoma. In: "The Glaucomas", R. Ritch, B.M. Shields, and T. Krupin, eds., Vol. 1, Chapter 31; Mosby, St. Louis, 1995.
2. D.B. Farber **L.E. Lerner**, and A.S. Viczian: Transient Transfection of Human Retinoblastoma Cells: Application to the Analysis of the Regulatory Regions of Photoreceptor-Specific Genes. In "Methods In Molecular Medicine: Vision Research Protocols", P.E. Rakoczy, ed., Vol. 47, Humana Press Inc., Totowa, NJ, pp. 31-43, 2000.
3. D.B. Farber, **L.E. Lerner**, Y.E. Gribanova, M.R. Verardo and N.I. Piriev: THE cGMP-PHOSPHODIESTERASE  $\beta$ -SUBUNIT GENE: Transcriptional and Post-Transcriptional Regulation. In "New Insights Into Retinal Degenerative Diseases", R.E. Anderson, M.M. LaVail and J.G. Hollyfield, eds., Kluwer Academic/Plenum Publishers, pp. 255-267, 2001.
4. **L.E. Lerner** and H. Lewis: Ophthalmologic Disorders. In "Clinical Preventive Medicine", R.S. Lang and D.D. Hensrud, eds., American Medical Association Press, Chapter 61, 711-723, 2004.
5. **L.E. Lerner**, N.I. Piriev and D.B. Farber: TRANSCRIPTIONAL AND POST-TRANSCRIPTIONAL REGULATION OF THE ROD cGMP-PHOSPHODIESTERASE  $\beta$ -SUBUNIT GENE: *Recent Advances and Current*

Concepts. In "New Insights Into Retinal Degenerative Diseases", R.E. Anderson, M.M. LaVail and J.G. Hollyfield, eds., Kluwer Academic/Plenum Publishers, 2005.

6. E.L. Ufret-Vincenty, **L.E. Lerner** and P.K. Kaiser: Non-exudative Age-Related Macular Degeneration. In "Retinal Imaging", Huang D. et al., eds., Mosby, St. Louis, in press, 2006.

### **Abstracts**

1. M.A. Goldberg, N. McNamara, **L.E. Lerner**, L. Rosenblum, D. Park, N. Nguyen, R.L. Abbott and B. Levy: *The Effect of Diclofenac Sodium (Voltaren) on Hypoxia Induced Corneal Edema and Recovery in Humans*, Invest. Ophthalmol. Vis. Sci, Vol. 34, No. 4, p. 1009, #1502, 1993.
2. R. Stern, D.G. Hwang, E.L. Howes, S. Shuster, P. Gakunga and **L.E. Lerner**: *Immunohistochemical Localization of Hyaluronic Acid, Hyaluronidase and CD44 in Human Cornea*, Invest. Ophthalmol. Vis. Sci., Vol. 35, No. 4, p. 1600, #1605, 1994.
3. **L.E. Lerner**, J.R. Polansky, D.J. Fauss and R. Stern: *Hyaluronidase and Other Hyaluronate Binding Proteins in Human Trabecular Meshwork*, Invest. Ophthalmol. Vis. Sci., Vol. 35, No. 4, p. 1846, #2730, 1994.
4. S.D. Carrington, S.J. Hicks, C. Goodall, **L.E. Lerner** and A.P. Corfield: *Canine Ocular Surface Epithelia Secrete Hyaluronan*, Invest. Ophthalmol. Vis. Sci., Vol. 37, No. 4, 1996.
5. **L.E. Lerner** and D.B. Farber: *Transcriptional Regulation of the  $\beta$ -subunit of Human Rod-specific cGMP Phosphodiesterase Gene*, Invest. Ophthalmol. Vis. Sci., Vol. 38, No. 4, #5297, 1997.
6. **L.E. Lerner**, K.G. Griбанова and D.B. Farber: *Is the 5'-Untranslated Region Involved in the Regulation of Expression of the  $\beta$ -Subunit of Human Rod-Specific cGMP Phosphodiesterase Gene?*, Invest. Ophthalmol. Vis. Sci., Vol. 39, No. 4, #3106, 1998.
7. **L.E. Lerner**, K.G. Griбанова and D.B. Farber: *A Control Element Critical for the Transcription of Human Rod cGMP-PDE  $\beta$ -Subunit Gene*, Invest. Ophthalmol. Vis. Sci., Vol. 41, No. 4, #2063, 2000.
8. Y.G. Griбанова, **L.E. Lerner**, B.E. Knox and D.B. Farber: *A Novel Element in the TATA/Inr-less Rod-Specific cGMP-PDE  $\beta$ -subunit Gene*, Invest. Ophthalmol. Vis. Sci., Vol. 42, No. 4, #1903, 2001.
9. **L.E. Lerner**, Y.G. Griбанова, B.E. Knox and D.B. Farber: *Transcriptional Events Regulating Rod-Specific cGMP-PDE  $\beta$ -subunit Gene Expression: Involvement of Nrl and Sp Transcription Factors*, Invest. Ophthalmol. Vis. Sci., Vol. 42, No. 4, #1900, 2001.
10. **L.E. Lerner**, K.G. Griбанова and D.B. Farber: *Interplay between Members of the Sp Family of Transcription Factors Regulates the Expression of Rod-Specific cGMP-PDE  $\beta$ -subunit Gene*, Invest. Ophthalmol. Vis. Sci., Vol. 43, No. 4, #3636, 2002.

11. E.H. Souied, S. Reid, S. Nusinowitz, A. Kanimura, N. Piriev, **L.E. Lerner** and D.B. Farber: *Gene Transfer Into the Mouse Retina Using Iontophoresis*, Invest. Ophthalmol. Vis. Sci., Vol. 43, No. 4, #2891, 2002.
12. **L.E. Lerner**, Y.E. Gribanova and D.B. Farber: *Transcription factors of the Sp family synergize with both Nrl and Crx, and regulate the expression of multiple retina-specific genes*, Invest. Ophthalmol. Vis. Sci., Vol. 44, No. 4, #3535, 2003.
13. G.-H. Peng, **L.E. Lerner**, Y.E. Gribanova, S. Chen and D.B. Farber: *Interaction between Crx and the Sp family of transcription factors regulates the expression of photoreceptor genes*, Invest. Ophthalmol. Vis. Sci., Vol. 44, No. 4, #3542, 2003.
14. S.J. Bakri, P.K. Kaiser and **L.E. Lerner**: *Twelve-month visual acuity outcomes after posterior subtenon triamcinolone acetonide injections for diabetic macular edema*, Invest. Ophthalmol. Vis. Sci., Vol. 45, #3464, 2004.
15. **L.E. Lerner**, Y.E. Gribanova, H. Khanna, J.S. Friedman, A. Swaroop and D.B. Farber: *DNA-Binding Domains of Sp4 and Nrl Transcription Factors are Required for Sp4-Nrl Functional Synergy on the  $\beta$ -PDE Gene Promoter*, Invest. Ophthalmol. Vis. Sci., Vol. 45, #645, 2004.
16. **L.E. Lerner**, G.-H. Peng, Y.E. Gribanova, S. Chen and D.B. Farber: *Transcription Factor Sp4 is Abundantly Expressed in Photoreceptors and Other Retinal Neurons and Together With Crx Co-Occupies the Promoters of Rod-Specific Opsin and  $\beta$ -PDE Genes*, Invest. Ophthalmol. Vis. Sci., Vol. 46, #2394, 2005.

#### **Presentations at Scientific/Clinical Meetings**

1. Immunohistochemical Localization of Hyaluronic Acid, Hyaluronidase and CD44 in Human Cornea, ARVO, Sarasota, FL, 1994. Poster.
2. Hyaluronidase and Other Hyaluronate Binding Proteins in Human Trabecular Meshwork, ARVO, Sarasota, FL, 1994. Poster.
3. Transcriptional Regulation of the  $\beta$ -subunit gene of Human Rod-specific cGMP-Phosphodiesterase Gene, ARVO, Fort Lauderdale, FL, 1997. Poster.
4. Response Elements Involved in the Regulation of Transcription of the Rod-specific cGMP-Phosphodiesterase  $\beta$ -subunit Gene, UCLA Research Retreat, Department of Ophthalmology and Jules Stein Eye Institute, Los Angeles, CA, 1997. Platform Presentation.
5. Characterization of Response Elements in the Regulatory Region of the Rod-specific cGMP-Phosphodiesterase  $\beta$ -subunit Gene, UCLA Research Retreat, Department of Ophthalmology and Jules Stein Eye Institute, Lake Arrowhead, CA, 1997. Platform Presentation.

6. Is the 5'-Untranslated Region Involved in the Regulation of Expression of the  $\beta$ -subunit of Human Rod-Specific cGMP-Phosphodiesterase Gene? ARVO, Fort Lauderdale, FL, 1998. Platform Presentation.
7. Mutational Analysis of the 5'-Untranslated Region of the Rod-Specific cGMP-Phosphodiesterase  $\beta$ -subunit Gene, UCLA Research Retreat, Department of Ophthalmology and Jules Stein Eye Institute, Lake Arrowhead, CA, 1998. Platform Presentation
8. Analysis of the 5'-Untranslated and Flanking Regions of Human Rod-Specific cGMP-Phosphodiesterase  $\beta$ -subunit Gene, Annual Research and Alumni Symposium, Jules Stein Eye Institute, Los Angeles, CA, 1999. Platform Presentation.
9. Protein-DNA Interactions at the 5'-Untranslated and Flanking Regions are Involved in the Regulation of Human Rod-Specific cGMP-Phosphodiesterase  $\beta$ -Subunit Gene, UCLA Research Retreat, Department of Ophthalmology and Jules Stein Eye Institute, Lake Arrowhead, CA, 1999. Platform Presentation.
10. A Control Element Critical for the Transcription of Human Rod cGMP-PDE  $\beta$ -Subunit Gene, Annual Research and Alumni Symposium, Jules Stein Eye Institute, Los Angeles, CA, 2000. Platform Presentation.
11. Response Element in the Proximal Promoter Region is Critical for the Transcription of Human Rod cGMP-PDE  $\beta$ -Subunit Gene, UCLA Research Retreat, Department of Ophthalmology and Jules Stein Eye Institute, Lake Arrowhead, CA, 2000. Platform Presentation.
12. Transcriptional Events Regulating Rod-Specific cGMP-PDE  $\beta$ -subunit Gene Expression: Involvement of Nrl and Sp Transcription Factors, ARVO, Fort Lauderdale, FL, 2001. Poster.
13. Multiple Response Elements Mediate Rod-Specific cGMP-PDE  $\beta$ -subunit Gene Expression, Annual Research and Alumni Symposium, Jules Stein Eye Institute, Los Angeles, CA, 2001. Platform Presentation.
14. Multiple Transcription Factors Including Nrl and Sp4 Regulate Transcription of Rod-Specific cGMP-PDE  $\beta$ -subunit Gene, UCLA Research Retreat, Department of Ophthalmology and Jules Stein Eye Institute, Lake Arrowhead, CA, 2001. Platform Presentation.
15. Interplay between Members of the Sp Family of Transcription Factors Regulates the Expression of Rod-Specific cGMP-PDE  $\beta$ -subunit Gene, ARVO, Fort Lauderdale, FL, 2002. Poster.
16. Sp1 and Sp4 Interact with Crx and Regulate the Expression of the Rhodopsin Gene, Annual Research and Alumni Symposium, Jules Stein Eye Institute, Los Angeles, CA, 2002. Platform Presentation.

17. Gene Therapy of Age-Related Macular Degeneration, 4<sup>th</sup> Annual Retina Summit, Cole Eye Institute, Cleveland Clinic Foundation, Cleveland, OH, 2003. Platform Presentation.
18. Molecular Interactions Involved in the Regulation of the Rod-Specific cGMP-Phosphodiesterase  $\beta$ -subunit Gene, Annual Research Symposium, Cole Eye Institute, Cleveland, OH, 2003. Platform Presentation.
19. Transcription Factors of the Sp Family Synergize with both Nrl and Crx, and Regulate the Expression of Multiple Retina-specific Genes, ARVO, Fort Lauderdale, FL, 2003. Poster.
20. Combinatorial Regulation of Transcription of Photoreceptor-specific Genes: Involvement of Members of the Sp Family of Transcriptional Regulators, ARVO Special Interest Group, 2003. Platform Presentation.
21. DNA-Binding Domains of SP4 and Nrl Transcription Factor are Required for SP4-Nrl Functional Synergy on the  $\beta$ -PDE Gene Promoter, ARVO, Fort Lauderdale, FL, 2004. Poster.
22. Transcription Factor SP4 is Abundantly Expressed in Photoreceptors and Other Retinal Neurons and Together With Crx Co-Occupies the Promoters of Rod-Specific Opsin and  $\beta$ -PDE Genes, ARVO, Fort Lauderdale, FL, 2005. Platform Presentation.

### **Invited Speaker**

1. University of California, Los Angeles (symposium honoring Nobel Laureate Dr. Louis Ignarro) (March 2000): “Molecular Regulation of Photoreceptor-Specific Genes”.
2. Johns Hopkins University, Wilmer Ophthalmologic Institute (October 2003): “Combinatorial Transcriptional Regulation of Retina-Specific Genes”.
3. University of Pennsylvania, Scheie Eye Institute (February 2004): “Molecular Regulation of Retina-Specific Genes”.
4. Columbia University, Edward Harkness Eye Institute (August 2005): “GENE REGULATION in Retinal Disease and Its Application to Molecular Therapy”.
5. University of California, Irvine, Department of Ophthalmology (September 2005): “Understanding Retina-Specific GENE REGULATION and Its Application to Molecular Therapy”.
6. Scripps Research Institute (October 2005): “Retina-Specific Gene Regulation and Its Applications to Molecular Therapy”.
7. Tuft University, New England Eye Center (November 2005): “Understanding Retina-Specific Gene Regulation and Its Application to Molecular Therapy”.

8. University of California, Irvine - Department of Biological Chemistry (August, 2006): “Understanding Retina-Specific Gene Regulation and Its Application to Molecular Therapy”.
9. University of California, Irvine - Sue and Bill Gross Stem Cell Research Center (with special guest Congressman James Langevin, sponsor of the HR-3 Stem Cell Bill) (February, 2007): “Stem Cell Applications to Retinal Degenerations: A Physician’s Perspective on Current and Future Therapeutic Approaches”.
10. University of California, Irvine - School of Medicine (March 2007): “Retinal Diseases.”