

## CURRICULUM VITAE

Name: Ruben Adler, M.D.

Birthplace: Los Toldos, Argentina

Present Position: Arnall Patz Distinguished Professor of Ophthalmology  
Professor of Neurosciences  
The Johns Hopkins University  
School of Medicine

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Maumenee 519  
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### EDUCATION

M.D., Facultad de Medicina, Universidad de Buenos Aires (1963)

### AWARDS AND HONORS

Graduated as "Bachiller" with Honors, Gold Medal, National College of Moron (1956), M.D. with Honors, Facultad de Medicina, Universidad de Buenos Aires (1964), "Goytia" Prize, Argentine Association for the Progress of Science (1966), Thesis Prize, Facultad de Medicina, Universidad de Buenos Aires (1974), John Simon Guggenheim Memorial Foundation Fellowship (1977), Invited Professor, Jules Stein Institute, University of California, Los Angeles, California (1984), Alcon Research Institute Award for Outstanding Contributions in Vision Research (1985), Research to Prevent Blindness - William and Mary Greve International Research Scholars Award (1985), Research to Prevent Blindness - Senior Investigator Awards (1992 and 1999), Chancellor=s Award, Louisiana State University School of Medicine (2002)

### MEMBERSHIP IN PROFESSIONAL AND SCIENTIFIC SOCIETIES

International Society of Developmental Biologists, Society for Neuroscience, International Society of Developmental Neuroscience, American Society for Cell Biology, Association for Research in Vision and Ophthalmology, American Society of Zoologists, American Society of Developmental Biology, International Society for Eye Research, American Association for the Advancement of Science

## SCIENTIFIC ADVISORY BOARDS

National Institutes of Health, Neurology B Study Section (1987-91), Chairman (1989-91), National Science Foundation, Ad-Hoc Reviewer, New York Academy of Sciences, Ad-Hoc Reviewer, Vice-Chairman, Gordon Conference on Central Nervous System Development (1985), Chairman, Gordon Conference on Central Nervous System Development (1985-87), National Advisory Eye Council (2001-2005)

## ACTIVE GRANTS

R01 EY04859 (Adler) 07/01/06-06/30/11  
NIH/NEI Requested amount: Direct Costs \$382,505/year 24

The long term goal of this grant is the investigation of the genetic and microenvironmental factors that regulate the survival and differentiation of retinal neurons and photoreceptors.

Foundation Fighting Blindness 07/01/04 – 06/30/07 \$43,400/year 3  
Wilmer AMD Center, Module VI: Transplantation Approaches to the Study of Retinal Cell Differentiation.

The major goal of this project is to investigate the mechanism of synapse formation by photoreceptor cells.

R03 EY14341 05/01/03-03/31/06; no cost extension to 03/31/07  
NIH/NEI \$100,000

Gene Expression Analysis in Microcaptured Retinal Cells

The goal of this collaborative project between the labs of Drs. Adler, Campochiaro and Zack is to investigate the molecular changes triggered by neurotrophic factors, using two complementary techniques: 1) The generation of cDNA from individual cells, and 2) their analyses using custom designed retinal cDNA microarrays.

T32 EYO7143 1/1/99-12/31/09  
NIH/NEI \$276,580

Visual Neuroscience Training Program  
Program Director: Ruben Adler

The goal of this program is to attract postdoctoral and graduate students to research in the visual neurosciences. This grant provides stipend, tuition and travel expenses for trainees appointed to the grant only, no salary support for the program director is provided.

## SELECTED PUBLICATIONS (1986-2007)

Huang, H, Wahlin, K.J., Adler, R (2007) Developmentally regulated expression of the muscleblind genes in the chick embryo retina. In preparation

Wahlin K J., Moreira, E. Yu N, Huang H, Adler R. (2007) Cellular and molecular mechanisms of photoreceptor synaptogenesis. In preparation.

Adler, R. (2007) Curing Blindness with Stem Cells: Hope, Reality, and Challenges, Proceedings of the 2006 Symposium on Retinal Degeneration, In press, in "Recent Advances into Retinal Degeneration Research" (Robert E. Anderson, Matthew M. LaVail, Joe G. Hollyfield, eds.) Springer, New York, NY

Adler, R. and Raymond, P. A. (2007). Have we achieved a unified model of photoreceptor cell fate specification in vertebrates? Brain Research, In press, Accepted manuscript, available online March 20, 2007

Li G; Tomita H; Liu X; Zack DJ; Adler R, Anderson RE. (2006) Non-redundant Role of Akt2 for Neuroprotection of Rod Photoreceptor Cells from Light-Induced Cell Death. Jnl. Of Neuroscience 2007 27: 203-211

Adler, R, Canto-Soler, V (2007) Molecular mechanisms of optic vesicle development: Complexities, ambiguities, and controversies. Dev. Biol., 305 (2007): 1-13

Moreira E, Adler R. (2006) Effects of follistatin overexpression on cell differentiation in the chick retina. Dev Biol, 298(1): 272-84.

Canto Soler V, Adler R. (2006) Optic cup and lens development requires Pax6 expression in the early optic vesicle during a narrow time window. Dev Biol 294:119-132.

Sehgal R, Andres D, Adler R, Belecky-Adams T. (2006) Bone morphogenetic protein 7 increases chick photoreceptor outer segment initiation Invest Ophthalmol Vis Sci, 47: 3625-34.

Bradford RL, Wang C, Zack DJ, Adler R. (2005) Roles of cell-intrinsic and microenvironmental factors in photoreceptor cell differentiation. Dev Biol 286:31-45.

Adler, R. (2005) Challenges in the study of neuronal differentiation: a view from the embryonic eye. Dev Dyn 234:454-463.

Wahlin KJ, Grice EA, Hackam AS, Lim L, Campochiaro PA, Zack DJ, Adler R. (2004) A method for analysis of gene expression in isolated mouse photoreceptor and Müller cells. Mol Vis 10:366-375.

Hackam AS, Bradford RL, Zack DJ, Adler R. (2003) Gene discovery in the embryonic chick retina. Mol Vis 9:262-276.

Toy J, Norton JS, Jibodh SR, Adler R. (2002) Effects of homeobox genes on the differentiation of photoreceptor and non-photoreceptor neurons. Invest Ophthalmol Vis Sci 43:3522-3529.

Belecky-Adams TL, Adler R, Beebe DC. (2002) Bone morphogenetic protein signaling

and the initiation of lens fiber cell differentiation. *Development* 129:3795-3802.

Adler R, Belecky-Adams TL. (2002) The role of bone morphogenetic proteins in the differentiation of the ventral optic cup. *Development* 129:3161-3171.

Wahlin KJ, Adler R, Zack DJ, Campochiaro PA. (2001) Neurotrophic signaling in normal and degenerating rodent retinas. *Exp Eye Res* 73:693-701.

Adler R, Tamres A, Bradford RL, Belecky-Adams TL. (2001) Microenvironmental regulation of visual pigment expression in the chick retina. *Dev Biol* 15:454-464.

Belecky-Adams, T., and Adler, R. (2001) Developmental expression patterns of bone morphogenetic proteins, receptors and binding proteins in the chick retina. *J Comp Neurol* 430:562-572.

Toy J, Bradford RL, Adler R. (2000) Lipid-mediated gene expression into chick embryo retinal cells *in ovo* and *in vitro*. *J Neurosci Meth* 104:1-8.

Xie HQ, Adler R. (2000) Green cone opsin and rhodopsin regulation by CNTF and staurosporine in cultured chick photoreceptors. *Invest Ophthalmol Vis Sci* 41:4317-4323.

Adler, R. (2000) A model of retinal cell differentiation in the chick embryo. *Prog Retina Eye Res* 20:529-557.

Wahlin KJ, Campochiaro PA, Zack DJ, Adler R. (1999) Neurotrophic factors cause activation of intracellular signaling pathways in Müller cells and other cells of the inner retina, but not photoreceptors. *Invest Ophthalmol Vis Sci* 41:927-936.

Belecky-Adams TL, Scheurer D, Adler R. (1999) Activin family members in the developing chick retina expression patterns, protein distribution, and *in vitro* effects. *Dev Biol* 210:107-123.

Adler R, Curcio C, Hicks D, Price D, Wong F. (1999) Cell death in AMD. *Mol Vis* 5:31.

Adler R, Belecky-Adams T. (1998) Cell fate determination in the chick embryo retina. In: *Cell Fate and Cell Lineage Determination* (S. Moody, ed.) Academic Press, San Diego, pp 463-474.

Adler R. (1998) Cellular and molecular aspects of photoreceptor differentiation. In: *Development and Organization of the Retina: From Molecules to Function*, (L. Chalupa and B. Finlay, eds.) Plenum Press, New York, pp 13-26.

Cook B, Portera-Cailliau C, Adler R. (1998) Developmental neuronal death is not a universal phenomenon among cell types in the chick embryo retina. *J Comp Neurol* 396:12-36.

- Weng J, Belecky-Adams T, Adler R, Travis GH. (1998) Identification of two rds/peripherin homologs in the chick retina. *Invest Ophthalmol Vis Sci* 39:440-443.
- Belecky-Adams T, Tomarev S, Li H-S, Ploder L, McInnes RR, Sundin O, Adler R. (1997) Prox 1, Pax-6 and chx10 homeobox gene expression correlate with phenotypic fate of retinal precursor cells. *Invest Ophthalmol Vis Sci* 38:1293-1303.
- Kumar R, Scheurer D, Duh E, Regemtulla A, Swaroop A, Adler R, Zack DJ. (1996) An Ap-1 cis-acting element mediates activation of the rhodopsin promoter by the bZIP transcription factor NRL. *J Biol Chem* 271:29612-29618.
- Belecky-Adams T, Cook B, Adler R. (1996) Correlations between terminal mitosis and differentiated fate of retinal precursor cells *in vivo* and *in vitro*: analysis with the "window-labeling technique. *Dev Biol* 178:304-315.
- Saga T, Scheurer D, Adler R. (1996) Development and maintenance of outer segments by isolated chick embryo photoreceptor cells in culture. *Invest Ophthalmol Vis Sci* 37:561-573.
- Adler R. (1995) Mechanisms of photoreceptor death in retinal degenerations: from the cell biology of the 1990's to the ophthalmology of the 21st century? *Arch Ophthalmol* 114:79-83.
- Cook BE, Lewis GP, Fisher SK, Adler R. (1995) Apoptotic photoreceptor degeneration in experimental retinal detachment. *Invest Ophthalmol Vis Sci* 36:990-996.
- Wang S-Z, Adler R. (1995) Chromokinesin: a DNA-binding, kinesin-like nuclear protein. *J Cell Biol* 128:761-768.
- Stenkamp DL, Iuvone PM, Adler R. (1994) Photomechanical movements of cultured embryonic photoreceptors: regulation by exogenous neuromodulators and by a regulable source of endogenous dopamine. *J Neurosci* 14:3083-3096.
- Stenkamp DL, Adler R. (1994) Cell type- and developmental stage-specific metabolism and storage of retinoids by embryonic chick retinal cells in culture. *Exp Eye Res* 58:675-687.
- Portera-Cailliau C, Sung C-H, Nathans J, Adler R. (1994) Apoptotic photoreceptor cell death in mouse models of retinitis pigmentosa. *Proc Natl Acad Sci USA* 91:971-978.
- Wang S-Z, Adler R. (1994) A novel basic-leucine zipper gene expressed in developing retina and lens. *Proc Natl Acad Sci USA* 91:1351-1355.
- Stenkamp DL, Adler R. (1993) Photoreceptor differentiation of isolated retinal precursor cells includes the capacity for photomechanical responses. *Proc Natl Acad Sci USA* 90:1982-1986.

Adler R. (1993) Plasticity and differentiation of retinal precursor cells. In: *International Review of Cytology* (Friedlander M, ed), Academic Press, San Diego, Vol 146, pp. 145-190.

Adler R. (1993) Determination of cellular types in the retina. *Invest Ophthalmol Vis Sci* 34:1677-1682.

Stenkamp DL, Gregory J, Adler R. (1993) Metabolism and biological effects of retinoids in RPE-free, glial-free, purified cultures of retina neurons and photoreceptors. *Invest Ophthalmol Vis Sci* 34:2425-2436.

Adler R. (1992) Cellular and Molecular Mechanisms Regulating Retinal Cell Differentiation In: *The Visual System from Genesis to Maturity* (Lent R, ed), Birkhauser, Inc. Boston, pp 21-35.

Paes de Carvalho R, Braas KM, Adler R, Snyder SH. (1992) Developmental regulation of adenosine A<sub>1</sub> receptors, uptake sites and endogenous adenosine in the chick retina. *Dev Brain Res* 70:87-95.

Repka A, Adler R. (1992) Differentiation of retinal precursor cells born *in vitro*. *Dev Biol* 153:242-249.

Repka A, Adler R. (1991) Accurate determination of the time of cell birth using a sequential labeling technique with [<sup>3</sup>H] thymidine and bromodeoxyuridine ("*window labeling*"). *J Histochem Cytochem* 40:947-953.

Wang S-Z, Adler R, Nathans J. (1991) A visual pigment from chicken that resembles rhodopsin: amino acid sequence, gene structure, and functional expression. *Biochem* 31:3309-3315.

Adler R, Hewitt AT. (1991) Molecular factors regulating the survival and differentiation of photoreceptor cells. IN: *Retinal Degenerations* (Anderson RE, Hollyfield JG, LaVail MM, eds), CRC Press, Boca Raton, pp 79-86.

Murillo-Lopez F, Politi L, Adler R, Hewitt AT. (1991) Proteoglycan synthesis in cultures of murine retinal neurons and photoreceptors. *Cell Mol Neurobiol* 11:579-591.

Paes de Carvalho R, Braas KM, Snyder SH, Adler R. (1990) Analysis of adenosine immunoreactivity, uptake and release in purified cultures of chick embryo retinal neurons and photoreceptors. *J Neurochem* 55:1603-1611.

Werner M, Madreperla S, Lieberman P, Adler R. (1990) Expression of transfected genes by differentiated, postmitotic neurons and photoreceptors in primary cell cultures. *J Neurosci Res* 25:50-57.

Adler R. (1990) Preparation, enrichment and growth of purified cultures of neurons and photoreceptors from chick embryos and from normal and mutant mice. IN: *Methods in Neurosciences*, Vol. II (Conn PM, ed), Academic Press, Inc. Orlando, pp 134-150.

Iuvone PM, Avendano G, Johnson-Butler B, Adler R. (1990) Cyclic AMP-dependent induction of serotonin N-acetyltransferase activity in photoreceptor-enriched chick retinal cell cultures: characterization and inhibition by dopamine. *J Neurochem* 55:673-682.

Madreperla SA, Edidin M, Adler R. (1989) Na<sup>+</sup>,K<sup>+</sup>- Adenosine triphosphatase polarity in retinal photoreceptors: a role for cytoskeletal attachments. *J Cell Biol* 109:1483-1493.

Politi LE, Lee L, Wiggert B, Chader G, Adler R. (1989) Synthesis and secretion of interphotoreceptor retinoid-binding protein (IRBP) by isolated normal and *rd* mouse retinal photoreceptor neurons in culture. *J Cell Physiol* 141:682-690.

Hewitt AT, Lindsey JD, Carbott D, Adler R. (1990) Photoreceptor survival-promoting activity in interphotoreceptor matrix preparations: characterization and partial purification. *Exp Eye Res* 50:79-88.

Abrams L, Politi LE, Adler R. (1989) Differential susceptibility of isolated mouse retinal neurons and photoreceptors to kainic acid toxicity: *in vitro* analysis of cell survival and neurotransmitter-related activities. *Invest Ophthalmol Vis Sci* 30:2300-2308.

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Adler R, Hatlee M. (1989) Plasticity and differentiation of embryonic retinal cells after terminal mitosis. *Science* 243:391-393.

Madreperla SA, Adler R. (1989) Opposing microtubule- and actin-dependent forces in the development and maintenance of structural polarity in retinal photoreceptors. *Dev Biol* 131:149-160.

Needham L, Adler R, Hewitt AT. (1988) Proteoglycan synthesis in purified cultures of retinal neurons and photoreceptors. *Dev Biol* 126:304-314.

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Politi L, Adler R. (1988) Selective failure of long term survival of isolated photoreceptors from both homozygous and heterozygous *rd* (retina degeneration) mice. *Exp Eye Res* 47:269-282.

Madreperla SA, Adler R. (1988) Opposing microtubule-and actin-dependent forces in the development and maintenance of structural polarity in retinal photoreceptors. *Dev Biol* 131:149-160.

Adler R. (1988) Trophic factors in neural development. In: *Handbook of Human Growth and Developmental Biology*, (E. Meisami and P. S. Timiras eds.), CRC Press, Inc., Boca Raton, pp 67-74.

Politi LE, Adler R. (1987) Selective destruction of photoreceptor cells by anti-opsin antibodies. *Invest Ophthalmol Vis Sci* 28:118-125.

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Adler R. (1987) Nature and nurture in the differentiation of retinal photoreceptors and neurons. *Cell Differentiation* 20:183-188.

Adler R. (1987) Cell culture systems for purified retinal neurons and photoreceptors. In: *Model Systems in Development and Aging of the Nervous System*, (A. Vernadakis, A. Privat, J. Lauder, P. Timiras, E. Giacobini eds.), Martinus Nijhoff Publ., Boston, pp 3-17.

Adler R. (1987) *In vitro* techniques for the investigation of trophic factors active on CNS neurons. In: *Handbook of Nervous System and Muscle Factors*, (J. R. Perez-Polo, ed.), CRC Press, Inc., Florida, pp 151-173.

Politi LE, Adler R. (1986) Generation of enriched populations of cultured photoreceptor cells. *Invest Ophthalmol Vis Sci* 27:656-665.

Adler R. (1986) Developmental predetermination of the structural and molecular polarization of photoreceptor cells. *Dev Biol* 117:520-527.

Adler R. (1986) Trophic interactions in retina development and in retinal degenerations: *in vivo* and *in vitro* studies. In: *The Retina: A Model for Cell Biology, Part I* (R. Adler and D. Farber, eds.), Academic Press, Orlando, pp 112-150.

Adler R. (1986) The differentiation of retinal photoreceptors and neurons *in vitro*. In: *Progress in Retinal Research* (N. Osborne and G. Chader, eds.), Pergamon Press, London, Vol. VI, pp 1-27.

Farber D, Adler R. (1986) Issues and questions in cell biology of the retina. In: *The Retina, A Model for Cell Biology Studies, Part I*, (R. Adler and D. Farber, eds.), Academic Press, Orlando, pp 2-16.