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Present Position: Professor and Vice Chair of Research
Department of Ophthalmology
Rocky Mountain Lions Eye Institute
University of Colorado School of Medicine

Education:

1974-1977 B.S. Zoology, University of Texas, Austin, TX
1977-1981 Ph.D. Human Biological Chemistry and Genetics
University of Texas Medical Branch, Galveston.
1981-1984 Postdoctoral Research Fellow, Department of Biochemistry
New York University, New York, NY

Academic Positions/Employment:

1984-1988 Research Assistant Professor of Ophthalmology
Emory University School of Medicine
Atlanta, Georgia
1988-1993 Assistant Professor of Ophthalmology and Visual Sciences
Assistant Professor of Genetics
Washington University School of Medicine
St. Louis, MO

- 1993-2000 Associate Professor of Ophthalmology and Visual Sciences
Associate Professor of Genetics
Washington University School of Medicine
St. Louis, MO
- 2000-2008 Professor of Ophthalmology and Visual Sciences
Professor of Genetics
Washington University School of Medicine
St. Louis, MO

University/Departmental Appointments and Committees:

- 1991-2008 Director of Research
Department of Ophthalmology and Visual Sciences
Washington University School of Medicine
- 1992-2008 Ophthalmology Resident Selection Committee
Department of Ophthalmology and Visual Sciences
- 1996-1999 Admissions Committee
Graduate Division of Biology & Biomedical Sciences
- 1997-2007 Biochemistry Program Steering Committee
Graduate Division of Biology & Biomedical Sciences
- 1998 Local co-organizer of V·I·S·I·O·N, an NIH-sponsored traveling exhibit shown at the St. Louis Science Center; organized a “scientist at the center” 12 week educational program involving demonstrations by Washington University vision scientists.
- 1999, 2000 Program Organizer, Annual retreat of combined programs of Chemistry, Biochemistry, Bioorganic Chemistry and Molecular Biophysics
Graduate Division of Biology & Biomedical Sciences
- 1999 Chair of university committee to advise on DNA sequencing core facilities at Washington University Medical Center.

Honors and Awards

- 1980 Excellence in Research in Birth Defects
 National Foundation March of Dimes
- 1988 Robert E. McCormick Research Scholar Award
 Research to Prevent Blindness, Inc.
- 1997 Lew R. Wasserman Merit Award
 Research to Prevent Blindness, Inc.
- 2000 Outstanding Faculty Mentor Award
 Graduate Student Senate of Arts & Sciences
 Washington University in St. Louis

Editorial Activities

Frequent reviewer for *Biochemistry*, *Biochem et Biophysica Acta*, *Current Eye Research*, *Diabetes*, *Experimental Eye Research*, *European Journal of Biochemistry*, *J Biological Chemistry*, *Molecular Vision*

1995-present Editorial Board: *Molecular Vision* (www.molvis.org/molvis/)

Consulting/Advisory Experience

- 1993-1995 Fight for Sight Grant Review Panel
- 1999-2004 NIH/Center for Scientific Review permanent appointment to AED1
 (former VISA1) study section; Chair 2002-2004
- 2003-present Anteon

Professional Societies and Organizations

American Association for Advancement of Sciences
American Chemical Society
American Diabetes Association
American Society for Biochemistry and Molecular Biology
Association for Research in Vision and Ophthalmology

Research Support

Governmental:

- 1981-1984 "Molecular Studies of Aldose Reductase Gene in Lens Cells"
F32 EY05596, National Research Service Award
Principal Investigator; Total Direct Costs \$50,000
- 1984-1988 "Molecular Studies of Aldose Reductase and Cataract"
R23 EY05639, New Investigator Research Award
Principal Investigator; Total Direct Costs: \$107,500.
- 1988-1992 "Molecular Biology of Aldose Reductase and Cataract"
R01 EY05856; Principal Investigator; Total Direct Costs: \$322,398.
- 1992-1995 Molecular Biology of Aldose Reductase and Cataract"
R01 EY05856; Principal Investigator;
Total Direct Costs: \$448,359.
- 1995-2000 Molecular Biology of Aldose Reductase and Diabetic Eye Disease
R01 EY05856, Principal Investigator, Total Direct Costs: \$1,100,435
- 1995-2000 Core Grant for Vision Research
P30 EY02687, Principal Investigator, Total Direct Costs: \$1,471,547
- 1996-2000 Control of Protein Aggregation in the Lens
R01 EY11694; Subcontractor; Total Direct Costs of subcontract: \$117,996
- 2000-2005 Aldose Reductase and Diabetic Eye Disease
R01 EY05856, Principal Investigator, Total Direct Costs: \$1,489,045
- 2000-2002 Aldose Reductase and Diabetic Eye Disease (request for supplement to
support DNA microarray studies)
R01 EY05856, Principal Investigator, Total Costs: \$350,000
- 2000-2005 Core Grant for Vision Research
P30EY02687, Principal Investigator, Total Direct Costs: \$1,374,998
- 2002-2007 Molecular Interactions of Crystallins in the Eye
R01 EY13897, Principal Investigator, Total Direct Costs: \$900,000
- 2005-2010 Core Grant for Vision Research
P30EY02687, Principal Investigator, Total Direct Costs: \$2,474,114
- 2005-2009 Aldose Reductase and Diabetic Eye Disease
R01 EY05856, Principal Investigator, Total Direct Costs: \$1,788,641

Non-governmental:

- 1985-1986 "Crystallography Studies of Aldose and Aldehyde Reductases"
Pfizer Central Research, Groton, CT.
Total Direct Costs: \$37,500
- 1987-1988 "Site-Directed Mutagenesis and Computer Modeling of Ocular Lens
Proteins"; Emory University-Georgia Tech Biomedical Technology
Research Center. Total Direct Costs: \$20,000
- 1989-1991 "Aldose Reductase Gene Expression in Diabetes"
Principal Investigator; Diabetes Research and Training Center,
Washington University; Total Direct Costs: \$50,000.
- 1993-1994 "Kinetic Study of Zopolrestat Inhibition of Human Aldose Reductase";
Principal Investigator; Pfizer Central Research, Groton, CT. Total Direct
Costs: \$30,000.
- 1998-2000 "Characterization of Galactose Dehydrogenase, A Potential Mediator of
Metabolic Imbalances in Hyperglycemia"
Principal Investigator, Kilo Diabetes and Vascular Research Foundation,
St. Louis, MO; Total Direct Costs: \$60,000
- 2000-2002 "Gene Discovery in Target Tissues of Diabetes Mellitus", Principal
Investigator, Kilo Diabetes and Vascular Research Foundation, St. Louis,
MO; Total Direct Costs: \$80,000
- 2006-2007 Mechanisms of Diabetic Retinopathy
Pearle Vision Foundation, Principal Investigator
Total Direct Costs: \$30,000
- 2007-2008 Mechanisms of Diabetic Retinopathy
Pearle Vision Foundation, Principal Investigator
Total Direct Costs: \$35,000

Teaching Title and Responsibilities:

- 1992-2008 "Nucleic Acids and Protein Synthesis"; Bio 548
Discussion Leader
- 1990 Coursemaster, "Molecular Aspects of Vision", Bio 5503
- 1989-1994 Thesis advisor to Ivan Tarle, MSTP student.

- 1996-2001 Thesis advisor to Brian Cobb, student in Biochemistry Program of DBBS
- 2001-2008 Thesis advisor to Kelly Barton, student in Biochemistry Program of DBBS

Bibliography:

A. Peer Reviewed Manuscripts

1. Petrash JM and Srivastava SK: Purification and properties of human liver aldehyde reductases. *Biochim Biophys Acta* 707:105-114, 1982.
2. Srivastava SK, Petrash JM, Sadana AJ, Partridge CA: Susceptibility of aldose and aldehyde reductases to aldose reductase inhibitors. *Current Eye Res* 2:407-410, 1982.
3. Srivastava SK, Ansari NH, Brown J, Petrash JM: Formation of sorbitol-6-phosphate by bovine and human lens aldose reductase, sorbitol dehydrogenase, and sorbitol kinase. *Biochim Biophys Acta* 717:210-214, 1982.
4. Srivastava SK, Das B, Hair GA, Gracy RW, Awasthi S, Ansari NH, Petrash JM: Biochemical and genetic interrelationships among human aldo-keto reductases: Immunochemical, kinetic, and structural properties. *Biochim Biophys Acta* 840:334-343, 1985.
5. Kaye NW, Church RL, Piatigorsky J, Petrash JM, Lalley PA: Assignment of the mouse alpha A-crystallin structural gene to chromosome 17. *Current Eye Res* 4:1263-1268, 1985.
6. Petrash JM, Church RL, Hay RE: Molecular cloning of bovine lens mRNA sequences: Isolation of crystallin cDNA clones using synthetic oligonucleotides. *Lens Res* 4:181-194, 1987.
7. Hay RE Petrash JM: Nucleotide sequence of a bovine alphaA2-crystallin cDNA. *Biochem Biophys Res Commun* 148:31-37, 1987.
8. Hay RE, Woods W, Church RL, Petrash JM: cDNA clones encoding bovine gamma-crystallins. *Biochem Biophys Res Commun* 146:332-338, 1987.
9. Skow LC, Womack JE, Petrash JM, Miller WL: Synteny mapping of the genes for 21 steroid hydroxylase, alpha A crystallin, and class I bovine leukocyte antigen in cattle. *DNA* 7:143-149, 1988.
10. Adkinson LR, Skow LC, Thomas TL, Petrash JM Womack JE: Somatic cell mapping and restriction fragment analysis of bovine genes for fibronectin and gamma crystallin. *Cytogenet Cell Genet* 47:155-159, 1988.
11. Petrash JM and Favello AD: Isolation and characterization of cDNA clones encoding aldose reductase. *Current Eye Res* 10:1021-1027, 1989.

12. Kaye NW, Lalley PA, Petrash JM Church RL: Regional assignment of the mouse α A2-crystallin gene (Crya-1) to chromosome 17A3-B by *in situ* hybridization. *Cytogenet Cell Genet* 53:155-159, 1990.
13. Petrash JM, DeLucas LJ, Bowling E, Egen N: Resolving isoforms of aldose reductase by preparative isoelectric focusing in the rotofor. *Electrophoresis* 12:84-90, 1991.
14. El-Kabbani O., Narayana SVL, Babu YS, Moore KM, Flynn TG, Petrash JM, Westbrook EM, DeLucas LJ Bugg CE: Purification and crystallization of porcine aldose reductase. *J Mol Biol* 218:695-698, 1991.
15. Petrash JM, Flath M, Sens D, Bylander J: Effects of osmotic stress and hyperglycemia on aldose reductase gene expression in human renal proximal tubule cells. *Biochem Biophys Res Commun* 187:201-208, 1992.
16. Abghari SZ, Stulting RD, Petrash JM: Detection of herpes simplex virus type 1 latency associated transcripts in corneal cells of inbred mice by *in situ* hybridization. *Cornea* 11:433-438, 1992.
17. Petrash JM, Harter TM, Devine C, Olins P, Bhatnagar A, Liu SQ, Srivastava SK: Involvement of cysteine residues in catalysis and inhibition of human aldose reductase: Mutagenesis of Cys-80, -298 and -303. *J Biol Chem* 267:24833-24840, 1992.
18. Borhani DW, Harter TM, Petrash JM: The crystal structure of the aldose reductase-NADPH binary complex. *J Biol Chem* 267: 24841-24847, 1992.
19. Bhatnagar A, Liu SQ, Petrash JM, Srivastava SK: Mechanism of inhibition of aldose reductase by menadione (Vitamin K3). *Mol Pharmacol* 42:917-921, 1992.
20. Petrash JM: Applications of molecular biology to the understanding of visual system disorders. *Am J Ophthal* 113:573-582, 1992.
21. Tilton RG, Chang K, Hasan KS, Smith S, Petrash JM, Misko TP, Moore WM, Currie MG, Corbett JA, McDaniel ML, and Williamson JR. Prevention of diabetic vascular dysfunction by aminoguanidine and methylguanidine: Inhibition of nitric oxide synthase versus inhibition of advanced glycation endproduct formation. *Diabetes* 42:221-232, 1993.
22. Wilson DK, Tarle I, Petrash JM, Quioco FA. Refined 1.8Å structure of human aldose reductase complexed with the potent inhibitor zopolrestat. *Proc Natl Acad Sci USA* 90:9847-9851, 1993.
23. Tarle I, Borhani DW, Wilson DK, Quioco FA, Petrash JM. Probing the active site of human aldose reductase: Site-directed mutagenesis of Asp-43, Tyr-48, Lys-77 and His-110. *J Biol Chem* 268:25687-25693, 1993.
24. Petrash JM, Harter TM, Tarle IT, Borhani DW: Kinetic alteration of human aldose reductase by mutagenesis of cysteine residues. In: *Enzymology and Molecular Biology of Carbonyl*

Metabolism 4, (H. Weiner, J. Crabb, G. Flynn, eds.) pp. 289-300, Plenum Press, New York, 1993

25. Hay RE, Andley UP, Petrash JM. Expression of recombinant bovine γ B-, γ C- and γ D-crystallins and correlation with native proteins. *Exp Eye Res* 58:573-584, 1994.
26. Petrash JM, Tarle I, Wilson DK, Quioco FA: Aldose reductase catalysis and crystallography: Insights from recent advances in enzyme structure and function. *Diabetes* 43:955-959, 1994.
27. Cook PN, Ward WHJ, Petrash JM, Mirrlees DJ, Sennitt CM, Carey F, Preston J, Brittain DR, Tuffin DP, Howe R. Kinetic characteristics of Zeneca ZD5522, a potent inhibitor of human and bovine lens aldose reductase. *Biochem Pharmacol* 49:1043-1049, 1995.
28. Wilson DK, Nakano T, Petrash JM, Quioco FA. 1.7 Å Structure of FR-1, a fibroblast growth factor-induced member of the aldo-keto reductase family, complexed with coenzyme and inhibitor. *Biochemistry* 34:14323-14330, 1995.
29. Das KP, Petrash JM and Surewicz WK. Conformational properties of substrate proteins bound to a molecular chaperone α -crystallin. *J Biol Chem* 271:10449-10452, 1996.
30. Nakano T and Petrash JM. Kinetic and spectroscopic evidence for active site inhibition of human aldose reductase. *Biochemistry* 35:11196-11202, 1996.
31. Andley UP, Mathur S, Griest TA and Petrash JM. Cloning, expression and chaperone-like activity of human α A crystallin. *J Biol Chem* 271:31973-31980, 1996
32. Cappiello M, Voltarelli M, Cecconi I, Vilaro PG, Dal Monte M, Marini I, Del Corso A, Wilson DK, Quioco FA, Petrash JM and Mura U. Specifically targeted modification of human aldose reductase by physiological disulfides. *J Biol Chem* 271:33539-33544, 1996
33. Petrash JM, Harter TM, Murdock G: A potential role for aldose reductase in steroid metabolism. *Adv Exp Med Biol* 414: 465-473, 1996.
34. Wilson DK, Nakano T, Petrash JM, Quioco FA: Structural studies of aldose reductase inhibition. *Adv Exp Med Biol* 414:435-442, 1996.
35. Chandra A, Srivastava S, Petrash JM, Bhatnagar A and Srivastava SK. Active site modification of aldose reductase by nitric oxide donors. *Biochim Biophys Acta* 1341:217-222, 1997.
36. Chandra A, Srivastava S, Petrash JM, Bhatnagar A, Srivastava SK. Modification of aldose reductase by S-nitrosoglutathione. *Biochemistry* 36:15801-15809, 1997
37. Wilson DK, Petrash JM, Quioco FA: Structural studies of aldose reductase inhibition. in: *Structure Based Drug Design*, (P. Veerapandian, ed.), pp. 229-246, Marcel Dekker, New York, 1997.

38. El-Kabbani O, Wilson DK, Petrash JM, Quioco FA: Structural features of the aldose reductase and aldehyde reductase inhibitor-binding sites. *Molec Vision* 4:19 (<http://molvis.org/molvis/v4/p19/>), 1998
39. Srivastava S, Harter TM, Chandra M, Bhatnagar A, Srivastava SK, Petrash JM: Kinetic studies of FR-1, a growth factor-inducible aldo-keto reductase. *Biochemistry* 37:12909-12917, 1998
40. Cecconi I, Moroni M, Vilaro PG, Dal Monte M, Borella P, Rastelli G, Costantino L, Garland D, Carper D, Petrash JM, Del Corso A, Mura U: Oxidative modification of bovine lens aldose reductase induced by copper ion. *Biochemistry* 37:14167-14174, 1998
41. Srivastava K, Watowich SJ, Petrash JM, Srivastava SK, Bhatnagar A: Structural and kinetic determinants of aldehyde reduction by aldose reductase. *Biochemistry* 38:42-54, 1999
42. Das KP, Choo-Smith LP, Petrash JM, Surewicz WK: Insight into the secondary structure of non-native proteins bound to a molecular chaperone α -crystallin: An isotope-edited infrared spectroscopic study. *J Biol Chem* 274:33209-33212, 1999
43. Reddy GB, Das KP, Petrash JM, Surewicz WK: Temperature-dependent chaperone activity and structural properties of human α A and α B crystallins. *J Biol Chem* 275: 4565-4570, 2000
44. Petrash JM, Harter TM, Srivastava S, Chandra A, Bhatnagar A, Srivastava SK: Structure-function studies of FR-1, a growth factor-inducible aldo-keto reductase. *Adv Exp Med Biol* 463:435-444, 1999
45. Srivastava S, Chandra A, Srivastava S, Petrash JM, Bhatnagar A: Regulation of aldose reductase by aldehydes and nitric oxide. *Adv Exp Med Biol* 463:501-508, 1999
46. Cobb BA and Petrash JM: Characterization of α -crystallin-plasma membrane binding. *J Biol Chem* 275: 6664-6672, 2000
47. Dixit B, Balendiran GK, Watowich SJ, Srivastava S, Ramana KV, Petrash JM, Bhatnagar A, Srivastava SK: Kinetic and structural characterization of the glutathione binding site of aldose reductase. *J Biol Chem* 275:21587-21595, 2000
48. Cobb BA and Petrash JM: Structural and functional changes in the α A crystallin R116C mutant in hereditary cataracts. *Biochemistry* 39: 15791-15798, 2000
49. Srivastava S, Dixit BL, Ramana KV, Chandra A, Chandra D, Zacarias A, Petrash JM, Bhatnagar A, Srivastava SK: Structural and kinetic modifications of aldose reductase by S-nitrosothiols. *Biochem J* 358:111-118, 2001
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51. Petrash JM, Murthy BSN, Young M, Morris K, Rikimaru L, Griest TA, Harter T: Functional genomic studies of aldo-keto reductases. *Chem Biol Interactions* 130, 673-683, 2001
52. Cobb BA and Petrash JM: α -Crystallin chaperone-like activity and membrane binding in age-related cataracts. *Biochemistry* 41:483-490, 2002
53. Cobb BA and Petrash JM: Factors influencing α -crystallin association with phospholipid vesicles. *Molec Vision* 8:85-93, 2002 (<http://www.molvis.org/molvis/v8/a12>)
54. Wu X, Chen SG, Petrash JM, Monnier VM: Alteration of substrate selectivity through mutation of two arginine residues in the binding site of Amadoriase II from *Aspergillus sp.* *Biochemistry* 41: 4453-4458, 2002
55. Rastelli G, Costantino L, Gamberini MC, Del Corso A, Mura U, Petrash JM, Ferrari AM, Pacchioni S: Binding of 1-benzopyran-4-one derivatives to aldose reductase: a free energy perturbation study. *Bioorg Med Chem* 10, 1427-1436, 2002.
56. Cecconi I, Scaloni A, Rastelli G, Moroni M, Vilardo PG, Costantino L, Cappiello M, Garland D, Carper D, Petrash JM, Del Corso, A, Mura U: Oxidative modification of aldose reductase induced by copper ion. Definition of the metal-protein interaction mechanism. *J Biol Chem* 277, 42017-42027, 2002.
57. Chang Q, Harter TH, Rikimaru LT, Petrash JM: Aldo-keto reductases as modulators of stress response. *Chem Biol Interactions* 143-144:325-332, 2003.
58. Chang Q, Harter TH, Griest TA, Murthy BSN, Petrash JM: Aldo-keto reductases in the stress response of the budding yeast *Saccharomyces cerevisiae*. In: *The Emerging Role of Aldo-Keto Reductases in the Metabolism of Toxic Substances*, (T. Penning, JM Petrash, eds.), pp. 225-238, American Chemical Society, Washington, DC, 2003.
59. Petrash JM: All in the family: Aldose reductase and closely related aldo-keto reductases. *Cell Molec Life Sci* 61:737-749, 2004.
60. Suryanarayana P, Kumar PA, Saraswat M, Petrash JM, Reddy GB: Inhibition of aldose reductase by tannoid principles of *Emblia officinalis*: Implications for the prevention of sugar cataract. *Molec Vis* 10, 148-154, 2004.
61. Hsu CD, Kymes S, Petrash JM: A transgenic model for human autosomal dominant cataract. *Inv Ophthal Vis Sci* 47:2036-2044, 2006
62. Singh R, White MA, Ramana KV, Petrash JM, Satowich SJ, Bhatnagar A, Srivastava SK: Structure of a glutathione conjugate bound to the active site of aldose reductase. *Proteins* 64: 101-110, 2006, 2006
63. Estey T, Wenston PA, Cantore M, Carpenter JF, Petrash JM, Vasiliou V: Mechanisms involved in the protection of UV-induced protein inactivation by the corneal crystallin ALDH3A1. *J Biol Chem* 282:4382-4392, 2007

64. Chang Q, Griest TA, Harter TM, Petrash JM: Phenotypic rescue of aldo-keto reductase null *Saccharomyces cerevisiae* by human aldose reductase. *Biochem Biophys Acta (Molec Cell Res)* 1773:321-329, 2007
65. Barton KA, Shui Y-B, Petrash JM, Beebe DC: Comment on: "The Stokes-Einstein equation and the physiological effects of vitreous surgery." *Acta Ophthal Scand* 85:339-340, 2007
66. Spite M, Baba SP, Ahmed Y, Barski O, Nijhawan K, Petrash JM, Bhatnagar A, Srivastava S: Substrate specificity and catalytic efficiency of aldo-keto reductases with phospholipid aldehydes. *Biochem J* 405:95-105, 2007
67. Suryanarayana P, Saraswat M, Petrash JM, Reddy GB: Emblica officinalis and its Enriched Tannoids Delay Streptozotocin-Induced Diabetic Cataract in Rats. *Molec Vis* 13:1291-1297, 2007
68. Chang Q and Petrash JM: Disruption of aldo-keto reductase genes leads to elevated markers of oxidative stress and inositol auxotrophy in *Saccharomyces cerevisiae*. *Biochem Biophys Acta (Molec Cell Res)* 1783:237-245, 2008
69. Reddy GB, Satyanarayana A, Balakrishna N, Ayyagari R, Padma M, Viswanath K, Petrash JM: Erythrocyte aldose reductase activity and sorbitol levels in diabetic retinopathy. *Molec Vis* 14:593-601, 2008.
70. Marchitti SA, Bateman B, Petrash JM, Vasiliou V: Mouse models of the cornea and lens— Understanding ocular disease. In *Animal Models of Eye Research* (Tsonis PA, ed); Elsevier, 2008.
71. Barton KA, Hsu C-D, Petrash JM: Interactions between small heat shock protein alpha crystallin and galectin-related inter-fiber protein (GRIFIN) in the ocular lens. (in review), 2008.