



**STATE BOARD OF OPTOMETRY**  
 2450 DEL PASO ROAD, SUITE 105, SACRAMENTO, CA 95834  
 P (916) 575-7170 F (916) 575-7292 www.optometry .ca.gov



Continuing Education Course  
 Approval Checklist

Title:

Provider Name:

- Completed Application
  - Open to all Optometrists?  Yes  No
  - Maintain Record Agreement?  Yes  No
- Correct Application Fee
- Detailed Course Summary
- Detailed Course Outline
- PowerPoint and/or other Presentation Materials
- Advertising (optional)
- CV for EACH Course Instructor
- License Verification for Each Course Instructor
  - Disciplinary History?  Yes  No



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## CONTINUING EDUCATION COURSE APPROVAL APPLICATION

**\$50 Mandatory Fee**

Pursuant to California Code of Regulations (CCR) § 1536, the Board will approve continuing education (CE) courses after receiving the applicable fee, the requested information below and it has been determined that the course meets criteria specified in CCR § 1536(g).

In addition to the information requested below, please attach a copy of the course schedule, a detailed course outline and presentation materials (e.g., PowerPoint presentation). Applications must be submitted 45 days prior to the course presentation date.

**Please type or print clearly.**

<b>Course Title</b> _____ ROCK Inhibitors and Glaucoma	<b>Course Presentation Date</b> <div style="text-align: center; font-family: monospace; font-size: 1.2em;">                     [0][9]/[1][7]/[2][0][1][6]                 </div>
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### Course Provider Contact Information

<b>Provider Name</b> _____ Wendy (First) Friedman (Last) _____ (Middle)	
<b>Provider Mailing Address</b> Street <u>393 East Walnut St</u> City <u>Pasadena</u> State <u>CA</u> Zip <u>91188</u>	
<b>Provider Email Address</b> <u>Wendy.L.Friedman@kp.org</u>	
Will the proposed course be open to all California licensed optometrists?	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO
Do you agree to maintain and furnish to the Board and/or attending licensee such records of course content and attendance as the Board requires, for a period of at least three years from the date of course presentation?	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO

### Course Instructor Information

Please provide the information below and attach the curriculum vitae for each instructor or lecturer involved in the course. If there are more instructors in the course, please provide the requested information on a separate sheet of paper.

<b>Instructor Name</b> _____ Pratap (First) Challa, MD (Last) _____ (Middle)	
<b>License Number</b> _____	<b>License Type</b> _____
<b>Phone Number</b> (919) <u>618-3937</u>	<b>Email Address</b> <u>pratap.challa@duke.edu</u>

*I declare under penalty of perjury under the laws of the State of California that all the information submitted on this form and on any accompanying attachments submitted is true and correct.*

\_\_\_\_\_  
 Signature of Course Provider

\_\_\_\_\_  
 Date



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Pasadena, California 91188  
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Medical Grouping and Board Use Only			
Receipt #	Payor ID	Beneficiary ID	Amount
1-1670	1509266	1509266	300

November 21, 2016

NOV 22 4 11 PM '16

Dear California Board of Optometry,

This letter is to correct the missing application pieces for the 2016 Ophthalmology Symposium at the Disneyland Hotel on Saturday, September 17, 2016

Enclosed is

- a check for \$300.00
- a detailed summary of each course
- outlines for each course
- powerpoint slides – which can also be viewed on the website (link below)

The reason the application was late

The delay was due to not knowing the status of one of our speakers (Nadia Waheed, MD) so the agenda wasn't finalized. She was originally scheduled to speak twice in the morning but then she informed us she was asked to present at a different symposium on the same day in San Diego. We didn't know until very close to the symposium if she would have to cancel or would be able to switch to an afternoon slot or she would only speak once and have another colleague take her other slot. What was finally settled upon is she would switch to the afternoon slot and give the other slot away to her colleague.

Your letter requested a CV for Dr. Garrick Chak.

He was the chair of the committee and introduced the day and all the speakers – he didn't give any presentation.

Below is the link to our registration website that has more information and shows that Southern California Permanente Medical Group (accredited by the Institute for Medical Quality/California Medical Association (IMQ/CMA) to provide continuing medical education for physicians – and they have approved this symposium for **6.5 AMA PRA Category 1 Credit(s)<sup>TM</sup>**  
<https://www.signup4.net/public/ap.aspx?EID=PHYE530E&OID=50>

I can email you soft copies (if you prefer) or if you need any more information, please feel free to contact me.

Sincerely,

Wendy Friedman  
Meeting Planner  
393 East Walnut, Pasadena, CA 91188      626) 405-4644      [wendy.L.friedman@kp.org](mailto:wendy.L.friedman@kp.org)



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393 East Walnut  
Pasadena, California 91188  
(626) 405-4644

August 15, 2016

Dear California Board of Optometry,

This letter is to request continuing education credits for the  
**2016 Ophthalmology Symposium**  
at the  
**Disneyland Hotel**  
1150 Magic Way, Anaheim, CA 92802  
**Saturday, September 17, 2016**

Enclosed is a check for \$50.00

Below is the link to our registration website that has more information and shows that Southern California Permanente Medical Group (accredited by the Institute for Medical Quality/California Medical Association (IMQ/CMA) to provide continuing medical education for physicians – and they have approved this symposium for **6.5 AMA PRA Category 1 Credit(s)<sup>™</sup>**

<https://www.signup4.net/public/ap.aspx?EID=PHYE530E&OID=50>

If you need any more information, please feel free to contact me.

Sincerely,

Wendy Friedman  
Meeting Planner  
393 East Walnut  
Pasadena, CA 91188  
626) 405-4644

[wendy.L.friedman@kp.org](mailto:wendy.L.friedman@kp.org)



**33rd Annual Southern California Kaiser Ophthalmology Symposium  
Disneyland Hotel**

1150 Magic Way, Anaheim, CA 92802

**Saturday, September 17, 2016**

7:00 am – 7:45 am	<b>Registration/Continental Breakfast</b>
7:45 am – 8:00 am	<b>Welcome/Opening Remarks</b> Garrick Chak, MD Symposium Chair, Kaiser Permanente, West Los Angeles
8:00 am – 8:45 am	<b>How to Avoid Being Burned by Pseudoexfoliation</b> Pratap Challa, MD ✓ Associate Professor of Ophthalmology, Duke Eye Center, Duke University
8:45 am – 9:30 am	<b>Update on Diagnosis and Management of Challenging Cornea Cases</b> Natalie Afshari, MD ✓ Professor of Ophthalmology, Shiley Eye Institute, UC San Diego
9:30 am – 9:45 am	<b>BREAK</b>
9:30 am - 11:30 am	<b>TECHNICIAN BREAKOUT SESSION: Helpful Need-to-Know Facts</b> Bobbi Ballenberg, COMT ✓ <del>Clinical Manager, Jules Stein Eye Institute, UCLA</del>
9:45 am – 10:30 am	<b>ROCK Inhibitors and Glaucoma</b> Pratap Challa, MD ✓ Associate Professor of Ophthalmology, Duke Eye Center, Duke University
10:30 am -11:30 am	<b>ROCK Inhibitors and Cornea</b> Natalie Afshari, MD ✓ Professor of Ophthalmology, Shiley Eye Institute, UC San Diego
11:30 am – 12:30 pm	<b>LUNCH</b>
12:30 pm – 1:15 pm	<b>Select Innovations in Pediatric Retina</b> Irena Tsui, MD ✓ Assistant Professor of Ophthalmology, Jules Stein Eye Institute, UCLA
1:15 pm – 2:00 pm	<b>Pearls for Scleral Fixated Intraocular Lenses</b> Irena Tsui, MD ✓ Assistant Professor of Ophthalmology, Jules Stein Eye Institute, UCLA
2:00 pm – 2:15 pm	<b>BREAK</b>
2:15 pm – 3:00 pm	<b>OCT Angiography</b> ✓ Nadia Waheed, MD ✓ Associate Professor of Ophthalmology, New England Eye Center, Tufts
3:00 pm – 3:55 pm	<b>Diabetic Macular Edema Pearls, Updates from Protocol T and DRCRnet</b> Nadia Waheed, MD ✓ Associate Professor of Ophthalmology, New England Eye Center, Tufts
3:55 pm – 4:00 pm	<b>Closing Remarks</b>



**9:45 am – 10:30 am**

**ROCK Inhibitors and Glaucoma**

SPEAKER: Pratap Challa, MD

DETAILED SUMMARY: No new class of drugs has come to market for treating glaucoma since 1996, when the FDA approved the first prostaglandin analogue.

Rho kinase (ROCK) inhibitors are a novel potential class of glaucoma therapeutics with multiple compounds currently in US Food and Drug Administration trials. Given the multiple beneficial effects for glaucoma patients, ROCK inhibitors are certainly a highly anticipated emerging treatment option for glaucoma. Rho Kinase (ROCK) inhibitors are considered the next generation of therapeutic agents. Research has shown that this new drug class may advance treatment of patients with glaucoma.

Evidence based guidance on the new developments with this pharmacotherapy may largely benefit glaucoma patients worldwide and reduce blindness from a condition that would otherwise cause irreversible vision loss.

Overall, recent studies by the Institute of Medicine, RAND, and others have called attention to the gap between scientifically supported approaches to care and day-to-day practice by clinicians. Health plans and large employers have targeted the *gap between knowledge and practice as the root cause for inappropriate variability in practice patterns*.

SCPMG physicians need to be aware of and prepare for use of emerging technology and medications, the gap between knowledge and practice is significant, and physicians do not routinely adhere to evidence-based guidelines when known.

OBJECTIVES - At the end of this activity, participants should be able to:

- Examine the evidence for use of Rho Kinase (ROCK) Inhibitors to treat glaucoma and cornea; develop and implement a plan to integrate into practice

TOPICAL OUTLINE

- Glaucoma introduction
- Insights from clinical trials
- Mechanism of ROCK inhibition
- Study outcomes

## ROCK Inhibitors and Glaucoma



Pratap Challa, MD  
Associate Professor  
Director, Residency Training Program

- Disclosures:
- Aerie pharmaceutical (P)

## Outline

- Glaucoma introduction
- Insights from clinical trials
- Mechanism of ROCK inhibition
- Study outcomes

## Selection of Treatment Technique

- Likelihood of success
- Target IOP
  
- Avoid short-term complications
- Minimize long-term complications

## Glaucoma Prevalence (POAG)

- 2.25 million Americans over 40 years old have POAG
- 5.5% of African-Americans
- 1.7% of Whites
- 84,000 to 116,000 are bilaterally blind

## Risk Factors for Glaucoma

- Ethnic background: African American and Asian American
- Age: >40
- Intraocular hypertension
- Family history of glaucoma

### Blindness at Diagnosis

Hattenhauer, et al, Ophthly 1998

- Olmsted County
- Diagnosis between 1965 and 1980
- 15 of 295 (5.1%) patients blind in at least one eye

### Risk of Blindness in Treated Glaucoma

Hattenhauer, et al, Ophthalmology 1998

- 295 residents of Olmsted County, MN
- Mean follow-up of 15 years ( $\pm$  8 years)
- Legal blindness (20 degree field or 20/200) using Kaplan-Meier over 20 years
- Blindness in one eye - 27 % (20-33%)
- Bilateral blindness - 9 % (5 to 14%)

### Risk of Blindness in at Least 1 eye from Glaucoma

- St. Lucia untreated 10 yrs 16 % AGIS  
38 % CIGTS
- Olmsted treated 20 yrs 27 % unilateral  
9 % bilateral
- Kwon, et al treated 22 years 19 %

### Bilateral Blindness Due to Glaucoma

Sommer, et al, NEJM, 1991

- 64 of 5308 (1.2%) persons 40 and older in Baltimore Eye Study bilaterally blind
- Glaucoma accounted for 17 of 128 eyes with blindness (13%)
- Compared to overall population, glaucoma blindness occurred in **no more than 0.16 to 0.3%** of cross-sectional, stratified sample

### Reconciling Baltimore and Olmsted County

- Bilateral blindness less common than unilateral (at least 1:3 ratio using Olmsted data)
- Population sample versus treatment sample
- Visual acuity data (Baltimore) versus acuity and field data (Olmsted)

### People in USA with Glaucoma, 2000

Quigley & Vitale, IOVS, 1997

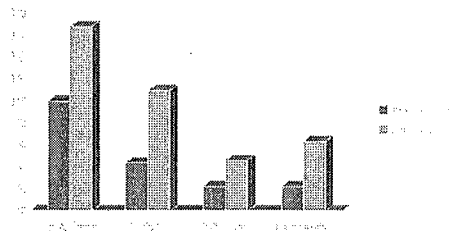
- Person-years with Glaucoma among Affected
 

Whites	12.8 years (12.5 – 14.7)
Blacks	16.3 years (14.9 – 16.3)
- Person-years affected by Glaucoma of a Cohort
 

Whites	1.1 % (0.79 – 1.6)
Blacks	3.9 %



### OHTS Treatment Benefit 5 years



### Hazard Ratios for POAG

- Age (per decade) 1.22
- Diabetes mellitus 0.37
- IOP (per mm Hg) 1.10
- Corneal thickness (40 um) 1.71
- PSD (0.2 db baseline) 1.27
- Vertical c/d (per 0.1) 1.32

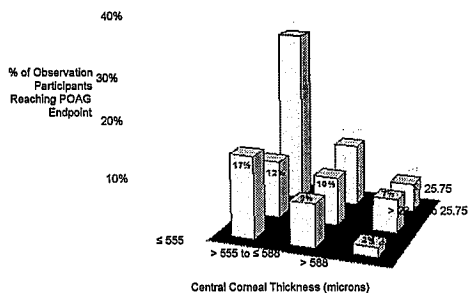
### Genetic Overview of Glaucoma

- A positive family history is a major risk factor for POAG
- A positive family history increases the risk of developing POAG 7-10 times that of the general population
- 50% of patients with POAG will have a relative with POAG

### Genetic Overview of Glaucoma

- Several genes associated with POAG have been identified.
- Only 3-5 % of POAG pts have been identified with a genetic mutation so far
- 50 to 75 % of JOAG

### Observation Participants at POAG Endpoint\* Central Corneal Thickness vs. Baseline IOP (mmHg)



### Treatment Issues of Suspects

- Different subsets at different risk levels
- Loss of nerve tissue vs. loss of visual field
- Ability to stop or slow loss

### Visual Field "Failure Rate" in Early Field Loss Glaucoma

- Mao, et al, AJO 1991; AAO PPP, 1992

Level of IOP (mm)	Field Progression (%)
< 17	0
17 to 21	53
> 21	100

### Visual Field "Failure Rate" in Advanced Field Loss Glaucoma

- Odberg, Acta 1987; AAO PPP, 1992

Level of IOP (mm)	Field Progression (%)
All < 16	33
Mostly < 16	47
Mostly > 15	82
Some > 20	84
All > 20	100

### "Failure Rate" in Glaucoma Filtering Surgery

- Modified "Dose Response" to IOP (PPP, 1992)

Mean IOP (mm)	Worse (%)	Follow-up (yrs)
14.4	6	5
15.0	18	5
17.3	35	4
18.1	29	5
19.1	58	5

### Blindness after Filtering Surgery

Parc, et al, AJO, 2001

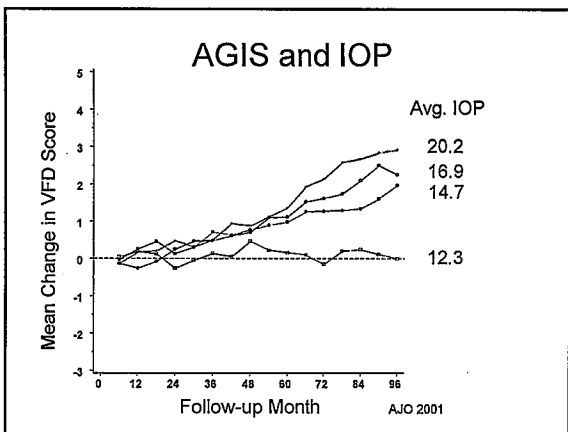
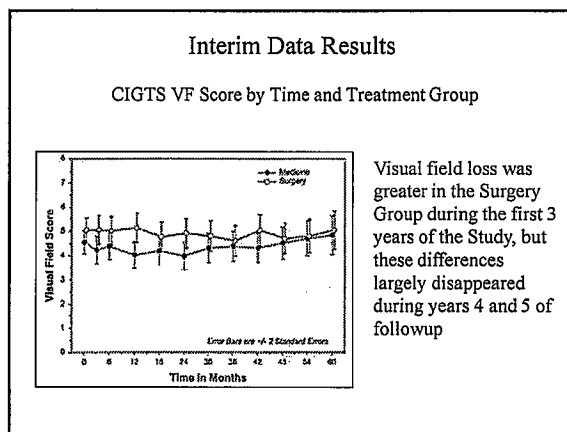
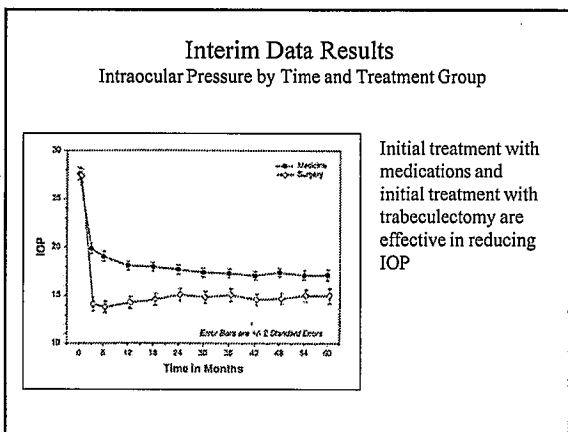
- 73 eyes from Olmsted County, diagnosed and between 1965 and 1980 and surgery between 1965 and 1998
- Mean pre-op IOP of  $27.6 \pm 8.5$  mm
- Blindness at 10 years was **46 %**
- NO difference in IOP (14.0 blind, 15.4 not)
- Difference – degree of initial VF loss

### Progression Rates - Untreated

		All	VF
OHTS	5 years	11 %	5 %
EMGT	6 years	62 %	---
CNTGS	5 years	60 % *	39 %
St. Lucia	10 years	CIGTS	73 %
		AGIS	54 %

### Effect of Treatment on Progression

- OHTS 5 yrs 11 % vs. 4.4 %
- EMGT 6 yrs 62 % vs. 45 %
- CNTGS 5 yrs 60 % vs. 20 %
- AGIS 5 yrs 18 %
- AGIS 10 yrs 39 %
- CIGTS 5 yrs 17 % surgery
- CIGTS 14 % medication



### Insights from Trials and Studies

- Subset of ocular hypertensives as focus of treatment
- Likely to UNDER-treat those with moderate (VF loss) or worse glaucoma

### Key Points

- Establish meaningful target pressure range
- Lowering pressure reduces vision loss and prevents blindness
- Use method likely to achieve target pressure range

### Optic Nerve Cupping

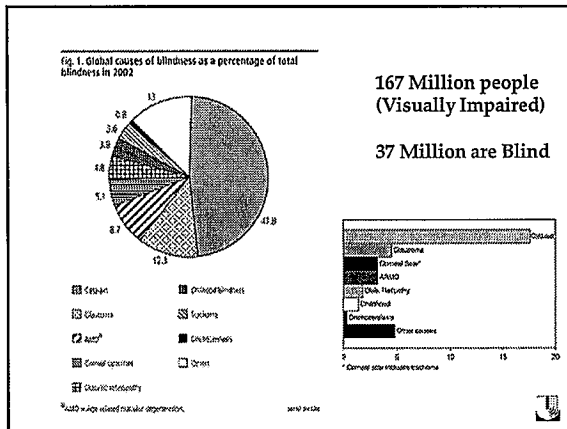
### Eye Disease Prevalence and Projections

*(Number of Adults 40 Years and Older in the U.S.)*

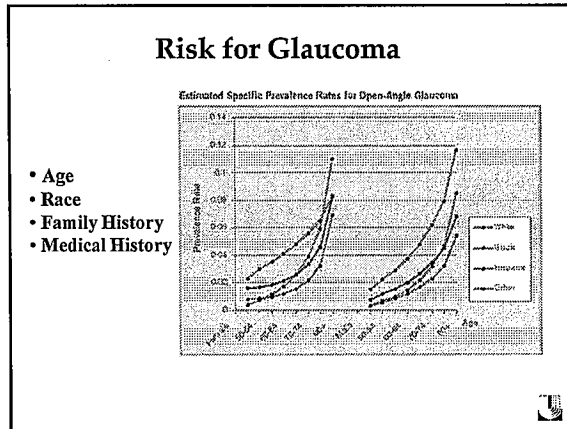
	Current Estimates (in millions)	2020 Projections (in millions)
Age-Related Macular Degeneration	1.8*	2.9
Glaucoma	2.2	3.3
Diabetic Retinopathy	4.1	7.2
Cataract	20.5	30.1

Visual field

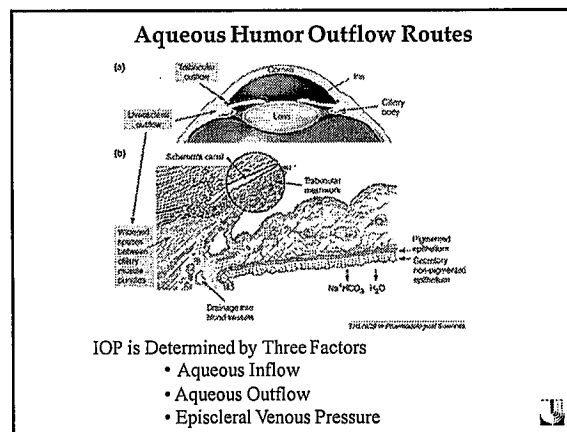
**Glaucoma is a second leading cause of blindness in the USA**



- ### Different Types of Glaucoma
- Open Angle Glaucoma
  - Angle Closure Glaucoma
  - Normal Tension Glaucoma
  - Congenital Glaucoma
  - Secondary Glaucoma



- ### Increased Intraocular Pressure
- is one of the major risk factors of POAG
  - can directly lead to glaucoma



- ### Different Treatment Options for Glaucoma
- Medical Treatment
  - Laser Surgery
  - Glaucoma Surgery

### Different Medications

- Prostaglandin analogs
- Beta-blockers
- Alpha-adrenergic agonists
- Carbonic anhydrase inhibitors
- Miotics



### Glaucoma is associated with

- Increased resistance to aqueous outflow
- Decreased TM cells
- Abnormal organization of ECM in JCT ?
- Accumulation of Plaque material ?
- Increased TGF-beta, Endothelin-1 in aqueous humor
- Increased IL-1 in TM
- Myocilin mutation



### Increased Intraocular Pressure

- Is a major risk factor for glaucoma
- Currently, the only proven therapy for glaucoma is lowering the IOP.
  - Medical
  - Laser surgery
  - Incisional surgery



### Glaucoma Medical History

- 1800's Pilocarpine
- 1930 Epinephrine
- 1950 Oral CAI's
- 1980 Timolol
- 1993 Apraclonidine
- 1995 Dorzolamide
- 1996 Latanoprost
- 2013 ?

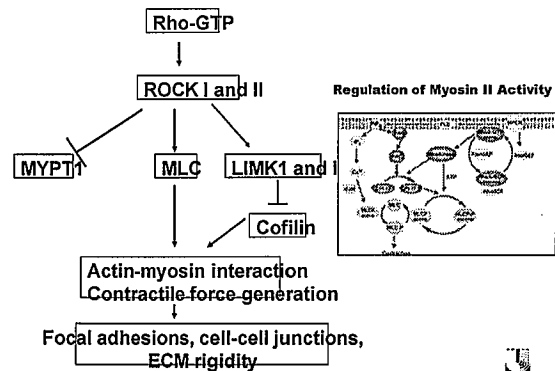


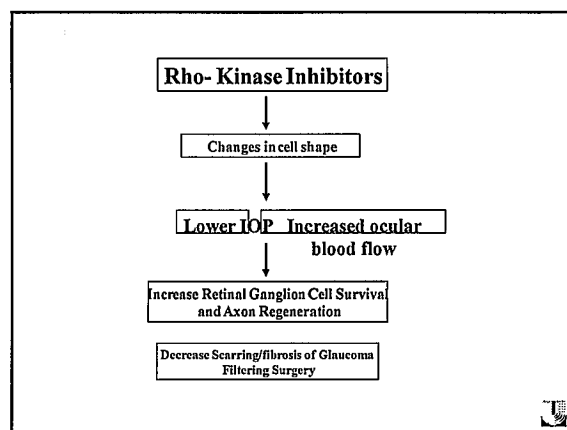
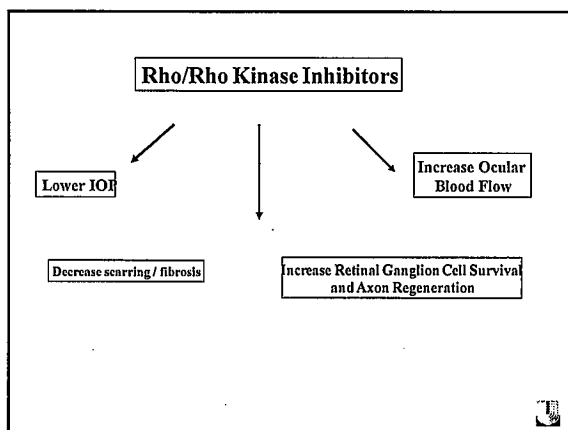
### A drug to target the TM?

- Need a drug that acts directly at the site of resistance to aqueous outflow
- Rho-Kinase inhibitors
  - Smooth muscle relaxation
  - Increase blood flow
  - Increase RGC survival
  - Decrease fibrosis



### Rho GTPase Signaling/ Action

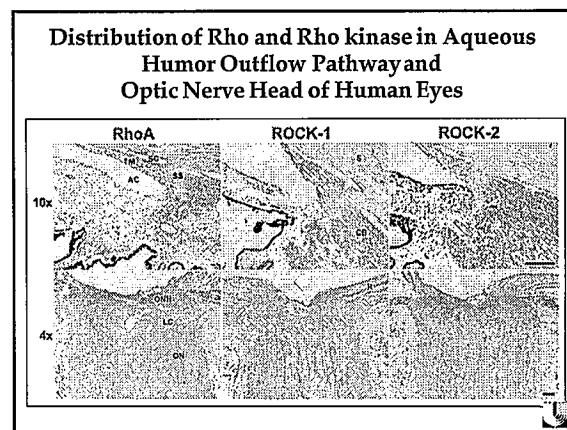




- ### Implications of the Rho/Rho-Kinase Pathway
- Cardiovascular Diseases
    - Hypertension
    - Coronary and cerebral vasospasm
    - Restenosis
    - Atherosclerosis
    - Stroke
    - Heart Failure
  - Bronchial Asthma
  - Erectile Dysfunction
  - Renal Disease
  - Osteoporosis
  - Ocular Diseases
    - Glaucoma
    - Vitreoretinal Diseases
- } *Diseases of Aging*

- ### Companies Researching Ocular Rho-kinase Inhibitors
- Aerie Pharmaceuticals (USA)
  - Altheos (USA)
  - AmaKem (Belgium)
  - Kowa Pharmaceutical (Japan)
  - Merck (Inspire Pharm USA)
  - Novartis (Switzerland)
  - Santen (Japan)
  - Senju Pharmaceuticals (Japan)

What does Rho do in the eye?



### H-1152-Induced Increase in Aqueous Outflow Facility Through the TM Pathway is Associated with Decreased MLC Phosphorylation in TM Tissue

**Changes in MLC Phosphorylation**

(A) pMLC  
(B) Actin

Control      H-1152

The TM tissue extracted from the drug-perfused eyes ( for 5 hours) was analyzed for the changes in MLC phosphorylation by Western blot analysis.

Rho kinase inhibitor induces morphologic changes in HTM and SC cells

Control      Y-27632

HTM  
SC

From: P. Vasantha Rao, Pei-Feng Deng, Janardan Kumar, David L. Epstein. Modulation of Aqueous Humor Outflow Facility by the Rho Kinase-Specific Inhibitor Y-27632. 1029-1037 IOVS 42 (5): 2001

### Effects of Rho Kinase Inhibitors on Aqueous Outflow Facility in Perfused Porcine Eyes

Y-27632  
H-1152

Enucleated porcine eyes were perfused at a constant pressure using the Grant perfusion system

Rao et. al. IOVS. 2001 & Exp Eye Res. 2005

Y-27632 significantly reduces IOP and increases pupil diameter

From: Megum Honjo, Hidenobu Tanihara, Masaru Inatani, Noriki Kido, Tatsuya Sawamura, Beatrice Y. J. T. Yue, Shuh Narumiya, Yoshihito Honda. Effects of Rho-Associated Protein Kinase Inhibitor Y-27632 on Intraocular Pressure and Outflow Facility. 137-144 IOVS 42 (1) 2001

### Lu, Overby, Scott, Freddo, and Gong, Exp Eye Res 2008

- Bovine eyes
- Increased outflow facility
- Increased "filtration length"

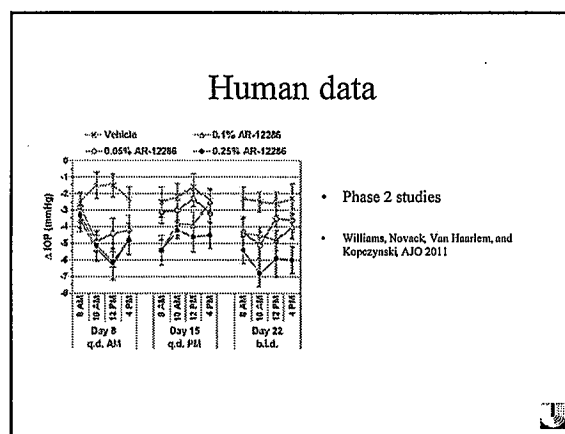
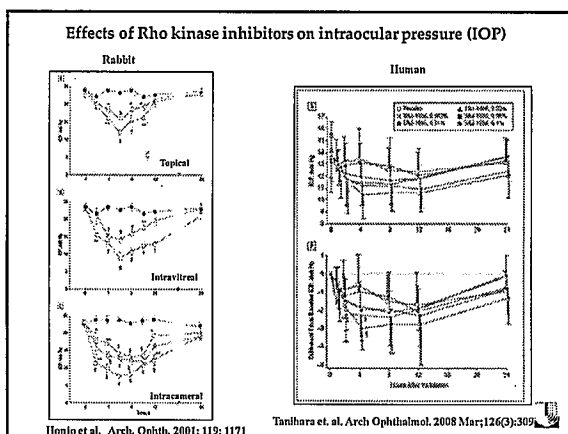
Lu, Zhang, Freddo, Gong, Exp Eye Res 2011

- Monkey eyes
- Relaxation of the JCT
- Increased giant vacuoles

Percent Separation Length

Y27      Wako      Control





### Side effects

- Ocular hyperemia 20 %
- Conjunctival hyperemia 13%
- Eye pain 3%
- Eye irritation/swelling 2%

Williams, Novack, Van Haarlem, and Kocpozynski AJO 2011

### Conclusions

- Rho-kinase inhibitors cause significant changes in the morphology of Trabecular Meshwork cells.
- Potent reducers of IOP
- Currently in phase 3 human studies
  - Potent
  - Side effects

**DUKE UNIVERSITY MEDICAL CENTER**

**CURRICULUM VITAE**

**Date Prepared: 05-07-15**

**Name** Pratap Challa, M.D.

**Primary academic appointment:** Associate Professor with Tenure

**Primary academic department:** Ophthalmology

**Present academic rank and title:** Associate Professor of Ophthalmology  
with Tenure  
Duke University Medical Center  
Durham, NC 27710

**Date and rank of first Duke Faculty appointment:** 8/2000 Assistant Professor

**Medical Licensure:** North Carolina License #9800493  
Date of License: 05-15-98

**Specialty certification(s):** National Board of Medical Examiners-  
Part I, June 1991  
United States Medical Licensure  
Examination-Part II, Sept. 1992;  
Part III, September 1994  
American Board of Ophthalmology-  
Written Exam, May 1999;  
Oral Exam, November 1999  
American Board of Ophthalmology-  
Maintenance of Certification,  
December 2009

**Date of birth:** 11-25-68

**Place:** Bapatla, India

**Citizen of:** United States

<b><u>Education:</u></b>	<b><u>Institution</u></b>	<b><u>Date (Year)</u></b>	<b><u>Degree</u></b>
<b>High School :</b>	Leon High School, Tallahassee, Florida	1986	Diploma
<b>College:</b>	Florida State University, Tallahassee, Florida	1988	
	University of Florida, Gainesville, Florida	1990	B.S.
<b>Graduate:</b>	University of Florida College of Medicine Gainesville, Florida	1993	M.D.

### Professional training and academic career

7/93- 6/95 Emory University Affiliated Hospital Residency Program  
7/95- 6/98 University of Florida College of Medicine, Department of Ophthalmology  
7/98- 7/99 Duke University Medical Center, Glaucoma Clinical Fellowship  
7/99 -7/00 Duke University Medical Center, Glaucoma Research Fellowship  
8/00- present Assistant Professor of Ophthalmology, Duke University Medical Center  
8/05-7/07 Duke University CRTP, Duke University Medical Center

### Publications:

#### Referred journals:

1. Hamed LM, Challa P, Fanous MM, Guy J. Strabismus Surgery in Selected Patients with Stable Ocular Myasthenia Gravis. *Binocular Vision Q* 1994; 9:283-290.
2. Fanous MM, Challa P, Maren TH. Comparison of Intraocular Pressure Lowering by Topical and Systemic Carbonic Anhydrase Inhibitors in the Rabbit. *J Ocular Pharmacology and Therapeutics* 1999 Feb;15(1):51-7.
3. Allingham RR, Seo B, Rampersaud E, Bembe M, Challa P, Liu N, Parrish T, Karolak L, Gilbert J, Pericak-Vance MA, Klintworth, Vance JM. A Duplication in Chromosome 4q35 is Associated with Hereditary Benign Intraepithelial Dyskeratosis. *Am J Hum Genet.* 2001 Feb;68(2):491-4.
4. Herndon LW, Asrani SG, Williams GH, Challa P, Lee PP. Paradoxical Intraocular Pressure Elevation After Combined Therapy With Latanoprost and Bimatoprost. *Arch Ophthalmol.* 2002 June;120(6):847-849
5. Challa P, Herndon LW, Hauser MA, Broomer B, Pericak-Vance MA, Ababio-Danso B, Allingham RR: Prevalence of myocilin mutations in adults with POAG in Ghana, West Africa. *J Glaucoma*, 2002 Oct; 11(5): 416-420.
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7. Asrani S, Challa P, Herndon L, Lee P, Allingham RR. Correlation Among Retinal Thickness, optic disc and visual field in glaucoma patients and suspects: a pilot study. *J Glaucoma.* 2003 Apr; 2(2):119-28.
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18. Liton P, Liu X, Challa P, Epstein D, Gonzalez P. Induction of TGF-beta1 in the trabecular meshwork under cyclic mechanical stress. *J Cell Physiol*. 2005 May13.
19. Challa P, Luna C, Liton P, Chamblin B, Wakefield J, Ramabhadran R, Epstein D, Gonzalez P. Lentiviral Mediated Gene Delivery to the Anterior Chamber of Rodent Eyes. *Mol Vis*. 2005 Jun 21;11:425-30.
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29. Gedde SJ, Herndon LW, Brandt JD, Budenz DL, Feuer WJ, Schiffman JC, and the Tube Versus Trabeculectomy Study Group. Surgical complications in the Tube Versus Trabeculectomy Study during the first year of follow-up. *American Journal of Ophthalmology* 143:23-31, 2007.
30. Stein JD, Herndon LW, Bond JB, Challa P. Exposure of Ex- Press Miniature Glaucoma Devices: Case Series and Technique for Tube Shunt Removal. *J Glaucoma*. 2007 Dec;16(8):704-6
31. Jagadeesan R, Kalyan DN, Lee PP, Stinnett S, Challa P. The Use of a Standardized Patient Satisfaction Questionnaire to Assess the Quality of Care Provided by Ophthalmology Residents. *Ophthalmology* 2008 Apr;115(4):738-743.

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58. Li G, Gonzalez P, Camras LJ, Navarro I, Qiu J, Challa P, Stamer WD. Optimizing gene transfer to conventional outflow cells in living mouse eyes. *Exp Eye Res*. 2013 Apr; 109:8-16.
59. Arnold JJ, Hansen MS, Gorman GS, Inoue T, Rao V, Spellens S, Hunsinger RN, Chapleau CA, Pozzo-Miller L, Stamer WD, Challa P. The effect of Rho-associated kinase inhibition on the ocular penetration of timolol maleate. *Invest Ophthalmol Vis Sci*. 2013 Feb 7; 54(2):1118-26.
60. Challa P, Arnold JJ. Rho-kinase inhibitors offer a new approach in the treatment of glaucoma. *Expert Opin Investig Drugs*. 2014 Jan; 23(1):81-95.
61. Wallace DJ, Chau FY, Santiago-Turla C, Hauser M, Challa P, Lee PP, Herndon LW, Allingham RR. Osteogenesis imperfecta and primary open angle glaucoma: genotypic analysis of a new phenotypic association. *Mol Vis*. 2014 Aug 29;20:1174-81. eCollection 2014.
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63. Dismuke WM, Challa P, Navarro I, Stamer WD, Liu Y. Human aqueous humor exosomes. *Exp Eye Res*. 2015 Mar;132:73-7. doi: 10.1016/j.exer.2015.01.019. Epub 2015 Jan 22.
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65. Li Z, Allingham RR, Nakano M, et. al. A common variant near TGFBR3 is associated with primary open angle glaucoma. *Hum Mol Genet*. 2015 Apr 10. pii: ddv128. [Epub ahead of print]
66. McNabb RP, Challa P, Kuo AN, Izatt JA. Complete 360° circumferential gonioscopic optical coherence tomography imaging of the iridocorneal angle. *Biomed Opt Express*. 2015 Mar 20;6(4):1376-91. doi: 10.1364/BOE.6.001376. eCollection 2015 Apr 1.
67. Hauser MA, Aboobakar IF, Liu Y, Miura S, Whigham BT, Challa P, Wheeler J, Williams A, Santiago-Turla C, Qin X, Rautenbach RM, Ziskind A, Ramsay M, Uebe S, Song L, Safi A, Vithana EN, Mizoguchi T, Nakano S, Kubota T, Hayashi K, Manabe S, Kazama S, Mori Y, Miyata K, Yoshimura N, Reis A, Crawford GE, Pasutto F, Carmichael TR, Williams SE, Ozaki M, Aung T,

Khor CC, Stamer WD, Ashley-Koch AE, Allingham RR. Genetic variants and cellular stressors associated with exfoliation syndrome modulate promoter activity of a lncRNA within the LOXL1 locus. *Hum Mol Genet.* 2015 Nov 15;24(22):6552-63. doi: 10.1093/hmg/ddv347. Epub 2015 Aug 25.

68. Germano RA, Finzi S, Challa P, Susanna Junior R. Rho kinase inhibitors for glaucoma treatment - Review. *Arq Bras Oftalmol.* 2015 Nov-Dec;78(6):388-91. doi: 10.5935/0004-2749.20150103.
69. Boussommier-Calleja A, Li G, Wilson A, Ziskind T, Scinteie OE, Ashpole NE, Sherwood JM, Farsiu S, Challa P, Gonzalez P, Downs JC, Ethier CR, Stamer WD, Overby DR. Physical Factors Affecting Outflow Facility Measurements in Mice. *Invest Ophthalmol Vis Sci.* 2015 Dec;56(13):8331-9. doi: 10.1167/iovs.15-17106.
- 70.

### 3. Chapters in books:

1. Challa P, Herndon L. Tonometry, Tonography, and Aqueous Fluorophotometry. In Duane's textbook of Ophthalmology.
2. Challa P, Early Post-operative Pressure Increase. In *Glaucoma* first edition, editors: Shaarway, Sherwood, Hitchings, and Crowston.
3. Challa P, Epstein DL. Adrenergic Agents: Blockers and Agonists. In Chandler and Grant's *Glaucoma*, 5<sup>th</sup> ed.
4. Challa P, Epstein DL. The Miotics. In Chandler and Grant's *Glaucoma*, 5<sup>th</sup> ed.
5. Challa P, Epstein DL. Carbonic Anhydrase Inhibitors: Systemic Use. In Chandler and Grant's *Glaucoma*, 5<sup>th</sup> ed.
6. Challa P, Schuman JS. Topical Carbonic Anhydrase Inhibitors. In Chandler and Grant's *Glaucoma*, 5<sup>th</sup> ed.
7. Stein JD, Allingham RR, Challa P. Management of Highly Elevated Intraocular Pressure. In Chandler and Grant's *Glaucoma*, 5<sup>th</sup> ed.
8. Challa P, Epstein DL. Pseudoexfoliation Syndrome and Open-Angle Glaucoma. In Chandler and Grant's *Glaucoma*, 5<sup>th</sup> ed.
9. Challa P. Early Postoperative Increase in Intraocular Pressure. In *Glaucoma*, Shaarawy, Sherwood, Hitchings, Crowston, 2<sup>nd</sup> ed, Vol 2

### 4. Books: (Indicate authors or editor.)

### 5. Non-authored publications:

### 6. Other: a. Published scientific reviews

#### b. Selected abstracts

1. Challa, P, Gonzalez, P, Allingham, RR, Epstein, DL and Bowes Rickman, C (2002) Identification of Genes Differentially Expressed in Individuals with Pseudoexfoliation



- Syndrome. Annual Meeting Abstract Search and Program Planner [on CD-ROM]. *Association for Research in Vision and Ophthalmology*, April 1, 2002. Abstract 4025.
2. Challa P, Gonzalez P, Liton PB, Caballero M, Epstein DL (2003) Gene Expression Profile in a Novel Cell Type in Primary Cultures of Human Trabecular Meshwork. Annual Meeting Abstract Search and Program Planner [on CD-ROM]. *Association for Research in Vision and Ophthalmology*, May 7, 2003. Abstract 3164
  3. Challa P, Gonzalez P, Liton P, Wang W, Chamblin B, Wakefield J, Ramabhadran R, Epstein D. Gene transfer to the trabecular meshwork and anterior segment of living rat eyes using lentiviral vectors. Annual Meeting Abstract Search and Program Planner [on CD-ROM]. *Association for Research in Vision and Ophthalmology*, April 28, 2004. Abstract 2100
  4. Cohen C, Challa P, Herndon L, Pericak-Vance M, Abramson K, Hauser M, Wiggs J, Allingham R. Prevalence of Optineurin Mutations in Adults with Primary Open Angle Glaucoma in Ghana, West Africa. Annual Meeting Abstract Search and Program Planner [on CD-ROM]. *Association for Research in Vision and Ophthalmology*, April 28, 2004. Abstract 4627.
  5. Arnold J, Challa P, Epstein D Novel Anti-glaucoma Formulations of Ethacrynic Acid Containing Chitosan. Invest Ophthalmol Vis Sci 2005 46: E-Abstract 3680.
  6. L.Talbot, P.Gonzalez, P.Liton, D.L. Epstein, P.Challa. Optimizing Delivery of Novel Anti-Sense Oligonucleotides to Trabecular Meshwork Cells Invest Ophthalmol Vis Sci 2006 E-abstract 1874.
  7. J.J. Arnold, Y.Choksi, X.Chen, A.Shimazaki, E.Toone, D.L. Epstein, P.Challa. Hydrogel Formulations Containing (2-Hydroxypropyl)- $\beta$ -Cyclodextrin and Chitosan Improve the Ocular Pharmacodynamics of the Poorly Soluble Ocular Hypotensives, Ethacrynic Acid (ECA) and SA9000 Invest Ophthalmol Vis Sci 2006 E-abstract 5104.
  8. Navarro ID, Epstein DL, Gonzalez P, Challa P. LOXL1 Gene Expression in Lens Capsule Specimens Invest Ophthalmol Vis Sci 2008 E-abstract 448
  9. Li G, Navarro ID, Epstein DL, Gonzalez P, Challa P. The Role of the Forkhead Box O Genes in Lens Cell Culture Response to Oxidative Stress Invest Ophthalmol Vis Sci 2008 E-abstract 2278
  10. Challa P, Inoue T, Rao V, Arnold J. Evaluation of the Ocular Distribution and Effects on the Corneal Permeability Barrier of a Specific Rho-Associated Protein Kinase Inhibitor, Y-27632. Invest Ophthalmol Vis Sci 2009 E-abstract 5165
  11. Challa P, Camras LJ, Navarro ID, Luna CC, Li G, Klintworth GK, Epstein DL, Gonzalez P. The Anterior Segment Effects of a Conditional Dicer Knockout in a Rodent Model. Invest Ophthalmol Vis Sci 2010 E-abstract 6431
  12. Huang W, Qui J, Navarro ID, Gonzalez P, Challa P. FOXO Protein Expression is Down-regulated with Aging in the Lens. Invest Ophthalmol Vis Sci 2010 E-abstract 4590.
  13. Challa P, Bordelon AH, Li G, Rickman CB, Epstein DL, Gonzalez P. Laminin B1 upregulation in pseudoexfoliation syndrome. Invest Ophthalmol Vis Sci 2011 E-abstract 72.
  14. Iyer P, Lalane R, Challa P, Morris C, Rao V. Autotaxin-LPA signaling axis is a novel molecular target for lowering intraocular pressure in a rabbit model. Invest Ophthalmol Vis Sci 2011 E-abstract 2070.
  15. Allingham RR, Liu Y, Gibson J, Qin X, Wheeler J, Akafo S, Richards J, Girkin C, POAG African American Study Group, Hauser MA. Variants in CAV1/2 are associated with POAG risk in African Americans. Invest Ophthalmol Vis Sci 2011 E-abstract 2402.

16. Hansen MS, Arnold JJ, Gorman GS, Rao V, Challa P. The effect of a Rho-associated kinase (ROCK) inhibitor on the ocular distribution of timolol maleate in New Zealand White Rabbits. Invest Ophthalmol Vis Sci 2011 E-abstract 3229.
17. Liu Y, Gibson J, Richards JE, Lichter PR, Gaasterland DE, Challa P, Herndon LW, Schmidt S, Allingham RR, Hauser, MA. Deletions in the GALC gene are associated with primary open angle glaucoma. Invest Ophthalmol Vis Sci 2011 E-abstract 3304.
18. Gonzalez P, Challa P, Camras LJ, Yuan F, Navarro ID, Li G, Luna C, Wu J, Klintworth GK, Epstein DL. Effects of a conditional DICER knockdown on the outflow pathway in living mice. Invest Ophthalmol Vis Sci 2011 E-abstract 6610.

**c: Editorials, position, and background papers**

**Consultant appointments:**

WOC faculty appointment at Durham VAH (8/2000 to 6/2009) and Asheville VAH (8/00 to 2006)  
 Faculty appointment (1/8) at Durham VAH (6/2009 to present)

**Professional awards and special recognitions:**

1988	Junior Honors Medical Program, University of Florida
1997	Outstanding Ophthalmology Resident of the Year
1999-2000	Glaucoma Research Foundation Clinician-Scientist Award
2002	Glaucoma Scholars Award
2003	Duke University Eye Center Golden Globe Award for Outstanding Resident Teaching
2005- present	Best Doctors in America
2006	Research to Prevent Blindness Sybil B. Harrington Scholar Award
2010, 2015	Appreciation from ABO for contributions to the Oral Board Examination
2011	American Academy of Ophthalmology Achievement Award

**Organizations and participation:**

1995-present American Academy of Ophthalmology  
 1995-present Contact Lens Association of Ophthalmologists  
 1997-present Association for Research in Vision and Ophthalmology  
 1999-present American Glaucoma Society

**PATENTS**

Kumar J, Challa P, Rao PV, Epstein DL. Method of Treating Disorders of the Eye. Ref 1736. Feb 2000.  
 Freedman SF, McKinley PH, Challa P, Herndon LW, Toth CA, Overaker RF, Dodge BC. Pressure Project. Ref 1984. June 2001.

Toone E, Epstein DL, Challa P, Snyder P, Chen X, deLong M. Ophthalmological Drugs. June 2006

## **OTHER**

Director, Residency Training Program, Duke University, April 2001 – present  
Pharmacy and Therapeutics Committee Member, July 2000 – 2005  
Duke University K12 program development committee 2004-present  
Duke University Core Grant Committee 2005-present  
Duke University Milestones Committee, 2015- present  
ABO Oral Board Examiner and prop development committee 2003-present  
ABO Exam Development Committee 2014-present  
AAO residency education committee 5/07-present  
Duke University K12 IRB chair 08/12 to present

## **Ad hoc Scientific Reviews:**

Journal of Controlled Release  
American Journal of Ophthalmology  
Ophthalmology  
Archives of Ophthalmology  
Journal of Glaucoma  
Investigative Ophthalmology and Visual Sciences  
British Journal of Ophthalmology  
Indian Journal of Ophthalmology  
European Journal of Ophthalmology  
Graefe's Archive for Clinical and Experimental Ophthalmology  
Molecular Vision  
Experimental Eye Research  
Current Eye Research  
Journal of Ocular Pharmacology and Therapeutics  
Clinical and Experimental Ophthalmology  
Eye  
Ophthalmic Research  
Human Molecular Genetics  
American Journal of Pathology  
PloS One  
Canadian Journal of Ophthalmology  
Survey of Ophthalmology

**TO BE COMPLETED FOR CHAIR**

## **Teaching responsibilities including continuing education:**

Director of Residency Training Program 2001-present  
Grand Rounds CME director  
Resident lecturer  
Resident Surgical Instructor  
Lecturer for medical students, technicians, and ancillary staff  
Associate Examiner, American Board of Ophthalmology February 2004, November 2005, February 2006, June 2006, June 2008, October 2008, June 2009, October 2009, June 2010, October 2010, June 2011, October 2011, October 2012, June 2013, October 2014, June 2015.  
Prop Development Committee, American Board of Ophthalmology, June 2006, June 2008, October 2008, June 2009, October 2009, June 2010, October 2010, June 2011, October 2011, October 2012, and June 2013.

**Research Mentor:**

**Post-Doctoral:**

John Arnold, PhD- Samford University (2005-2007)

**3<sup>rd</sup> Year Duke Medical Students:**

Rajasekar Jagadeesan (2003-2004)

Lenny Talbot (2004-2005)

Tanya Khan (2008-2010)

**Medical and Undergraduate students:**

Anna Hong

Jonathan Besas

Puneet Panda

Yash Choksi

Anant Agarwalla

Winston Garris

Rama Kastury

Joseph Christenbury

**Residents and Fellows (over 40)**

**Areas of research interests (basic and applied) - list:**

- 1) Molecular basis of Pseudoexfoliation Syndrome
- 2) Collecting surgical specimens for multiple molecular projects
- 3) Drug delivery studies to increase ocular bioavailability
- 4) Modulating cataract development through longevity pathways
- 5) Gene expression profiling of the trabecular meshwork and Schlemm's canal tissue
- 6) Generating conditional knockouts of the TM in rodents
- 7) Clinical: Evaluating the outcomes of current glaucoma therapies
- 8) Development of new instruments to measure resident performance in the core competencies

**External support - gifts, grants, and contracts:**

**Approximate**

<u>PI</u>	<u>% Effort</u>	<u>Purpose</u>	<u>Amount</u>	<u>Duration</u>
Past: Novartis Research Fellowship American Glaucoma Society Pseudoexfoliation in Glaucoma PI: Challa		The major objective is identify genetic causes of pseudoexfoliation glaucoma.	50,000	7/1/03- 7/1/04
American Health Assistance Genetic Study of Pseudoexfoliation Syndrome PI: Challa		The goals of this proposal is to identify genes associated with the development of Pseudoexfoliation glaucoma Using gene array technologies	50,000	4/1/03- 3/31/05
1K23 EY014019-01AI (Challa) PI NIH/NEI The Molecular Basis of Pseudoexfoliation		75% The goal of this research is to investigate molecular mechanisms that are associated with the development of Pseudoexfoliation syndrome (PEX) and Pseudoexfoliation syndrome with glaucoma (PEX-G)	863,000	9/1/03- 8/30/08
5R03-EY014939-03 (Allingham) PI NIH/NEI Genetic Studies of POAG in Ghana, West Africa		Identify discordant sib-pairs in Ghana, West Africa for association Studies of POAG		09/30/03- 08/31/06
R01 EY13315 Hauser (PI) NIH/NEI		Purpose is to identify candidate susceptibility genes for POAG Candidate Genes for Primary Open Angle Glaucoma		7/1/03- 6/30/04
Healthy Vision Award Denny (PI) NIH/NEI		Healthy Vision 2010 Community Awards Program	40,000	1/1/04- 12/31/04
Research to Prevent Blindness Sybil B. Harrington Scholar Award		This award provides funding for additional studies on modifying the expression of candidate genes for pseudoexfoliation syndrome	60,000	9/1/06
1 R01 EY016228-01A1 (Gonzalez) PI NIH/NEI Cellular Senescence and Glaucoma		Identify novel POAG pathways		09/30/05- 06/30/10

**Visiting Professorships:**

West Virginia University, May 2001  
University of Florida, February 2004  
Emory University, March 2004  
Bascom Palmer Eye Institute, May 2004  
University of California at Irvine, July 2004  
Wayne State University, May 2005  
University of Florida, June 2005  
University of Pennsylvania, September 2006  
Mayo Clinic, August 2009  
University of Colorado, October 2009  
SUNY Upstate Medical University, December 2009  
Vanderbilt University, June 2010  
University of Kentucky, June 2010  
Yale University, September 2010  
University of Florida May, 2012  
University of California at Irvine, March 2016

**Invited lectures and presentations (selected):**

Heed Foundation Residency Retreat, September 2006, 2007  
AGS Annual Meeting, 2002, 2007, 2009, 2010, 2012, 2013, 2014, 2015  
AAO Subspecialty Day, 2008  
AUPO discussant, 2009  
AUPO presenter, 2013  
ASCRS Annual Meeting, 2009

**Clinical activity - type of practice and estimate of time commitment:**

Glaucoma specialty practice 50%  
Residency Director 15%  
Glaucoma research 35%

**Participation in academic and administrative activities of the University and Medical Center**

Residency Program Director 2001- present  
ICGME Member and Program Review Committee  
June 2003 Residency Hearing Chairperson  
2002, 2013 Faculty Retreat Committee Leader  
Pharmacology and Therapeutics Committee representative

## Personal Information

**Faculty members' preferred familiar name:** Pratap

**Home address:** 104 Legends Way  
Chapel Hill, NC 27516

**Home Phone #** 919-969-2846

**Marital status:** Married

**Name of spouse:** Shellye Challa

**Children:** 3