Genetic Survey of the Primary Mitochondrial Mutations along with Clinical Correlation in suspected Leber Hereditary Optic Neuropathy (LHON) patients from an Indian Cohort

Srilakha Sundaramurthy, Jayaprakash Moorti, Vithya Din-man, Ramesh Sundaramurthy, Sumanapally Sripram, Sreedhara Gopi, Somashekar Mallavarapu, Anika Saha-Rahaman

Objectives
- Hypothesis: LHO neurons are preferentially vulnerable to mitochondrial dysfunction
- Hypothesis: LHO neurons are preferentially vulnerable to mitochondrial dysfunction

Methods
- Methods: Case-control study
- Methods: Case-control study

Results
- Results: Significant association between mitochondrial mutations and LHON
- Results: Significant association between mitochondrial mutations and LHON

Conclusions
- Conclusions: Mitochondrial dysfunction plays a crucial role in LHON
- Conclusions: Mitochondrial dysfunction plays a crucial role in LHON

Sankaya Neethralaya, 18, College Road, Chennai - 600 006

ARVO 2018
2018 by the numbers

- **179** Travel grants awarded
- **$210,000** Invested in research grants & fellowships
- **672** ARVO members and friends who supported the ARVO Foundation with a gift
- **3** Grants given to help authors with financial need publish in ARVO journals
- **$63,500** Awarded to recognize and encourage innovative research

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Our purpose

The ARVO Foundation raises funds through partnerships, grants and sponsorships to support ARVO’s world-class education and career development resources for eye and vision researchers.
A message from the Chair

In April 2018, I stepped into the big shoes of J. Mark Petrash, PhD, FARVO as I assumed the role of Chair of the ARVO Foundation Board of Governors.

My first days as Chair were during the ARVO 2018 Annual Meeting in Honolulu, where I saw the mission of the ARVO Foundation shine through: to help bring people to the meeting who otherwise may not be able to participate, to support special guest speakers, to reward talented and innovative scientists and to enhance the ARVO experience.

With the support of many generous ARVO members in Honolulu, we met the fundraising challenge issued by Joyce Tombran-Tink, PhD, FARVO and Colin J. Barnstable, DPhil, FARVO and raised more than $32,000 to support travel awards for ARVO 2019.

This past year was also highlighted by the addition of two new funding opportunities to the ARVO Foundation’s growing portfolio: the Bert M. Glaser, MD Award for Innovative Research in Retina, which will recognize a bright young scientist working in retina, and the Ramesh and Brenda Tripathi Vision Research Fund, which will help underwrite several of ARVO’s mentorship and career development programs.

Thank you for your generosity as we seek to attract, support and retain the talented young minds in our field.

Gratefully,

Paul Sternberg, Jr., MD, FARVO
Chair, ARVO Foundation Board of Governors
The ARVO Foundation awarded 179 travel grants through 30 named funds in 2018, benefitting trainees from 15 countries. These travel grants underwrite the cost of attendance for the ARVO Annual Meeting, allowing young scientists to present their research and network with other eye and vision researchers from around the world.
Sanja Petrovic Pajic
Clinical Centre of Serbia
2018 Kreissig Travel Grant recipient

“I am thankful for the opportunity to take part in probably the biggest and certainly the most important vision research meeting. This has helped me to gather new ideas, discuss my work with the leading world experts, acquire new knowledge and to establish contacts with so many young researchers.”

Ryan Salvador
National Institute of Health
2018 Ocular Immunology and Uveitis Foundation Travel Grant recipient

“Attending the meeting allowed me to present my data and meet people from all over the world whose research I have only read in print. It was a great opportunity to meet a diverse group of like-minded individuals to get feedback and learn about my focus on autoimmune uveitis.”

Jacob Heng
Johns Hopkins University
2018 Joanne G. Angle Travel Grant recipient

“Attending the ARVO 2018 meeting allowed me to share my work with a diverse international audience. This gave me the invaluable experience of giving an oral presentation in a large international meeting while also allowing me to gather helpful feedback on my work. This has helped me to think more critically about my own work.”

Janet Hrdina
University of Rochester
2018 WEAVR Travel Grant recipient

“I found value in both attending the meeting and the opportunity to present. I was thrilled to be able to learn from and converse with so many great minds at the conference; I learned a lot and look forward to contributing to this immense, advancing scientific field. I greatly appreciate your support both in encouragement and monetarily.”
2018 Developing Country Eye Researcher Travel Fellowships
The Developing Country Eye Researcher Travel Fellowships (DCERF) program brings aspiring scientists from developing nations to the ARVO Annual Meeting. Each recipient is paired with a volunteer mentor who guides them through ARVO’s large scientific meeting.

The goal of the program is to provide young researchers with access to the latest in vision science while offering the opportunity to network with colleagues, mentors and thought leaders to develop an effective vision research program in their home countries.

**2018 Developing Country Eye Researcher Travel Fellows**

**Luisa Banzon, MD, DPBO**  
Asian Eye Institute  
Makati City, Philippines

**Nina Jovanovic, MD, MSc, MPH**  
Canton Hospital Zenica  
Zenica, Bosnia and Herzegovina

**Rafael Lani, MD**  
Federal University of Rio de Janeiro  
Rio de Janeiro, Brazil

**Kristina Lončarić, MD**  
Clinical Hospital Centre Sestre Milosrdnice  
Zagreb, Croatia

**Jeanne Mayouegeo Kouam, MD**  
Nylon District Hospital  
Douala, Cameroon

**Melina Mateos, PhD**  
Instituto de Investigaciones Bioquímicas de Bahía Blanca-UNS-CONICET  
Buenos Aires, Argentina

**Wilson Ovienria, FWACS, FVRS**  
Irrua Specialist Teaching Hospital  
Irrua, Nigeria

**Srilekha Sundaramurthy, PhD**  
Vision Research Foundation, Sankara Nethralaya  
Chennai, India

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**Program supporters**

The Alcon Foundation  
ARVO 2017 Annual Meeting donors  
ARVO Asia 2017 Brisbane  
University of Wisconsin - Madison  
Women in Eye and Vision Research (WEAVR)
Modeling future treatments for AMD
Glenn Yiu, MD, PhD

Glenn Yiu, MD, PhD, was awarded the 2016 Genentech AMD Research Fellowship for his work as an early-career clinician-scientist. The grant provided Yiu the opportunity to design and create an innovative animal model that combines viral and light delivery into the eye to improve our understanding of age-related macular degeneration, which can potentially provide novel therapies for AMD patients.

“Lack of funding is a major issue for early-career researchers,” said Yiu. “For a clinician-scientist like myself, career development awards provide salary support to give us time to do research. They help get early investigators on their feet during those first few critical years of their career. I thank the ARVO Foundation for providing these grant opportunities which are so critical in helping junior investigators become independent.”

Yiu’s research combines viral-mediated gene delivery and ocular imaging to create a novel animal model of AMD. He plans to continue this translational research program in AMD as he expands his research team and refines his area of focus.

“The ultimate animal model we hope to develop would employ nonhuman primates like rhesus monkeys, which have better resemblance to humans and can better predict a treatment’s effectiveness in human clinical trials. The research from this ARVO Foundation grant is helping us to apply for additional funding for work in rhesus monkeys,” adds Yiu.
2018 Award recipients

**ARVO/Alcon Early Career Clinician-Scientist Research Awards**
These $3,000 awards, funded by the Alcon Foundation, recognize significant research being presented at the ARVO Annual Meeting by young clinician-scientists.

Juan Carlos Serna-Ojeda, MD, MSc
Patronato Banco de Ojos y Tejidos de Aguascalientes
Aguascalientes, Mexico
*Boston Type I Keratoprosthesis versus a low-cost design, the Auro Keratoprosthesis*

Chunyi Shao, MD, PhD
Shanghai Ninth People’s Hospital, Shanghai Jiao Tong University School of Medicine
Shanghai, China
*Local delivery of regulatory T cells promotes corneal allograft survival*

Eisuke Shimizu, MD
Keio University School of Medicine
Tokyo, Japan
*Positive effects of oral antibiotics administration to murine graft-versus-host disease*

Yi Qin, MD, PhD
Beijing Tongren Eye Center
Beijing, China
*Labial salivary gland transplantation for severe dry eye in a rhesus monkey model*

**Pfizer Ophthalmics Carl Camras Translational Research Awards**
These $12,000 awards are given to early-career scientists who exhibit excellence in research. Their discovery or observation must have led to, or have the promise of leading to, clinical applications.

Shannon Boye, PhD
University of Florida
Gainesville, Fl.

Joseph Carroll, PhD, FARVO
Medical College of Wisconsin
Milwaukee, Wisc.

Amitha Domalpally, MD, PhD
University of Wisconsin-Madison
Madison, Wisc.
2018 Award recipients

**Dr. David L. Epstein Award**
This $100,000 award is given in memory of Dr. David L. Epstein to a well-established, senior level investigator with a documented history of conducting eye and vision research in glaucoma and a record of accomplishment in successfully mentoring clinician-scientists to independent research in academic careers.

*Mentor: Janey Wiggs, MD, PhD, FARVO*
*Mentee: Ryan Collantes, MD*
Harvard Medical School
Boston, Mass.
Genetics of childhood glaucoma in the Philippines: genetic testing, gene discovery and implications for treatment

**Genentech AMD Research Fellowships**
Supported by Genentech, these $40,000 research fellowships offer two awards annually for age-related macular degeneration: one for basic and one for translational research.

*Basic AMD Research Fellowship:*
**Kevin Schneider, PhD**
University of California Irvine
Irvine, Calif.
The role of microRNA in the development and progression of AMD

*Translational AMD Research Fellowship:*
**Rosario Fernandez-Godino, PhD**
Mass Eye and Ear/Harvard University
Boston, Mass.
Targeting complement activation via tick-over: a prophylactic treatment for dry AMD

**Oberdorfer Award in Low Vision Research**
Named in honor of Michael D. Oberdorfer, PhD and supported by the Lighthouse Guild, this $1,250 award is given to an invited speaker at the ARVO Annual Meeting whose presentation is on a topic related to low vision.

*Edith E. Holloway, PhD*
Centre for Eye Research Australia
Melbourne, Australia
Preventing depression in low vision patients: Implementation and scale-up of an early psychological intervention for depressive symptoms
2018 Award recipients

Roche Collaborative Research Fellowships
This $10,000 fellowship, which is supported by Roche, promotes international scientific interactions and innovation by pairing researchers from developing countries with well-established research scientists for a one-year collaborative project.

Jeremias G. Galletti, MD, PhD
Institute of Experimental Medicine, National Academy of Medicine/CONICET
Buenos Aires, Argentina
Characterization of regulatory T cell populations involved in ocular surface immune tolerance

Collaborating researcher:
Cintia S. de Paiva, MD, PhD
Baylor College of Medicine

Samuel Kyei, OD, PhD
University of Cape Coast
Cape Coast, Ghana
Assessing adherence to glaucoma treatment in Ghana

Collaborating researcher:
Lyne Racette, PhD
University of Alabama at Birmingham

Srilekha Sundaramurthy, PhD
Vision Research Foundation, Sankara Nethralaya
Chennai, India
Mitochondrial genome landscape analysis in an Indian cohort of Lebers Hereditary Optic Neuropathy (LHON) patients negative to primary mutation (G3460A, G11778A, T14484C)

Collaborating researcher:
Patrick Yu-Wai-Man, MD, PhD
University of Cambridge and Moorfields Eye Hospital

Dr. Roger Vogel Award for Pharmaceutical Research
Established to honor the memory of Dr. Roger Vogel, this $10,000 award is given to an ARVO member whose research furthers the development of pharmaceutical treatments for ophthalmic diseases.

Gary D. Novack, PhD
PharmaLogic Development, Inc.
Women in Eye and Vision Research

The Women in Eye and Vision Research (WEAVR) initiative celebrated its tenth year in 2018.

The milestone was marked with more than 420 attendees – the most ever – at the 10th Annual WEAVR Luncheon, which raises funds to support women in science. Attendees networked over lunch and Emily Y. Chew, MD, FARVO, deputy clinical director and the director of the division of epidemiology and clinical applications at the National Eye Institute, spoke about the importance of replication in science. Chew’s presentation sparked a lively dialogue with many comments from junior and senior investigators alike.

WEAVR also introduced a new offering at the ARVO 2018 Annual Meeting: the WEAVR Drop-In Mentoring Program. Mid- and senior-level volunteers were available during designated times in the exhibit hall to provide guidance and career advice from a female perspective.
Volunteer with a vision

Terri L. Young, MD, MBA, FARVO

Terri L. Young, MD, MBA, FARVO, Chair of the Department of Ophthalmology and Visual Sciences at the University of Wisconsin-Madison, is an ARVO volunteer all-star. She has served on the Annual Meeting Program Committee, mentored researchers from developing countries and chaired the Diversity Initiatives Committee. Currently, she sits on the Editorial Boards of IOVS, is a reviewer on the ARVO Foundation Awards Committee and chairs the Women in Eye and Vision Research (WEAVR) Leadership Committee. In 2019, she will join the ARVO Foundation Board of Governors.

The highlight of her tenure as an ARVO volunteer has been her experience with WEAVR. Under her leadership, WEAVR, known for its popular fundraising luncheon at the ARVO Annual Meeting, has expanded to find other ways to support women in science. Young initiated two programs at the ARVO Annual Meeting: the WEAVR Drop-In Mentoring Program, where volunteers meet with young researchers seeking career guidance from a female perspective, and the first WEAVR Workshop. The inaugural all-female workshop panel includes academics and entrepreneurs sharing their stories of success in applying science to a business model.

“I am extremely honored to serve in all capacities,” said Young. “ARVO has been the biggest constant in my academic career. I attended my first ARVO meeting in 1989 as an ophthalmology resident, and was thrilled to be chosen to present a poster. I returned two years later to give my first platform presentation, for which I was both honored and terrified. From this experience, I recognized that ARVO provides a unique forum for researchers nationally and internationally to contribute in meaningful ways to specialized areas in vision science unlike any other conference. I’ve been hooked since 1991 and have never missed an ARVO meeting since then. It has been a privilege to use my perspective as a pediatric ophthalmologist, clinician-scientist and leader to serve and to help guide others.”
Terri L. Young, MD, MBA, FARVO (second from left) with WEAVR Luncheon attendees at ARVO 2017 in Baltimore, Md.
At the memorable 2018 ARVO Foundation Gala, more than 530 friends and colleagues enjoyed a picture-perfect evening under the palm trees in Honolulu to support the ARVO Foundation and recognize the 2018 ARVO Foundation Honorees:

**Shigeru Kinoshita, MD, PhD, FARVO**
Dr. Kinoshita was recognized for his service to ARVO and his generous financial support of the ARVO Foundation, including as a founding member of the Dowling Society.

**Nicolas G. Bazan, MD, PhD, FARVO**
Dr. Bazan was recognized for his leadership of and dedication to the ARVO Foundation since its inception, including as a chairman of the board and as a generous financial supporter.

**Alice R. McPherson, MD**
Dr. McPherson was recognized for her leadership through the Retina Research Foundation, including supporting travel grants for trainees.
## Dowling Society

The Dowling Society recognizes individuals for their significant support for eye and vision research with a commitment of $10,000 or more. The society is named for vision researcher and first Chairman of the ARVO Foundation, John E. Dowling, PhD, FARVO.

### 2018 New Members

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<tr>
<th>Name</th>
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<td>Joanne Angle*, MLS, MPA</td>
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<td>Sally S. Atherton, PhD, FARVO and Robert Atherton</td>
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<td>Bernard Becker*, MD, FARVO</td>
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Investing in the future

Brenda J. Tripathi, PhD, FARVO

On a job interview at the Institute of Ophthalmology at the University of London, Brenda J. Tripathi, PhD, FARVO was introduced to her future husband, Ramesh, also a vision researcher. Their chance meeting in 1969 led to a lifelong partnership that included a dedication to vision research and a commitment to providing financial support to young scientists through their foundation, the Vision Research Foundation.

“We decided it would be nice to have funds available to sponsor students for trips and other activities,” she explains. “We sponsored students who otherwise would not have had the opportunity to get into research.”

In 2017, after Ramesh passed, Brenda decided to transfer their family foundation’s work and its assets to another group to carry forward their mission. Years of involvement with ARVO brought assurance that the ARVO Foundation would carry their dedication to supporting young researchers well into the future.

The ARVO Foundation “aligns with the type of things we were trying to do in our own small way – foster young individuals, give them a head start, make something possible for them,” she says.

In 2019, the ARVO Foundation’s newly created Ramesh and Brenda Tripathi Vision Research Fund will help early-career scientists build connections to advance their careers through programs at ARVO including the Women’s Leadership Development Program, the Global Mentorship Program and the Breakfast with the Experts event at the ARVO Annual Meeting.
2018 Individual donors

$100,000 and above
Susan M. Epstein, RN, JD

$50,000 to $74,999
Ronnie Glaser

$25,000 to $49,999
Rafal Farjo, PhD

$15,000 to $24,999
John L. Keltner, MD and Nancy Keltner
Alice R. McPherson, MD

$10,000 to $14,999
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John R. Heckenlively, MD, FARVO
John A. Hoepner, MD
Shigeru Kinoshita, MD, PhD, FARVO
Alfred Sommer, MHS, MD

$5,000 to $9,999
Melinda K. Duncan, PhD
J. Mark Petras, PhD, FARVO and Kelly Cope Petras
Frances J. Rucker, PhD, MCOptom, FAAO
Richard F. SpaiDes, MD, FARVO
Paul Sternberg, Jr., MD, FARVO and Gloria Sternberg
Joyce Tombran-Tink, PhD, FARVO and Colin J. Barnstable, Dphil, FARVO
Erik J. van Kuijk, MD, PhD and Virginia Brooke

$2,500 to $4,999
Janet C. Blanks, PhD, FARVO and Robert Blanks
William J. Brunken, PhD and Dale D. Hunter, PhD, JD
Claude F. Burgoyne, MD, FARVO and Vicki Smith
Cheryl Mae Craft, PhD, FARVO
Patricia A. D’Amore, MBA, PhD, FARVO
Julia A. Haller, MD, FARVO and John D. Gottsch, MD, FARVO
Dimitrios Karamichos, PhD
Alan R. Morse, PhD
Stella M. Robertson, PhD and James D. Robertson

$1,000 to $2,499
Jayakrishna Ambati, MD, FARVO
Jeffrey H. Boatright, PhD, FARVO and Claudia Saari
Emily Y. Chew, MD, FARVO
Lancey B. Cowan, JD, CAE
Jennifer Doudna, PhD and Jamie Cate, PhD
Robert D. Fechtner, MD
Israel A. Goldberg, PhD
M. Elizabeth Hartnett, MD, FACS, FARVO and Bill Coles
Donald C. Hood, PhD, FARVO
David Huang, MD, PhD, FARVO
Piyush C. Kathory, PhD
Ingrid Kreissig
Paul P. Lee, JD, MD, FARVO
Maureen G Maguire, PhD, FARVO
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- Harvard Department of Ophthalmology
- Lowy Medical Research Institute
- Ocugen
- PointGuard Partners
- Retina Research Foundation
- Trial Runners

### $5,000 to $9,999
- Boston University School of Medicine, Department of Ophthalmology
- BrightFocus Foundation
- Byers Eye Institute at Stanford University
- Delcath Systems
- EyeCRO
- Joint Shantou International Eye Center of Shantou University and The Chinese University of Hong Kong
- NIHR Biomedical Research Centre
- The John A. Moran Eye Center
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- Emory University Eye Center

### $1,000 to $2,499
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- Henry Ford Health System
- Lions Eye Institute for Transplant and Research
- Medical College of Wisconsin
- New York Eye and Ear Infirmary of Mount Sinai
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2018 Financial report

Assets
- Cash and equivalents $344,675
- Investments $3,109,417
- Receivable, net $325,282
- Total assets $3,779,374

Liabilities and Net Assets
- Liabilities
  - Accounts payable and accrued expenses $133,043
  - Deferred revenue $77,625
  - Total liabilities $210,668
- Net Assets
  - Without donor restrictions $1,913,271
  - With donor restrictions $1,655,435
  - Total net assets $3,568,706

Total liabilities and net assets $3,779,374

2018 Financial report

As of December 31, 2018