

Rajalekshmy “Raji” Shyam

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Education

Ph.D. in Neurobiology and Anatomy | Dec 2017 | University of Utah, Salt Lake City, UT

B.S in Biology with Honors | May 2009 | Roosevelt University, Chicago, IL

Experience

Assistant Professor | Indiana University | Jan 2023-

Post-Doctoral Fellow | Indiana University | Oct 2017-Dec 2022

- Mentor – Joseph A. Bonanno, O.D, Ph.D.

Graduate Student | University of Utah | Aug 2011-May 2017

- Mentor – Paul S. Bernstein, M.D, Ph.D.

Lab-Technician | University of Illinois Chicago | June 2009-Apr 2011

- Mentor – Beatrice Yue, Ph.D.

Intern | University of Illinois Chicago | May 2008-May 2009

- Mentor – Beatrice Yue, Ph.D.

Grants

INDIANA UNIVERSITY

- NEI K99/R00 Pathway to Independence Grant (Sep 2021-2026)
- Knights Templar Eye Foundation Career Starter Grant (July 2019 - June 2021)
- NIH-NCATS/Indiana CTSI TL1 Post-Doctoral Training Grant (May 2018 - Apr 2020)

UNIVERSITY OF UTAH

- Ruth Kirschstein NIH T-32 Vision Training Grant (July 2016 – June 2017)

Awards and Honors

- Members in Training Best Poster Award in Cornea, ARVO (2021)
- NEI Travel Grant, ARVO (2019)
- Graduate fellowship, University of Utah (2011-2017)
- Member of Franklin Honor Society for academic achievement, Roosevelt University, Chicago (2009)
- Departmental Honors – Department of Biology, Roosevelt University, Chicago (2009)
- Student Employee of the year – Roosevelt University, Chicago (2009)
- Student Excellence in Scientific Research Award – Roosevelt University, Chicago (2008)
- Awarded membership in Sigma Xi scientific research society (2008)
- Full tuition scholarship from Roosevelt University Honors Program (2007-2009)

Publications

Google Scholar profile - <https://scholar.google.com/citations?user=o3ZQECAAAAAAJ&hl=en>

Post-doctoral work

- 1) **Shyam, R.***, Ogando, D.G., Bonanno, J.A. Mitochondrial ROS in Slc4a11 KO Corneal Endothelial Cells Lead to ER Stress. *Front. Cell Dev. Biol.*, April 2022. <https://doi.org/10.3389/fcell.2022.878395>
* **Corresponding author**
- 2) **Shyam, R.***, Ogando, D.G., Kim, E.T., Murugan, S., Choi, M., Bonanno, J.A. Rescue of the CHED mouse model by AAV-mediated Slc4a11 replacement. *Ophthalmology Science*, March 2022. <https://doi.org/10.1016/j.xops.2021.100084>
* **Corresponding author**
- 3) Bonanno, J.A., **Shyam, R.**, Choi, M., Ogando, D.G. The H⁺ Transporter SLC4A11: Roles in Metabolism, Oxidative Stress and Mitochondrial Uncoupling. *Cells*, 2022. PMID: 35053313.
- 4) **Shyam, R.***, Ogando, D.G., Choi, M., Liton, P.B., Bonanno, J.A. Mitochondrial ROS Induced Lysosomal Dysfunction and Autophagy Impairment in an Animal Model of Congenital Hereditary Endothelial Dystrophy. *Investigative Ophthalmology and Visual Sciences*, 2021. PMID: 34533563
* **Corresponding author**
- 5) Ogando, D.G., **Shyam, R.**, Kim, E.T., Wang, YC, Liu, C.Y., Bonanno, J.A. Inducible Slc4a11 knockout triggers corneal edema through perturbation of corneal endothelial pump. *Investigative Ophthalmology and Visual Sciences*, 2021. PMID: 34190974
- 6) Li, S., **Shyam, R.**, Ogando, D.G., Bonanno, J.A. Bicarbonate activates glycolysis and lactate production in corneal endothelial cells by increased pH. *Experimental Eye Research*, 2020. PMID: 32818510
- 7) Ogando, D.G., Choi, M., **Shyam, R.**, Li, S., Bonanno, J.A. Ammonia sensitive SLC4A11 mitochondrial uncoupling reduces glutamine induced oxidative stress. *Redox Biology*, 2019. PMID: 31254733

Graduate school work

- 8) **Shyam, R.**, Gorusupudi, A., Nelson, K., Horvath, M.P, Bernstein, P.S. RPE65 has an additional function as the lutein to meso-zeaxanthin isomerase in vertebrates. *Proceedings of the National Academy of Sciences*, 2017. PMID: 28874556
- 9) **Shyam, R.**, Vachali, P.P., Nelson, K., Gorusupudi, A., and Bernstein, P.S. All three Class B Scavenger receptor proteins function as carotenoid transporters for all three macular carotenoids in the primate eye. *Archives of Biochemistry and Biophysics*, 2017. PMID: 28947101
- 10) Gorusupudi, A.*, **Shyam, R.***, Li, B., Vachali, P.P., Subhani, Y., Nelson, K., Bernstein, P.S. Developmentally regulated production of meso-zeaxanthin in chicken retina and retinal pigment epithelium/choroid. *Investigative Ophthalmology and Visual Sciences*, 2016. PMID: 27082300
(* - Equal contribution)
- 11) Bernstein, P.S, Li, B., Vachali, P.P., Gorusupudi, A., **Shyam, R.**, Hendriksen, B., and Nolan, J. Lutein, zeaxanthin, and meso-zeaxanthin: The basic and clinical science underlying carotenoid-based nutritional interventions against ocular disease. *Progress in Retinal Eye Research*, 2015. PMID: 26541886

Lab technician work

- 12) Qiu, Y., Shen, X., **Shyam, R.**, Yue, B.Y.J.T. and Ying, H. Cellular processing of myocilin. *PLoS One*, 2014. PMID: 24732711
- 13) Turturro, S., Shen, X., **Shyam, R.**, Yue, B.Y.J.T., and Ying, H. Effects of mutations and deletions in the human optineurin gene. *Springer Plus*, 2014. PMID: 24683533

- 14) Shen, X., Ying, H., Park, J-S., Qiu, Y., **Shyam, R.**, Chi, Z-L., Iwata, T., and Yue, B.Y.J.T. Processing of optineurin in neuronal Cells. *Journal of Biological Chemistry*, 2011. PMID: 21059646
- 15) **Shyam, R.**, Shen, X., Yue, B.Y.J.T., and Wentz-Hunter, K. K. Wnt gene expression in human trabecular meshwork cells. *Molecular Vision*, 2010. PMID: 20111673
- 16) Koga, T., Shen, X., Park, J-S., Qiu, Y., Park, B-C., **Shyam, R.**, and Yue, B.Y.J.T. Differential effects of myocilin and optineurin, two glaucoma genes, on neurite outgrowth. *American Journal of Pathology*, 2010. PMID: 24683533
- 17) Park, B-C., Ying, H., Park, -S., Shen, X., Qiu, Y, **Shyam, R.**, and Yue, B.Y.J.T. Impairment of protein trafficking upon overexpression and mutation of optineurin. *PLoS One*, 2010. PMID: 20634958

Oral Presentations

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| Mar 2023 | Invited speaker, Responsible Conduct of Research Seminar Series, Indiana University, Bloomington
Talk title - Responsible Conduct in Research – Authorship |
| Feb 2023 | Invited speaker, <u>ARVO ADVANCE</u> Research Career Development Conference
Talk title - Obtain and negotiate a faculty position |
| Nov 2022 | Invited speaker, Indiana University Post-doctoral association, <u>PhD Career Diversity Symposium</u>
Talk title - Road to a tenure track position |
| May 2022 | Invited symposium speaker on <u>Autophagosomes, Lysosomes and Other-somes: Their Role in Ocular Tissues Homeostasis</u> , ARVO 2022
Talk title - Dysfunctional autophagy in corneal endothelial dystrophy |
| Apr 2022 | Invited speaker, Dept. of Ophthalmology, Moran Eye Center, Univ. of Utah
Talk title - Corneal Endothelial Dystrophies - identifying the cellular dysfunctions and devising therapies |
| Apr 2022 | Invited speaker, Dept. of Ophthalmology, Univ. of Florida, Gainesville
Talk title - Corneal Endothelial Dystrophies - identifying the cellular dysfunctions and devising therapies |
| Apr 2022 | Invited speaker, Dept. of Ophthalmology, Emory University
Talk title - Corneal Endothelial Dystrophies - identifying the cellular dysfunctions and devising therapies |
| Mar 2022 | Invited speaker, Responsible Conduct of Research Seminar Series, Indiana University, Bloomington
Talk title - Responsible Conduct in Research – Authorship |
| Mar 2022 | Invited speaker, School of Optometry, Indiana University
Talk title - Corneal Endothelial Dystrophies - identifying the cellular dysfunctions and devising therapies |
| Jan 2020 | Invited keynote speaker, Knights Templar Eye Foundation Indiana chapter annual meeting
Talk title – Gene therapy for Congenital Hereditary Endothelial Dystrophy |

Professional Activities

Editor: Special Issue of Frontiers in Cell and Developmental Biology

Issue title - Mechanisms in ocular development and disease

Journal Reviewer: Experimental Eye Research, Journal of Visualized Experiments, Journal of Ocular Pharmacology and Therapeutics, Translational Vision Science & Technology, Experimental Biology and Medicine

Teaching at Indiana University School of Optometry:

- Lecturer for Ocular Biology under Dr. Joseph Bonanno. Delivered lectures on Retinal anatomy and physiology, and Ocular Embryology (Fall 2022)
- Facilitator for the course Problem Based Learning (Fall 2022)
- Facilitator for the course Problem Based Learning (Spring 2022)
- Lecturer for Ocular Biology session under Dr. Chia-Yang Liu. Delivered a lecture on retinal anatomy and physiology (Fall 2021).
- Trainee facilitator under Dr. William Swanson for the course Problem Based Learning (Fall 2021).

Poster Presentations

- 1) Mitochondrial ROS in Slc4a11 KO Corneal Endothelial Cells Lead to ER Stress (Shyam, Ogando, and Bonanno) poster at ARVO 2022.
- 2) Rescue of a mouse model of CHED (Shyam, Ogando, Kim, Murugan, Choi, and Bonanno) presentation at Heartland Vision Conference 2021, Indiana University, Bloomington, IN
- 3) Mitochondrial ROS leads to autophagy impairment and lysosomal dysfunction in Congenital Hereditary Endothelial Dystrophy (Shyam, Ogando, Choi, Liton, and Bonanno) poster at ARVO 2021 (Virtual conference)
- 4) Mitochondrial ROS leads to autophagy impairment and lysosomal dysfunction in Congenital Hereditary Endothelial Dystrophy (Shyam, Ogando, Choi, Liton, and Bonanno). Oxyopia Seminar Presentation 2021, Indiana University, Bloomington, IN
- 5) Autophagy and Mitophagy in Slc4a11 Corneal endothelial cells (Shyam, Ogando, Choi and Bonanno) poster at Indiana CTSI Conference 2019, Indianapolis, IN
- 6) Autophagy and Mitophagy in Slc4a11 Corneal endothelial cells (Shyam, Ogando, Choi and Bonanno) poster at ARVO 2019, Vancouver, Canada.
- 7) Cell Survival in Slc4a11 KO Corneal endothelial cells (Shyam, Ogando, Choi, and Bonanno) poster at ACTS Translational Science Conference 2019, Washington DC
- 8) Biochemical Mechanisms of macular carotenoid pigment synthesis and uptake (Ph.D. dissertation). Oxyopia Seminar Presentation 2018, Indiana University, Bloomington, IN

- 9) Class B Scavenger Receptors mediate carotenoid transport into the primate eye (Shyam, Vachali, Gorusupudi, Nelson and Bernstein) poster at ARVO 2017, Baltimore, MD
- 10) Role of Scavenger Receptors in carotenoid transport into the primate retina (Shyam, Vachali, Gorusupudi and Bernstein) poster at ARVO 2016, Seattle, WA
- 11) Wnt gene expression in human trabecular meshwork cells (Shyam, Shen, Yue, and Wentz-Hunter) poster at American Society of Cell Biology meeting 2008, San Francisco, CA
- 12) Elucidating Wnt signaling pathways in trabecular meshwork cells (Shyam and Wentz Hunter) presentation at Argonne National Laboratories' Undergraduate Symposium 2007, IL

Departmental and Science Community Involvement

- 1) Co-organizer for a webinar to “demystify the K99/R00 grant application for NEI applicants.” This event was organized entirely through social media interactions in November 2021. It was attended by over 65 participants. <https://k99webinar.github.io/>
- 2) Organizer for weekly Journal Club at Indiana University School of Optometry (2018-2021)
- 3) Participated at Girls in Engineering Math and Science event (GEMS), Bloomington, IN (2021). Presented an overview of my experiences as a scientist and explained eye diseases to middle school girls of the Monroe County school district.
- 4) Participated at the Indiana University Annual Science Fest (2018, 2019, 2022). Helped organize the events for the School of Optometry. Explained various parts of the eye to school children from Indiana.
- 5) Volunteer for BioEyes at the University of Utah (2016, 2017) Helped in setting up zebrafish tanks in schools of low-income neighborhoods in and around Salt Lake City. Helped children visualize development of zebrafish embryos.