

Department of Ophthalmology, Visual and Anatomical Sciences



Wayne State University School of Medicine

Faculty Profiles
Fall 2023

KEY:



Research Track Mentor



Education Track Mentor

Elizabeth Berger, Ph.D.



Elizabeth Berger, Ph.D.
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The studies carried out by the Berger lab focus on disease pathogenesis and the interplay between the immune and neuroendocrine systems. We mechanistically and therapeutically investigate the events of inflammation and resolution using models of ocular infectious disease and diabetes-induced ocular complications.

In addition, I am the MS Program Director, as well as a core teaching faculty member of M1 human gross anatomy, contribute to the M1/M2 Research Elective, medical student PBL sessions, and the Biology of the Eye course, and serve as a faculty facilitator for the First Patient Project.

Bruce Berkowitz, Ph.D.



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Dr. Berkowitz's research is focused on developing and applying novel imaging methods to measure neuronal energy ecosystem biomarkers in vivo (including mitochondrial respiration and oxidative stress) to improve treatment efficacy during emerging neurodegeneration.

<http://berkowitzlab.wayne.edu/>

[Google Scholar Link](#)

Rodney Braun, Ph.D.



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Dr. Braun is heavily involved in the medical education mission of the school. As Director of Medical Histology and Embryology, Dr. Braun is the lead educator and director overseeing all of the lectures and lab sessions associated with those disciplines. This includes developing the curriculum for the 18 small group lab sessions that occur longitudinally throughout the M1 pre-clerkship curriculum. In addition, Dr. Braun is also co-Course Director for two of the M1 courses, co-Course Director for the M1 and M2 research electives, is the lead educator for the Embryology segment of the Post-Baccalaureate Program, and contributes a lecture to the Biology of the Eye course. Finally, Dr. Braun serves as Faculty co-Chair of the School of Medicine Curriculum Management Committee and is also a member of several education-associated committees and subcommittees.

Maria Bykhovskaia, Ph.D.



Maria Bykhovskaia, Ph.D.
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Our research is focused on molecular machinery that controls the release of neuronal transmitters from synaptic terminals. These processes are highly dynamic and plastic, and disruptions in their regulation can produce severe neurological disorders. We couple computational and experimental approaches to understand how clinically relevant mutations can affect the dynamics of neuronal proteins and their function. The main approach currently used in our lab is molecular dynamics, a computational method that enables understanding of the effect of the disease-associated mutations on the dynamic formation of protein-lipid complexes.

Tiffany Cook, Ph.D.



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The Cook Lab is focused on defining neuron-glia crosstalk during development and aging. Using genetic, genomic, histological and electrophysiological approaches, we are dissecting fundamental molecular networks required for maintaining the functional and structural integrity of the visual system. The ultimate goal of these mechanistic studies is to identify new diagnostic and therapeutic targets for neurodegenerative diseases affecting the eye.

Dennis Goebel, Ph.D.



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Dr. Goebel's research had previously centered on developing quantitative molecular, biochemical and cytochemical assays, which monitor distinct cell death pathways, that were mediated by glutamate excitotoxicity. These studies have since led him to assist Dr. Maik Hutterman, PhD (CMMG, WSU-SOM) and his colleagues, with their studies involving neuroprotection in the brain and spinal cord, utilizing Infrared irradiation.

In addition, Dr. Goebel continues to serve as a core teaching faculty member of WSU School of Medicine's Year I Human Gross Anatomy, and Embryology courses. He continues to serve as a Co-Chair for the WSU School of Medicine's Medical Student Research Program; and judge at its annual Medical Student Research Symposium.

Linda D. Hazlett, Ph.D.



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Our research is focused on the host immune response to corneal infection, in particular, to the gram-negative bacterium *Pseudomonas aeruginosa* (PA). The first tests whether glycyrrhizin (GLY), a derivative of the licorice root, in combination with antibiotics potentiates antibiotic effectiveness to multi-drug resistant isolates of PA and the mechanisms involved. A second project tests the effects on the eye of exposure to airborne particulates vs ambient air (using a whole-body exposure chamber) and response to bacterial infection of the cornea. The role of the Nrf2 pathway is being tested as well as how to inhibit its signaling and decrease disease. In vivo and tissue culture models are used.

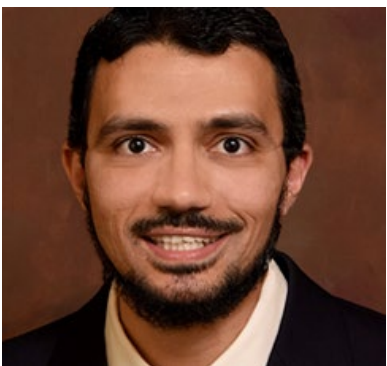
Avril Gene Holt, Ph.D.



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Both healthy aging individuals as well as military personnel that are exposed to loud noise or explosions often suffer from untreatable deterioration in auditory and vestibular function. Studies in the Holt Lab focus on the effect of loud noise and blast on central auditory and vestibular pathways and the impact on function (hearing and balance). To understand the biological basis of dysfunction in these pathways, we collect behavioral, neuronal, molecular, and biochemical, data related to ion channels and neurotransmission. The goal is to both understand the causes of auditory and vestibular dysfunction and identify new targets for treatment and prevention.

Ahmed Ibrahim, Ph.D.



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My research centers on investigating the underlying molecular and cellular mechanisms of Angiogenesis-driven diseases. The focus is primarily on pathological ocular angiogenesis which is the underlying mechanism of a variety of sight-threatening diseases such as Retinopathy of prematurity (ROP), proliferative diabetic retinopathy (PDR), and exudative age-related macular degeneration (wet AMD). The long-term goal of my research is to identify novel therapeutic targets, with specific focus on endothelial metabolic reprogramming, and to discover already FDA-approved drug(s) that could be repurposed to modulate the key proteins in the energy metabolism of angiogenic endothelial cells.

Tomomi Ichinose, M.D., Ph.D.



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Our research is focusing on elucidating the retinal neural networks. Using the mouse and other species as the model system, we investigate how neural networks process object detection, motion detection, and light-level coding. We conduct two-photon Ca imaging, patch clamp recordings, immunohistochemistry, multiple electrode array (MEA), and mouse behavioral experiments.

Ryan Insolera, PhD



Ryan Insolera, PhD
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With their high energetic demands, neurons are critically reliant on a healthy population of mitochondria, which are constantly maintained through biogenesis, dynamics, and degradation. In the lab, we are interested in understanding the underlying cell biology of neurodegenerative diseases in which mitochondrial maintenance is disrupted. We primarily utilize the simple model organism *Drosophila melanogaster* (fruit flies) to achieve the goal of correlating subcellular perturbations with physiological dysfunction and neurodegeneration.

Renu Kowluru, Ph.D.



Renu Kowluru, Ph.D.
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Our main goal is to understand the molecular mechanism(s) of the development of diabetic retinopathy, and research focus is on mitochondrial damage and epigenetic modifications. The lab uses both in vivo (rodents) and in vitro (primary cells in culture) models of diabetic retinopathy, and utilizes molecular, biochemical and functional techniques.

Ashok Kumar, Ph.D.



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The research interests of laboratory are to study host-pathogen interactions in microbial infection caused by bacteria, viruses, and fungi. Specifically, our focus has been on developing immunomodulation strategies targeting Toll-like receptor (TLR) signaling in preventing and/or treating infectious diseases affecting the eye. We use cutting-edge and high throughput “omics” technologies such as transcriptomics, lipidomics, and metabolomics combined with systems biology to study host immune responses to infection. Another area of our research is to understand mechanisms of antibiotic resistance among bacteria, and develop alternative antimicrobial therapeutics to reduce antibiotic resistance.

Zhuo-Hua Pan, Ph.D.



Zhuo-Hua Pan, Ph.D.
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Research in my laboratory focuses on the development of optogenetic strategies to cure blindness caused by retinal degenerative diseases. The optogenetic approach involves converting light-insensitive inner retinal neurons to photosensitive cells by ectopic expression of microbial channelrhodopsin (ChRs), thus imparting light sensitivity. Ongoing research projects include: 1) developing low light-sensitive and long wavelength-sensitive ChRs; 2) improving AAV-mediated retinal cell targeting; 3) investigating the impact of retinal degeneration on the outcome of optogenetic vision restoration. Molecular engineering, immunohistochemical analyses, electrophysiological recordings, and animal behavioral tests are performed in our studies.

Jean Peduzzi-Nelson, Ph.D.



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The main goal of my lab is to develop treatments for neural injuries and diseases. The ideal treatment for neural damage is olfactory stem cells that can be obtained from one side of the nose and then later delivered on the other side of the nose which may facilitate clinical approval by the FDA. Olfactory stem cells are ideal because the normal fate of these cells is nerve cells. Our ultimate goal is to establish a bank of olfactory stem cell and exosomes from these stem cells. In addition to research, I continue to serve as a core teaching faculty member of the medical and graduate Neuroscience curriculum. I am also Course Director for the Step 1 Prep course.

Lalit Pukhrambam, Ph.D.



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Major Research Interests: To understand the role of oxidative stress and sterile inflammation in disease development and progression of diabetic retinopathy (DR), particularly the role played by thioredoxin-interacting protein in dysregulation of mitochondrial quality control and mitophagy leading to NLRP3 inflammasome activation; Targeted genomics, epigenomics and proteomics-based identification of early biomarkers of diabetes and its neuronal and vascular complications of the eyes via O-GlcNAc and S-nitrosylated proteins; RNAi technology and gene therapy approaches to prevent/slow down the progression of DR.

Daniel L. Rathbun, Ph.D.



Daniel L. Rathbun, Ph.D.
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Dr. Daniel L. Rathbun's research in the Bionics and Vision Lab applies the study of neural coding in the visual system to: 1) understanding how images are processed in the healthy and degenerating retina; 2) understanding how the retina responds to electrical stimulation; and 3) using this knowledge to advance bionic vision. At Henry Ford, he is establishing the world's first electrophysiology laboratory dedicated to working with human retinal tissue freshly donated by ophthalmology patients.

Nikhlesh Singh, Ph.D.



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Vascular diseases are the leading cause of morbidity and mortality in developed societies. My research focuses on understanding the molecular mechanisms of vascular diseases particularly atherosclerosis, restenosis, and proliferative retinopathies. Our multidisciplinary approach includes biochemical and cell biology procedures (Western blot analysis, 2-D gel electrophoresis, HPLC, cell migration assay, transfections, imaging, and immunoprecipitation), molecular techniques (electrophoretic mobility shift assay, chromatin IP assay, site-directed mutagenesis, and cloning), and various animal models (Rat/mouse carotid artery injury, hind-limb ischemia, oxygen-induced retinopathy, and ApoE^{-/-} mouse model). By defining the molecular bases for these pathologies, we hope to find new targets for therapeutics to improve vascular disease prevention and treatment.

Jena Steinle, Ph.D.



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My research is on diabetic retinopathy with a focus on retinal inflammation. We use cell culture and animal models to investigate how specific cAMP pathways may protect the diabetic retina through reducing inflammation.

Susmit Suvas, Ph.D.



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Tissue injury results in an initiation of inflammation. Acute mucosal inflammation developed in response to an infection is beneficial to host, as it helps in eradicating the infectious pathogen. However, the inflammation that persists (chronic inflammation) in mucosal tissue for longer time-period is detrimental to host because it prevents an effective healing and the normal functioning of the tissue. Depending upon the tissue that gets inflamed, chronic inflammation could cause morbidity or mortality to the host. The goal of our lab is to understand the cellular and molecular pathways involved in regulating sterile inflammation and viral infection induced chronic inflammation.

Ryan Thummel, Ph.D.



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The main focus of the lab is to study the development and function the retina. We utilize all the genetic and developmental advantages of zebrafish as a model system – most notably their conservation to our human anatomy and physiology in regard to pigmentation, myelin formation, and visual function. In addition, we take advantage of the amazing capacity of the zebrafish to regenerate its entire retina following injury or disease. <https://www.thummellab.com/>

In addition to his research, Dr. Thummel is the Graduate Program Officer for OVAS, the co-course director for the M1 and M2 research elective courses, is a core member for the M1 histology and embryology disciplines, assists with M1/M2 problem-based learning exercises, and is a faculty facilitator for the First Patient Project.

Paul Walker, Ph.D.



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Dr. Walker contributes heavily to the medical education mission of the department and school and has been teaching anatomy and neuroscience to medical and graduate students for over 3 decades. As Director of Medical Gross Anatomy, he runs a full cadaver dissection program at the School of Medicine, which is the centerpiece of the M1 pre-clerkship curriculum. Dr. Walker also is the Director of Medical Neuroanatomy/CNS, a Unit Leader for two of the M1 courses, Course Director for Graduate Gross Anatomy, and the lead educator for the Gross Anatomy segment of the Post-Baccalaureate Program.

Fu-Shin Yu, Ph.D.



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We have two NIH/NEI funded projects: corneal innate immunity and diabetic wound healing and sensory nerve (de)regeneration. Using mouse model of diabetes, we investigate how hyperglycemia causes sensory neuropathy and delayed wound healing with focus on the role of exosomes, a newly rediscovered mediator of cell-cell communication. Our second project addresses molecular mechanisms underlying susceptibility and proneness of diabetic patients to microbial infection in the cornea.

Shunbin Xu, Ph.D.



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The research interest of my laboratory is to study the roles of microRNAs (miRNAs) in the eye and ocular diseases. miRNAs are small, non-coding, regulatory RNAs and constitute a newly recognized level of gene expression regulation. Our long-term goal is to uncover the roles miRNAs in normal development and function of the eye, as well as in ocular diseases so as to identify novel miRNA-based therapeutic targets for the treatment of various ocular diseases. Currently, the major projects in the lab focus on the roles of miRNAs in neuroimmune interaction in the cornea and bacterial keratitis.