Department of Ophthalmology, Visual and Anatomical Sciences

Wayne State University School of Medicine

Faculty Profiles
Fall 2021

KEY:

Research Track Mentor

Education Track Mentor

Elizabeth Berger, Ph.D.

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The studies carried out by our laboratory predominately focus on disease pathogenesis and the interplay between the immune and neuroendocrine systems. We mechanistically and therapeutically investigate the events of inflammation and innate immunity using models of ocular infectious disease and diabetic retinopathy. This includes analyses of: pro-resolving lipid mediators, host inflammatory cells (macrophages, neutrophils, T cells - both in vivo and in vitro), extracellular matrix and adhesion molecules, cytokines/chemokines, Toll-like receptors and other related molecules using a number of molecular, cellular and immunohistochemical techniques.

Bruce Berkowitz, Ph.D.

Bruce Berkowitz, Ph.D.
Department of Ophthalmology, Visual and Anatomical Sciences
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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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Department of Ophthalmology, Visual and Anatomical Sciences
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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 Unit Leader 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, contributes a lecture to the Biology of the Eye course, and teaches multiple M2 laboratories in Pathobiology and Pathophysiology. Finally, Dr. Braun serves on the School of Medicine Curriculum Committee and Promotions Committee, as well as several associated 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 nerve terminals. Neuronal transmitters are packaged into synaptic vesicles and released by fusion of the vesicles with the neuronal membrane. These processes are highly dynamic and plastic, and disruptions in their regulation can produce severe neurological disorders, such as epilepsy. Our lab investigates the mechanisms that lead from disruptions in the synaptic vesicle fusion to imbalance in neuronal networks to epilepsy.

Tiffany Cook, Ph.D.

Tiffany Cook, Ph.D.
Center of Molecular Medicine and Genetics
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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.

Andrew Garrett, Ph.D.

Andrew Garrett, Ph.D.
Department of Ophthalmology, Visual and Anatomical Sciences
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The Garrett lab is interested in how developing neurons use cell-surface recognition molecules called cell adhesion molecules (CAMs) during neural circuit formation. Our focus is on the process of self-avoidance, which prevents sister neurites from the same cell (“self”) and from cells of the same type (“homotypic”) from becoming entangled with each other. Our model is the mouse retina, where both self- and homotypic-avoidance is important for the orderly organization of the ~100 distinct types of neurons that process visual information.

Dennis Goebel, Ph.D.

Dennis Goebel, Ph.D.
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Dr. Goebel has focused his research on refining an in vivo retinal toxicity model. This model has allowed his lab to develop quantitative molecular, biochemical and cytochemical assays, in addition to anatomical assessments, that monitor distinct cell death pathways mediated by glutamate excitotoxicity. Resulting studies have yielded several novel discoveries that have significant therapeutic potential in preventing neuronal damage/death resulting from an ischemic event in affecting the retina and brain. In addition to his research interests, Dr. Goebel continues to serve as a core teaching faculty member of WSU-School of Medicine's Year I Human Gross Anatomy, Human Embryology and Human Neuro- Anatomy courses. He also continues to serve as a Co-Chair for the WSU School of Medicine's Medical Student Research Programs.

Linda D. Hazlett, Ph.D.

Linda D. Hazlett, Ph.D.
Department of Ophthalmology, Visual and Anatomical Sciences
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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 Genene Holt, Ph.D.

Avril Genene Holt, Ph.D.
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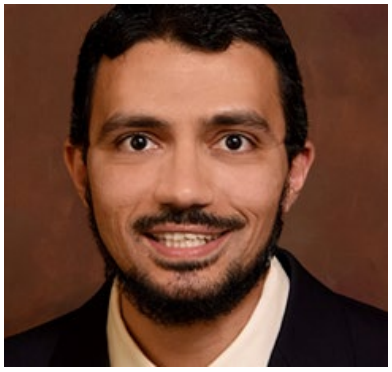
Both healthy aging individuals as well as military personnel that are exposed to loud noise or explosions often suffer from untreatable deterioration in auditory and vestibular function. Studies in the Holt Lab focus on the effect of loud noise and blast on central auditory and vestibular pathways and 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.



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.

Tomomi Ichinose, M.D., Ph.D.
Department of Ophthalmology, Visual and Anatomical Sciences
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Our research is focusing on understanding the visual system. Using the mouse and human retina as the model system, we conduct electro-physiology and immunohistochemistry to investigate neural network and visual signal processing. We investigate how retinal neural network processes motion detection, light adaptation, and other visual functions.

Ryan Insolera, PhD

Ryan Insolera, PhD
Department of Ophthalmology, Visual and Anatomical Sciences
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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.

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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.

Kwaku Nantwi, Ph.D.

Kwaku Nantwi, Ph.D.
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The focus of research in the lab of Dr. Nantwi is restoration of respiratory motor function after paralysis of the diaphragm in an animal model of spinal cord injury (SCI). In this model, functional restoration is attained by pharmacologic manipulations that activate a latent respiratory motor pathway referred to as the “Crossed Phrenic Pathway” (CPP). We have found that systemic administration of theophylline induces functional recovery in a paralyzed hemidiaphragm, but the underlying mechanism is are unknown. Therefore, our research focus now is to investigate this mechanism and identify molecular signaling pathways that may initiate and sustain drug-induced persistent recovery. In addition to research, Dr. Nantwi is the course director for Post-Bacc Histology and is a core member of the M1 histology and embryology disciplines.

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.

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. We are performing the foundation research for the establishment of olfactory stem cell bank. In addition to research, I continue to serve as a core teaching faculty member of the medical and graduate curriculum, including Gross Anatomy and Neuroanatomy.

Lalit Pukhrambam, Ph.D.

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.
Bionics and Vision Lab
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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.

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.

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 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 assists in teaching the M2 pathobiology laboratory sessions.

Paul Walker, Ph.D.

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 NIIH/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. One of the major projects is to study the roles of miR-183/96/182 cluster in retina and other sensory organs. The second major project in my laboratory is on miRNAs in diabetic retinopathy (DR).