IMPACT EYE INNOVATIONS

THE OHIO STATE UNIVERSITY
WEXNER MEDICAL CENTER

Department of Ophthalmology
& Visual Sciences

Powered By **Collaboration**

38
Clinicians

3
Physician Scientists

9
Vision Scientists

32
Learners

Laura Sladoje
laura.sladoje@osumc.edu

Lori Schumacher
lori.schumacher@osumc.edu

Shane Peterson
shane.peterson@osumc.edu

614.293.8760

go.osu.edu/OphResearch

Use this QR code for online giving, or if you prefer to specify a research area, please contact us.

Dear Friends of the Havener Eye Institute,

I want to begin with a heartfelt thank you. Your generosity and belief in our mission make all the difference in advancing clinical care, education, and vision research. Because of your support, we're able to turn ideas into discoveries, and discoveries into treatments that change lives.

Ophthalmology is constantly evolving. Thanks to groundbreaking research, we now have tools like optical coherence tomography (OCT) that enables us to see the eye in extraordinary detail, as well as the first FDA-approved gene therapy for an inherited retinal disease. These advances remind us just how powerful the partnership is between grateful patients like you and the academic ophthalmology community. Together, we're making real progress in preserving sight and improving quality of life.

The future of vision care holds tremendous promise. Every day, research brings us closer to earlier diagnoses, more effective treatments, and new ways to preserve sight. With your continued support, our faculty and researchers are building on this momentum, leading innovative studies and clinical trials that bring hope to patients today and the exciting possibility of a healthier vision for generations to come. I hope this publication gives you a glimpse of our growing faculty's dedication to advancing clinical and translational research and the meaningful impact it is having.

On behalf of all of us at the Havener Eye Institute, we would like to thank you for being such an important part of this journey.

With gratitude,

Sayoko Moroi, MD, PhD

Contents

Why is Vision Research Important?

Translational research bridges the gap between the research lab and your office visit. Our faculty work collaboratively to advance knowledge from the lab to the patient experience, ensuring that scientific discoveries are translated into meaningful changes in patient care. The team is at the forefront of innovation in vision science with research funding and many peer-reviewed publications.

Our commitment to serving patients is our highest priority. We apply research-driven insights to deliver personalized, high-quality care. These focused efforts create a brighter future for patients affected by eye disease. The Department of Ophthalmology & Visual Sciences is united by the mission to **"Restore, Preserve, and Enhance Vision to Improve Lives for All."**

The Ohio State University Department of Ophthalmology & Visual Sciences

Collaborating with Research for You

Comprehensive
Mona Adeli, MD
David Castellano, MD
Carla Ford, MD
N. Maxwell Scoville, MD
Amit Tandon, MD

Cornea & External Disease
Andrew Hendershot, MD
Rebecca Kuennen, MD
Christine Martinez, MD
Tyler Oostra, MD

Oculoplastics
Raymond Cho, MD, FACS
Sruti Akella, MD

Glaucoma
Joshua Evans, MD
Gloria Fleming, MD
Shelly Gupta Jain, MD
Zachary Mikolaj, MD
Sayoko Moroi, MD, PhD
Andrea Sawchyn, MD
Mark Slabaugh, MD

Neuro-Ophthalmology
Mairghread Casey, MD
Nelli Galoyan, MD
Hersh Varma, MD
Xiaojun (June) Zhang, MD, PhD

Optometry
Randy McLaughlin, OD
Barbara Mihalik, OD, FAAO
Chantelle Mundy, OD, FAAO
Stevie Njeru, OD, MS
Stephanie Pisano, OD, FSLS, FAAO
Anastasia Soulas, OD, FAAO
Sarah Yoest, OD
Kristen Zulliger, OD, MS, FAAO

Retina and Uveitis
Reece Bergstrom, DO
Colleen Cebulla, MD, PhD
Irina Livshitz, MD
Thomas Mendel, MD, PhD
Matthew Ohr, MD
Ana Suelves, MD, PhD
Michael Wells, MD
Fatoumata Yanoga, MD

New Achievements

The Department is honored to be recognized as a leading vision research hub across the nation. We hope you enjoyed reviewing the many collaborations highlighted by our physicians, clinicians, and vision researchers. As we look to the future, your eye care in coordination with our research inspires us to push the boundaries in the persuit of curing blindness. Your support, in parallel with the achievements highlighted below, enable us to impact eye care.

60
Active Studies

12
Clinical Trials

48
Publications FY2025

Scan for Publications

NIH National Eye Institute
Research Today Vision Tomorrow

P30 Core Grant

The prestigious National Institutes of Health/National Eye Institute (NEI) P30 Core Grant was awarded to the Department of Ophthalmology & Visual Sciences (DOVS). The Ohio State University Vision Sciences Research Core Program was established to provide shared resources and facilities to enhance collaboration for vision science researchers across campus.

Research to Prevent Blindness

New Chair Challenge Grant

Dr. Sayoko E. Moroi is dedicated to advancing research, education, and patient care to prevent vision loss. Her department recently received a New Chair Challenge Grant from Research to Prevent Blindness (RPB), supporting emerging eye research programs. The grant funds pilot studies, new research, and advanced equipment.

FOUNDATION FIGHTING BLINDNESS

Career Development Award

The Foundation Fighting Blindness has awarded a five-year Career Development Award to Dr. Thomas Mendel at The Ohio State University for his project titled “Surgical and adjuvant assisted retinal gene therapy.” The grant supports innovative research aimed at advancing retinal gene therapy and will be distributed in annual installments.

Saving Sight, Saving Lives

ADVANCING PRECISION TREATMENTS & CAUSES OF VISION LOSS

Colleen M. Cebulla, MD, PhD, researches the underlying mechanisms that contribute to a wide range of retinal diseases. Rather than focusing on a single condition, her lab investigates shared pathways, such as retinal ischemia and inflammatory damage, that are involved in diabetic retinopathy, retinal vein occlusion, macular degeneration, and others.

Aiming for Neuroprotection

The overarching goal of Dr. Cebulla's lab is neuroprotection: saving retinal neurons from degenerating in various disease states. By targeting inflammatory pathways, particularly using drugs that inhibit Macrophage Migration Inhibitory Factor (MIF), her team has demonstrated success in reducing scar tissue and preserving retinal structure and function across different preclinical models. Although promising, translating this research into clinical use remains challenging due to drug delivery limitations and the need for reformulation to sustain longer intraocular activity.

Translational and Collaborative Research

Dr. Cebulla emphasizes translational research and the development of therapies that can transition from the lab bench to the clinic. Her team collaborates extensively, not only with vision scientists, but also with biomedical engineers, neuroscientists, and geneticists through the P30 Vision Research Core.

Ocular Melanoma and Hereditary Cancer Syndromes

In addition to retinal disease, Dr. Cebulla works with Dr. Mohamed Abdel-Rahman on ocular melanoma and hereditary cancer syndromes. Through a specialized clinic, she cares for patients with rare cancers like ocular melanoma, and they identify patients with genetic mutations like BAP1, providing early cancer screening and counseling. Their work has already uncovered new cancers related to this syndrome and aims to improve patient outcomes through targeted cancer screening and future clinical trials.

KEY FACTS

- Dr. Cebulla's lab focuses on protecting neurons in the retina by reducing scar tissue and preserving retinal structure.
- Her specialized clinic aims to improve patient outcomes through targeted cancer screening and future clinical trials.
- Supporting skilled researchers is crucial to maintaining the momentum of her lab's impactful work.

Learn more **go.osu.edu/DrCebulla**

Marrying Research And Patient Care

USING GENETICS FOR PRECISION BASED MEDICINE

Thomas Mendel, MD, PhD, has established a translational gene therapy lab to accelerate new gene-based treatments. He is leveraging his training to build an Inherited Retinal Disease (IRD) focused clinical team that can provide the very latest diagnosis through evaluation for emerging new treatments and clinical trials.

Gene therapy is a process of modifying the genetic code of diseased cells to improve disease outcomes. OSU has established a team to provide expert services in diagnosis, genetic counseling, and gene therapy clinical trials. Our faculty have uniquely positioned the OSU Gene Therapy Institute as a global leader in this area, with end-to-end capabilities ranging from fundamental science to clinical trials and, ultimately, commercialization.

Precision Based Care

Genetics research is essential for precision-based care to provide earlier diagnosis, improve outcomes, reveal the genetic causes of disease, and determine the best treatments and their timing for each patient. Dr. Mendel built a genetics program to develop and implement gene therapies in patients with IRDs. Common symptoms include diminished vision in low light or night blindness, loss of color vision, light sensitivity, and vision loss.

KEY FACTS

- Gene therapy targets missing or defective genes within our cells to restore function and, in some cases, cure devastating illnesses.
- IRDs have no cures. Today's FDA-approved treatment helps less than 0.5% of patients.
- Genetics research is essential for precision-based care to provide earlier diagnoses, improve outcomes, and tailor treatments to each patient's unique needs.

Patients with IRDs slowly lose vision due to damaged cells in the retina. Dr. Mendel provides care to both adults and children in the Department of Ophthalmology & Visual Sciences at Ohio State and Nationwide Children's Hospital.

He focuses on IRDs both in translational research and clinical care. Dr. Mendel says it's incredibly powerful to see patients, especially children, respond to the therapy. After surgery, many go from being nearly blind with no night vision to having vision between 20/40 and 20/70. With donor support, innovation is turning into action. Dr. Mendel's work stands at the intersection of compassionate care, cutting-edge research, and real-world impact. Every gift fuels breakthroughs that change lives.

Learn more **go.osu.edu/DrMendel**

Getting Back to Basics

DECREASING GLAUCOMA RELATED BLINDNESS

Sayoko Moroi, MD, PhD, has the long-term goal to lower eye pressure by identifying clinical risk factors that can be used for optimal drug therapy and surgical interventions.

The Disease Glaucoma is caused by irreversible damage to the optic nerve. When the optic nerve is damaged, individuals lose the connection of light information in the eye to the brain, which causes blindness. Currently, the only effective management is to lower eye pressure through medication, laser, or surgery. Despite these treatment options, some patients still progress with optic nerve damage leading to vision impairment and blindness.

Risk Factors Guide Treatment
Clinical trials supported by the National Eye Institute (NEI) have helped identify factors that influence whether individuals with elevated eye pressure progress rapidly to blindness or experience slower disease progression. People with thin corneas and high intraocular pressure are at a greater risk of developing glaucoma from high eye pressure.

The advanced glaucoma intervention study provides evidence that pressure fluctuation also contributes to disease progression. By employing iCare HOME technology, intraocular pressure can be regularly monitored throughout the day and night. Individuals exhibiting significant pressure fluctuations can have their treatment regimen modified to better mitigate these fluctuations.

Genetics is another strategy to identify gene markers that relate to glaucoma disease severity, eye pressure fluctuations, and other pathways involved in severe forms of glaucoma. The strategy is to identify genetic markers that will allow us to perform risk stratification of patients who need more aggressive therapy versus those who can be monitored.

KEY FACTS

- NEI-supported clinical trials have identified risk factors like thin corneas and high pressure that increase glaucoma risk.
- Home-based eye pressure tracking tools are being used to tailor treatments more precisely.
- Genetic research and AI are helping doctors predict who is most at risk for glaucoma-related blindness.

Why It Matters Dr. Moroi combines foundational knowledge of how eye pressure is regulated, the genetics behind glaucoma and eye pressure, and recent discoveries about eye physiology and optic nerve health. She is optimistic that integrating this information with artificial intelligence (AI) will improve the identification of individuals at the highest risk for glaucoma-related damage, ultimately helping to reduce blindness caused by the disease.

Learn more **go.osu.edu/DrMoroi**

Cancer Genetics and Genomics

PRESERVING VISION AND LIFE OF MELANOMA PATIENTS

Mohamed Abdel-Rahman, MD, PhD, has worked for over 20 years with colleagues to study the genetic factors that increase the risk of uveal (ocular/eye) melanoma and genomic changes in the tumor.

The Disease Eye melanoma is the most common eye tumor in adults leading to loss of vision in more than 70% of patients and death in about half due to metastasis. Identifying individuals and families at higher risk of uveal melanoma and other cancers facilitates early diagnosis and treatment, preserving vision and life. Also, understanding the genetic changes in the tumor could lead to new targeted therapies and individualization of patients' care.

In 2011, Dr. Abdel-Rahman with his colleagues identified a new cancer predisposition syndrome caused by mutations in the BAP1 gene (BAP1-Tumor Predisposition Syndrome or BAP1-TPDS). This syndrome increases the risk for several cancers and non-cancer conditions. Since its discovery, more than 600 families with BAP1-TPDS have been identified. This discovery was made possible by a generous donation through the Patti Blow Research Fund as well as a National Institute of Health grant. He currently co-leads an international consortium working on better understanding the clinical features and management of this new cancer syndrome.

In addition to BAP1, Dr. Abdel-Rahman identified other genes that increase the risk of uveal melanoma and other cancers. His laboratory findings have been implemented in national and international guidelines for the management of BAP1-TPDS and uveal melanomas.

How Are They Doing This? Through a combination of clinical and laboratory studies, next generation sequencing of thousands of genes, cell culture, gene editing, and eye models to study disease mechanisms and test potential treatments.

Why It Matters Understanding the genetic factors leading to predisposition to uveal melanoma and other cancers will lead to early treatment preserving the vision and life of patients.

KEY FACTS

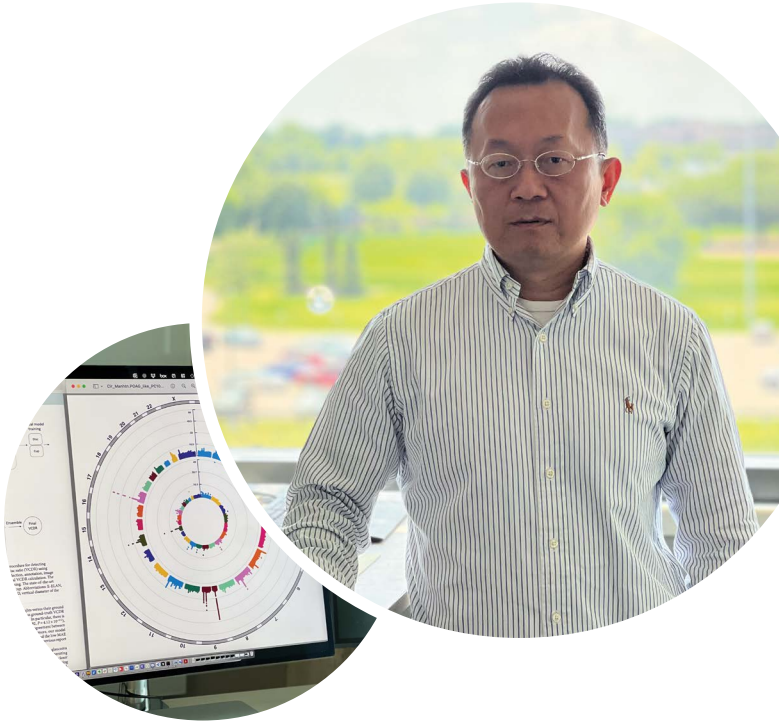
- Eye melanoma leads to loss of vision in more than 70% of patients.
- Understanding genetic changes could lead to new targeted therapies and individualization of patients' care.
- Co-leads, with Dr. Cebulla, an international collaboration of experts for BAP1-Tumor Predisposition Syndrome.

Learn more **go.osu.edu/DrAbdel-Rahman**

Unlocking the Future of Eye Health

THE POWER OF GENETICS AND AI IN VISION RESEARCH

Raymond Gao, PhD's research bridges two transformative fields — genetics and artificial intelligence (AI). The goal is to improve early detection and treatment of eye diseases like glaucoma.



Genes That Guide Treatment

On the genetics side, he focuses on identifying genetic markers that influence how and why certain eye diseases develop. These markers can help explain individual differences in disease progression and response to treatment. For instance, two people might have the same symptoms, but one may suffer due to high eye pressure while another experiences nerve damage from a neurological issue. Understanding these distinctions can lead to personalized medicine, tailoring prevention or treatment based on each person's unique biology.

AI-Powered Eye Exams

The AI portion of the work is just as revolutionary. Using advanced algorithms, Dr. Gao trains computer systems to analyze images of the eye, specifically the retina, taken with simple cameras or even smartphones. These tools can detect disease with impressive accuracy, and at a much lower cost than traditional methods. This innovation could drastically improve access to eye care, especially in remote or underserved areas.

Catching Disease Before It's Too Late

Rather than waiting until symptoms become severe or irreversible, which is often the case with glaucoma, these technologies aim to detect disease earlier, when intervention is most effective. Dr. Gao emphasizes that timely diagnosis isn't just better for patients, it also reduces long-term healthcare costs.

KEY FACTS

- Identifying genetic markers enhances early detection and understanding of eye diseases.
- AI-driven analysis of retinal images allows for quicker, more affordable, and accessible diagnosis.
- Integration of these technologies opens pathways to the discovery of new therapeutic targets and personalized treatments.

What It Takes to Move Forward

Bringing these innovations to the bedside requires significant resources: data access, specialized personnel, and funding. With more support, this research could transform how and when we detect eye disease, making preventative eye care truly accessible to all.

Learn more **go.osu.edu/DrGao**

From Science to Sight

TURNING AMD RESEARCH INTO HOPE FOR VISION LOSS

Nagaraj Kerur, DVM, PhD, leads a research team focused on uncovering the molecular and immune mechanisms driving age-related macular degeneration (AMD), a leading cause of vision loss. His work sheds new light on the immune system's role in AMD and offers hope for future treatments.

Understanding AMD at the Molecular Level

Dr. Kerur's lab investigates AMD at the sub-microscopic level. Their work focuses on the retinal pigment epithelium (RPE), a critical cell layer in the retina. They study how inflammatory and immune responses lead to RPE cell dysfunction and death, fundamentally driving AMD progression.

Shutting Down the Root Cause of Illness

While the immune system is meant to protect us, it can sometimes react in harmful ways, especially when cells are stressed or damaged by aging. Dr. Kerur's team discovered that a molecule called cGAS, typically involved in detecting misplaced DNA, actually triggers damaging inflammation in dry AMD. By turning off this molecule in experimental models, they were able to protect RPE cells and reduce signs of disease. This approach offers a potential new treatment pathway, one that aims to prevent disease at its source rather than just manage symptoms.

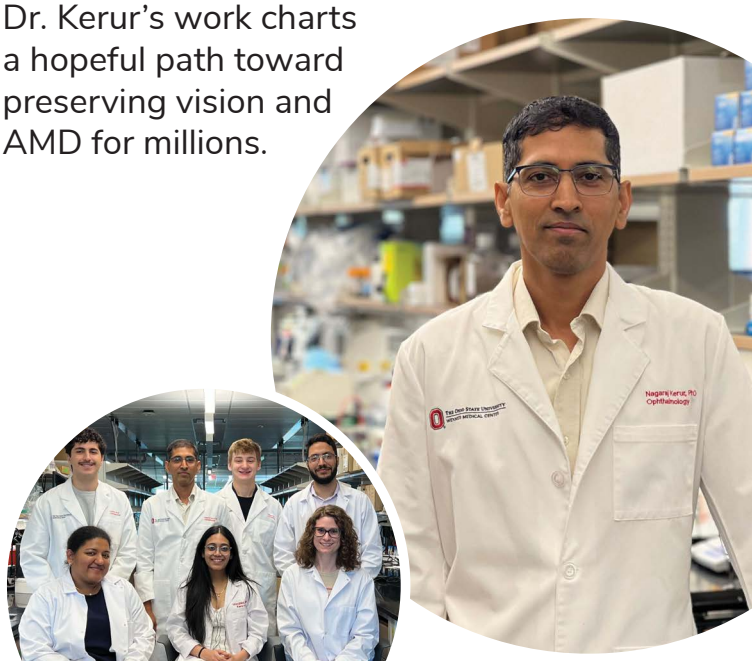
KEY FACTS

- Dr. Kerur's lab investigates how immune and inflammatory signals contribute to AMD progression.
- The team identified a key protein, cGAS, that drives disease and could be blocked to slow vision loss.
- Their research has shown promising results in preclinical models and may help guide future clinical trials.

In a separate but related line of investigation, the team also found that telomerase, an enzyme best known for maintaining chromosome ends, may contribute to disease progression in wet AMD. Their ongoing research focuses on designing novel drug candidates that block telomerase activity, with the goal of developing more effective therapies for this aggressive form of AMD.

Engaging Donors in the Research Mission

Dr. Nagaraj Kerur welcomes donor involvement and believes strongly in sharing the science behind the mission. "We love to show people what we're working on," he says. Visitors to the lab can see firsthand how foundational discoveries are driving progress toward new therapies. With cutting-edge research that connects basic science to long-term clinical goals, Dr. Kerur's work charts a hopeful path toward preserving vision and AMD for millions.



Learn more **go.osu.edu/DrKerur**

Under Pressure

DECODING EYE PRESSURE REGULATION AND GLAUCOMA

Krish Kizhatil, PhD, and his team are conducting pioneering research in glaucoma, a leading cause of blindness affecting 3 million people in the U.S. and 80 million globally. The disease is influenced by age, genetics, and environment. There is currently no cure. The lab investigates the biology and genetics of glaucoma to develop effective treatments.

The Disease Glaucoma is caused by the degeneration of retinal ganglion cells—neurons that transmit visual information from the eye to the brain. As these cells die, the optic nerve deteriorates, leading to irreversible blindness. The most common form of glaucoma involves increased eye pressure. This is the only treatable symptom today, typically managed by eye drops or surgery, both of which have limitations and side effects. More effective and targeted therapies are urgently needed.

Biology of Eye Pressure Eye pressure rises when fluid in the front of the eye doesn't drain properly. The lab focuses on Schlemm's canal, a tiny but vital structure in the eye's drainage system. If it malfunctions, pressure increases, raising glaucoma risk. The team studies how this canal works and what causes its failure.

Saving Retinal Ganglion Cells Beyond lowering pressure, the lab aims to pioneer new therapies to protect and preserve these critical nerve cells from dying, thus preventing further vision loss.

Looking at Glaucoma Genes The team also studies genes that may increase glaucoma risk. Understanding these could help identify at-risk individuals and offer more personalized treatment strategies to prevent and slow down the progression of the disease.

How Are They Doing This? The lab uses advanced tools—microscopy, genetic analysis, and models of eye structures similar to humans to study disease mechanisms and test potential treatments.

Why It Matters Understanding how eye pressure and nerve cell loss occur could lead Dr. Kizhatil lab's to develop better treatments, perhaps even new medicines, that can prevent blindness in people with glaucoma.

KEY FACTS

- Expert cell and developmental biologist.
- Trained in virology and gene therapy.
- Multipronged glaucoma research.

Learn more **go.osu.edu/DrKizhatil**

Eye Wound Healing from an Immunological View

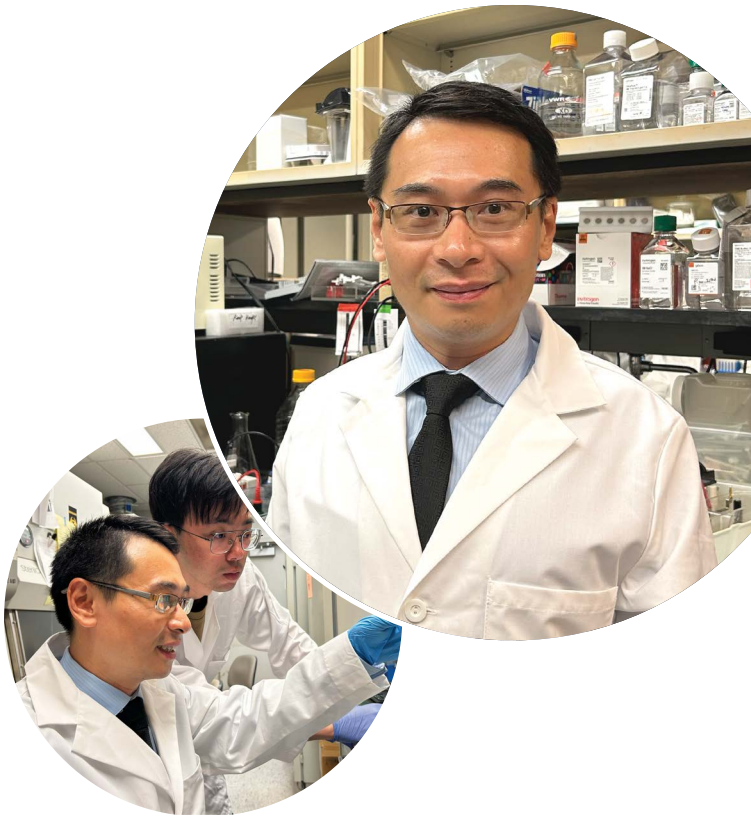
DEVELOPING NOVEL THERAPIES FOR EYE INJURIES

Qing Lin, MD, PhD, is an immunologist focused on how inflammation shapes healing in the eye. His long-term goal is to restore vision by developing therapies that prevent harmful blood vessel growth and promote tissue regeneration.

The Disease When the eye is injured, through chemical burns or surgery such as corneal transplantation, new blood vessels can grow into the cornea. This process, called corneal neovascularization (CNV), clouds the normally clear cornea and leads to vision loss or even blindness. Current treatments to block these vessels are limited because we do not fully understand how injury drives blood vessel growth.

Wound-Healing Mechanisms Dr. Lin's research shows that injury activates the damage associated molecular pattern (DAMP) pathway in the eyes. One of these signals, the inflammatory cytokine HMGB1, acts as a powerful trigger for abnormal vessel growth by turning on the receptor TLR4. These discoveries highlight an important link between injury, immune activation, and pathological vascularization in the cornea.

Developing New Immunotherapies Building on these findings, Dr. Lin is developing therapies that regulate immune responses after eye injury. His work targets inflammatory pathways such as DAMP and G protein-coupled receptors (GPCRs) to reduce abnormal tissue growth. He is also using biologics derived from human birth tissues (amniotic membrane) to mimic fetal-like wound healing and promote regeneration in adults. In addition, his studies extend to the lung and skin, which share similar epithelial barriers with the eye, to identify therapies that restore tissue function across organs.



Why It Matters Better control of immune responses after injury is critical to treating ocular neovascular diseases such as CNV, diabetic retinopathy, and uveitis. Dr. Lin's research aims to preserve vision and prevent blindness caused by inflammation, while also advancing treatments for vascular and fibrotic diseases in other related organs.

KEY FACTS

- Immunologist uncovering wound-healing processes in the eyes.
- Research aims to achieve fetal-like regeneration in adult tissues.
- Developing immune-based therapies for ocular vascular diseases to prevent vision loss.

Learn more **go.osu.edu/DrLin**

The Window to the Eye

CORNEAL BIOMECHANICS & EFFECTS ON OCULAR CONDITIONS

Cynthia Roberts, PhD, and her team are researching the effects of corneal biomechanics on eye diseases, including glaucoma, keratoconus, and diabetes. The cornea is the clear front layer of the eye that helps a person see by focusing on light. Eye conditions can change the way the cornea functions, making a person's vision worse. Dr. Roberts' findings will help other researchers develop new technologies for testing and treating these ocular conditions.

The Disease Keratoconus is a condition where the cornea becomes thin and takes on a cone shape instead of its traditional aspherical shape. Diabetes and high blood sugar can also alter the shape of the cornea. The most common form of glaucoma involves high eye pressure, which affects the biomechanics of the cornea.

Tools and Technologies Over four decades, Dr. Roberts has pioneered the use of advanced devices to study the cornea. She uses tools like the Pentacam to assess shape and power, the Ocular Response Analyzer to measure eye pressure, and new imaging devices like the Anterion to capture detailed corneal data. These technologies help identify biomechanical abnormalities earlier and more precisely.

Looking at Genes One of Dr. Robert's newer studies is investigating the relationship between glaucoma, corneal biomechanics, and ancestry. The newly funded study is also analyzing saliva samples to determine whether there are specific genes that may influence the development of ocular diseases in certain populations.

How Are They Doing This? The research team uses advanced tools, genetic analysis, and new devices to study disease mechanisms and how they progress over time.

Why It Matters Understanding how eye pressure and corneal biomechanics influence disease development and progression may lead to earlier diagnoses and better treatments. Dr. Roberts and her team are bridging the gap between clinical research and medical treatments in patients with many different eye conditions.

KEY FACTS

- Keratoconus affects the cornea's shape, leading to severe vision problems.
- New imaging tools like the Anterion offer unprecedented detail in corneal assessment.
- Genetic studies may reveal why some populations are more at risk for certain eye diseases.

Learn more **go.osu.edu/DrRoberts**

A Clearer Future

GENE THERAPY SOLUTIONS FOR VISION LOSS

Liujiang Song, PhD, is a scientist focused on developing gene therapy solutions for people affected by vision issues. Her research began with studying front-of-the-eye diseases, including corneal cloudiness, a major global cause of vision loss, that relies heavily on corneal transplants, which are limited by the availability of donor tissue and carry risks such as surgical complications and rejection.

Why Gene Therapy? This approach offers a way to repair the eye at the genetic level. What makes gene therapy especially powerful is that it's not restricted to an anatomic part of the eye. Whether the disease affects the cornea, retina, or optic nerve, the key is to identify the right genetic target and fix it, replace it, or introduce a healthy version in a safe and effective way.

A key effort in her lab is directed toward gene delivery, the process of transporting therapeutic genes into specific organs and cells. It's often compared to package delivery: the gene is the package, and the vehicle, viral or non-viral, is the delivery truck. While the human body encounters many viruses, some harmful, some harmless, her team works with harmless kinds that naturally infect (enter) cells and deliver genetic material to specific parts of the eye, where they can restore functions or prevent further damage.

Delivery, however, is only step one. Another major part of her team's work involves designing the genetic "package" itself, carefully assembling different molecular components (cis-elements) that work together, each with a specific role, to ensure the gene function where and when it's needed. This level of control is key to making gene therapy safe, effective, predictable, and tunable.

KEY FACTS

- The first FDA-approved AAV gene therapy in the US is for blindness.
- Eye diseases are the #1 focus of gene therapy clinical trials.
- Front-of-the-eye diseases remain underexplored but hold strong potential in gene therapy.

Dr. Song will be actively collaborating with ophthalmologists on co-developing gene therapy solutions for eye diseases that cause vision loss. By combining clinical expertise with cutting-edge genetic tools, her team aims to accelerate the development of treatments that can preserve and restore vision.

Learn more **go.osu.edu/DrSong**

Fighting Vision Loss

PREVENTING RETINAL SCARRING

Shigeo Tamiya, PhD, performs research to understand how scarring happens in the eye. Scarring causes tissue dysfunction by destroying its architecture. Identifying changes happening in different types of cells over time is key to finding methods and medicine to prevent it.

Unlike other tissues in the body, the eye must remain clear for light to pass through effectively, making any scarring very damaging. It is particularly problematic when scarring affects the retina, the delicate tissue at the back of the eye essential for converting visual signals to an electrochemical signal sent to the brain, as it cannot be replaced. Retinal scarring can disrupt how light is captured and translated into vision, leading to significant sight loss. Dr. Tamiya's work aims to identify ways to stop this damage before it becomes permanent.

Injury or Eye Disease Can Cause Scarring

Scarring can be caused directly from injury or surgery. It is also a common but often overlooked final step in several blinding eye diseases, including diabetic retinopathy and age-related macular degeneration (AMD). In AMD, for instance, around one-third of affected eyes may end up with scarring. Whether caused by injury or from disease progression, scarring often marks the point of irreversible vision loss.

KEY FACTS

- Scarring is the final common pathway in many blinding eye diseases.
- The goal is to prevent or reduce scarring through targeted medication.
- Dr. Tamiya's research bridges lab science with clinical collaboration for real patient impact.

Learn more **go.osu.edu/DrTamiya**

Targeting Treatment and Moving Toward the Clinic

Dr. Tamiya uses laboratory models to study the process of scarring and test treatments. His lab team investigates how specific cells behave when scarring begins, and tests medications that might prevent or reduce this harmful process. Multicellular systems are also utilized to examine cell-to-cell communication, and how it contributes to the scarring process. Promising medications are tested with advanced drug delivery systems, with hopes of developing a future clinical product to prevent scarring.

Looking Ahead

While still in the research phase, Dr. Tamiya's work holds potential to reshape treatment for some retinal diseases. His long-term goal is to stop scarring before it causes vision loss—translating lab discoveries into real-world solutions for patients.

Improving Fluid Drainage For Healthier Eyes

HOW IMPAIRED DRAINAGE CONTRIBUTES TO GLAUCOMA

Carol Toris, PhD, physiologist, studies the pressure inside the eye and ways to reduce it to improve eye health. Her team is answering the following questions.

Why do some people respond well to glaucoma drugs and others respond poorly? Researchers studied volunteers' eyes before and after they took pressure-lowering drugs, then grouped them into responders and nonresponders. By uncovering important structural and functional differences between the two, this work could help doctors more precisely match patients with the most effective treatments and even inspire the development of safer, more effective drugs in the future.

Can placement of tiny tubes in the drainage pathway of the eye improve eye fluid drainage and reduce eye pressure? The lab teams up with other institutions to study tiny tubes and hydrogels placed in the eye's drainage pathways of human postmortem donor eyes. The idea is to improve drainage and decrease eye pressure. Such tubes could reduce or even eliminate the number of eye drops needed which would save time and money.

KEY FACTS

- Treatments that improve eye fluid drainage do a good job of lowering pressure.
- Understanding the drainage pathways in the eye helps in the design and placement of drainage devices.
- Identifying a person's unique eye fluid circulation helps improve treatments for that individual.

How does the fluid drainage and eye pressure change as a child matures? A team from the University of Nebraska Medical Center works with Dr. Toris to study teenagers and parents. Additionally, models were studied from the time they were weaned until they reached maturity. Numerous age-related differences in the fluid drainage were found.

Why does this matter? As a person ages, the risk of glaucoma increases. Structural changes take place, making adults respond differently to drugs than children. Eye doctors could use this information to better treat the glaucoma patient based on age.

Learn more **go.osu.edu/DrToris**

Clinical Trial Research

These trials evaluate interventions using new eye medication or therapies. Our fellowship trained physicians, in tandem with research coordinators, imaging staff and patients are changing the future. We are recruiting for specialized trials that offer unique research opportunities.

go.osu.edu/EyeClinicalTrials

Matthew Ohr, MD

Dr. Ohr is Director of the Retina Division. He is double fellowship trained in Vitreoretinal Surgery and Cornea & External Disease as well as an experienced Principal Investigator (PI).

- **Thames Trial** evaluates a new medication to treat diabetic macular edema.
- **Sienna Trial** evaluates the safety and efficacy of medications to treat advanced dry age-related macular degeneration(AMD).
- **Ascent Trial** uses novel gene therapy to treat wet AMD.

Mark Slabaugh, MD

Dr. Slabaugh is a glaucoma specialist and a knowledgeable PI with an interest in education and research. His current trial is for patients with Open-Angle Glaucoma (OAG) or Ocular Hypertension.

- **Prostamide Trial** evaluates the Safety and efficacy of a Prostamide Sustained Release Implant.

Ana Suelves, MD, PhD

Dr. Suelves is a retina specialist who focuses on the diagnosis, management, and treatment of uveitis. She completed a fellowship in both Vitreoretinal Surgery and an additional fellowship in Ocular Immunology and Uveitis.

- **Clarity Trial** which investigates how well a medication taken by mouth can treat uveitis.

Fatoumata Yanoga, MD

Dr. Yanoga is a retina specialist, trained in Vitreoretinal Surgery. She is the current Vitreoretinal Fellowship Director for the Retina Division. She also plays a vital role in patient recruitment for both observational studies and clinical trials.

- **Burgundy Trial** investigates the safety and effectiveness of a new medication delivered through a surgical port delivery system in the eye to treat wet AMD.

Impactful Collaborations

Community Outreach

In collaboration with local partners, the department brings free vision care including screenings, imaging, and eyeglasses to underserved communities. Alongside this, we are growing the Teleophthalmology Program to additional sites starting with the OSU free-clinics to expand access to eye care across the region. Our goal is to ensure more people receive timely and equitable vision services.

Ophthalmology Excellence Fund

FUND #312805

Your support provides excellence in ophthalmology education, research, and patient care through events with physicians, donors and other community partners.
go.osu.edu/OphExcellence

Scan to Give

Education and Clinical Care

We will continue to grow and maintain a dynamic balance between outstanding patient care, pioneering research and quality educational programs. We look forward to expanding our center of excellence with a strong partnership between clinicians, staff and patients.

Ophthalmology Education and Research Fund

FUND #307517

Your support provides our residents with educational materials, opportunities to learn, grow, collaborate, and attend national meetings.
go.osu.edu/EducationAndResearch

Scan to Give

Paul A. Weber Innovation and Research Fund

FUND #317479

Your support advances in research in the Department of Ophthalmology and Visual Sciences for innovative cures for blindness and eye disease including glaucoma and macular degeneration.
go.osu.edu/WeberResearch

Scan to Give

THE OHIO STATE UNIVERSITY
WEXNER MEDICAL CENTER

Sayoko Moroi, MD, PhD
Department of Ophthalmology & Visual Sciences
915 Olentangy River Rd, Suite 5000
Columbus, OH 43212-3154