BrightFocus® Foundation | Macular Degeneration Research

Today's investments, tomorrow's breakthroughs.

2024 Macular Degeneration Research Projects






Macular Degeneration Research

Meet the Next Generation of Innovators

Macular Degeneration Research, a BrightFocus Foundation program, is on a mission to cure and raise awareness about this sight-stealing disease impacting an estimated 20 million U.S. adults.

By providing initial funding for highly innovative experimental research and creative ideas, we spark revolutionary approaches and vision-saving breakthroughs for this leading cause of vision loss in Americans aged 60 and older.

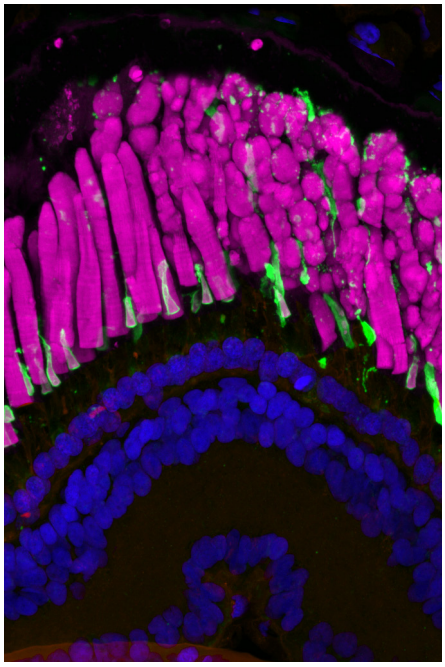
Explore all active grants:
brightfocus.org/MDRgrants

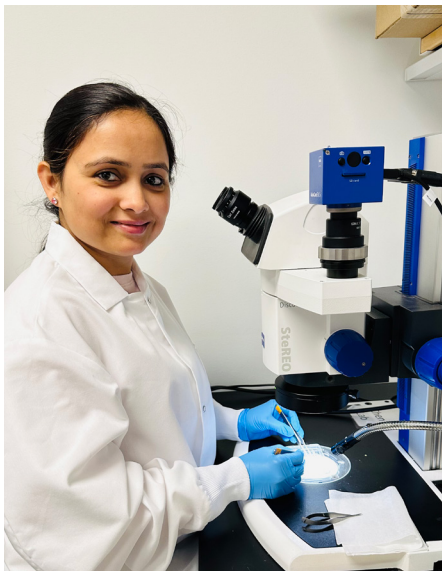
We're funding
49
active macular degeneration research projects worldwide.

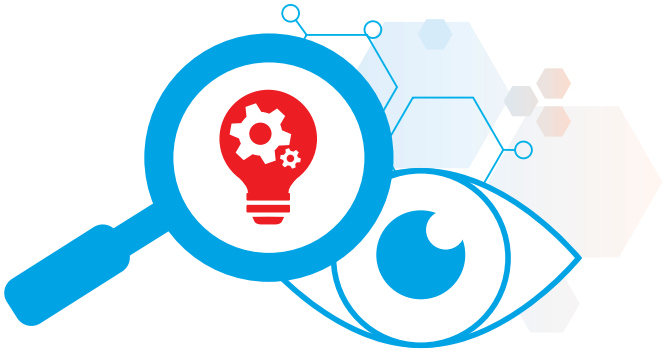
Since inception:
We've awarded nearly
$53 million
in research grants.

Since inception:
We've supported
1,148
scientists across 348 grants.

Opposite page: Image of an eye treated with CRISPR, where some vision cells remain healthy (left side), while others are altered (right side), illustrating the mixed effects of gene editing (Brittany Carr, PhD).







Our 360-Degree Approach

Macular Degeneration Research invests in a wide range of innovative scientific approaches, from exploring ways to regenerate damaged cells to determining the influence of early-life events, diet, and nutrition on disease risk. By tackling the disease from many angles, we leave no stone unturned.

This research portfolio provides an overview of our current Macular Degeneration Research grant projects. Grants are vetted through a rigorous evaluation process by the world's top scientists and clinicians who serve on our Scientific Review Committee.

We are deeply grateful to our donors, whose generosity empowers the next generation of researchers to pursue innovative, bold, and promising science, bringing us closer to tomorrow's cure.

Contents

This portfolio reflects awarded grants as of July 3, 2024.

Cell Metabolism

Macular Degeneration Research-funded scientists are examining the decline in cellular and mitochondrial energy production in the retinal pigment epithelium (RPE) at the back of the eye and other retinal cells as possible triggers of age-related macular degeneration (AMD). They are also exploring ways to restore health to the aging eye by improving cellular metabolism.

Getting to the Root of Fat Transport Dysfunction in AMD

Catharina Grubaugh, PhD | University of Pennsylvania
Mentor: Kathleen Boesze-Battaglia, PhD

This project focuses on a retinal pigment epithelium protein that drives lipid packaging. Researchers will knock out production of microsomal triglyceride transfer protein in the eye to study the effects of its absence. They will then study the added effects of aging and a high-fat diet, two risk factors for age-related macular degeneration. The results are expected to highlight potential treatments for defective lipid transport in the eye for preventing or slowing disease progress.

Storing Fat in the Eye: A Pathway for Tackling AMD

John Han, PhD | University of Michigan
Mentor: Jason Miller, MD, PhD

Age-related macular degeneration is characterized by the buildup of fatty deposits under the retinal pigment epithelium (RPE) cells at the back of the eye. The RPE consumes enormous amounts of fat each day, which is temporarily stored in lipid droplets inside the cell. Researchers aim to understand how the RPE forms these lipid droplets and to manipulate them so that less fat is secreted from the RPE, thereby preventing the formation of toxic fatty deposits.

Interactions of Immune Proteins and Glucose Breakdown in Severe, Hereditary AMD

Rayne Lim, PhD | University of Washington
Mentor: Jennifer Chao, MD, PhD

This project relies on a model of a severe, inherited form of age-related macular degeneration to study interactions of glucose breakdown and the complement pathway, an immune process. Researchers will evaluate how adding the normal form of the gene to cells affects disease-related changes to

the retinal pigment epithelium. This is the first such study of the links between complement pathway activity and glucose metabolism in this context and is expected to highlight treatment targets.

Transcriptional Regulation of Cellular Organelle Function in the Retinal Pigment Epithelium

Mallika Valapala, PhD | Indiana University

This project addresses strategies by which the degradative ability of lysosomes (cellular organelles) can be enhanced or restored to augment clearance of cellular waste that declines with advanced age. These strategies help keep the intracellular environment of the cell clean and promote overall cellular health.

Macular Degeneration, Metabolism, and a Novel Mitigation Strategy

Thomas Wubben, MD, PhD | University of Michigan

While the exact cause of age-related macular degeneration remains unknown, deregulation of cellular metabolism is believed to be critical to its pathogenesis. This project will reveal the significance of modulating metabolic targets important in macular degeneration, which may have immediately translatable applications to clinically treat patients.

Diet & Nutrition's Impact on Age-Related Macular Degeneration Risk

The current treatment for preventing the progression of intermediate age-related macular degeneration (AMD) is the AREDS2 supplement formula. Investigators are exploring ways to increase the uptake of carotenoids (pigments that give fresh produce their bright red, yellow, and orange colors) and the benefits of a Mediterranean-style diet rich in fish, whole grains, fruits, and leafy vegetables for eye health. Ideally, these dietary findings will translate into clinical use and promote "vision-healthy" lifestyles.

How AMD Risk Factors Interact in Disease Development

Freya Mowat, PhD | University of Wisconsin-Madison

Researchers will characterize how genetics, age, and diet interact in age-related macular degeneration risk as the basis for a tool for therapeutics development and testing. A novel aspect is the focus on how these factors affect DNA methylation, which has not been clarified, especially in early stages of the disease. Such a model could be used to test whether candidate therapies prevent accumulation of methylation changes associated with these risk factors.

Molecular Events in Early Life That Lead to AMD

Przemyslaw Sapieha, PhD | Hôpital Maisonneuve-Rosemont (Canada)

Immune cells play a key role in aberrant blood vessel growth during age-related macular degeneration. They change because of pathogen encounters and in chronic states such as obesity. Researchers will assess whether immune cells change in a way that increases risk for age-related macular degeneration after weight gain and subsequent weight loss. The work will yield insights into mechanisms underlying age-related macular degeneration, potentially opening a path to targeted interventions.

Drusen Formation & Immune Response

As the eye ages, it becomes less efficient at removing waste, which can lead to a buildup of drusen and trigger an immune response. Increases in the number and size of drusen may cause the immune system to kick into overdrive and damage cells in the macula, which provides sharp central vision. Researchers are testing drugs that can clear the waste deposits that contribute to age-related macular degeneration (AMD).

Exosomes and Autophagy: Suspicious Partners in Drusen Biogenesis and AMD

Miguel Flores-Bellver, PhD | University of Colorado Anschutz Medical Campus
Mentor: Joseph Brzezinski, PhD

Age-related macular degeneration (AMD) affects a part of the retina called the macula, which is responsible for clear vision. Retinal pigment epithelium (RPE) and retinal cells secrete little vesicles called exosomes, which contain many cellular by-products. To understand how exosomes contribute to drusen formation and the progression of AMD, the research team will identify bioactive molecules released in exosomes that could serve as potential biomarkers for AMD.

Can Fatty Acid Oxidation Influence Drusen Levels in the Eye?

Daniel Hass, PhD | University of Washington
Mentor: James Hurley, PhD

Researchers will establish the effect of a small molecule on fatty acid metabolism, cell function, and deposit levels in multiple cell cultures and mouse models of age-related macular degeneration. The small molecule in this study has been tested in humans in clinical trials, indicating its safety. If it is effective at decreasing deposit levels, the transition to clinical use may be more rapid than for untested treatments.

The Novel Role of an Intracellular Nuclear Receptor in AMD Pathogenesis

Neetu Kushwah, PhD | Boston Children's Hospital
Mentor: Jing Chen, PhD

Age-related macular degeneration (AMD) is a multifactorial disease involving multiple cellular pathways, including lipid dysregulation and inflammation. Researchers will investigate the role of a novel lipid regulator of inflammation in a type of immune cell to elucidate AMD pathogenesis. This could uncover new knowledge that may provide new druggable molecular targets for designing potential AMD therapies.

Origin, Heterogeneity, and Function of Immune Cells in a Wet AMD Model

Jeremy Lavine, MD, PhD | Northwestern University Feinberg School of Medicine
Mentors: Harris R. Perlman, PhD & Amani Fawzi, MD

Macrophages are immune cells present in different subtypes, with classically derived macrophages promoting wet age-related macular degeneration and nonclassical macrophages blocking its development. This group has identified a macrophage subset that expresses blood vessel growth factors derived

from classical macrophages and is present in patients with wet age-related macular degeneration. The researchers aim to identify nonclassically derived macrophage subsets and establish their inhibition of experimental wet age-related macular degeneration.

Tracking How Rare Eye Immune Cells Respond to Damage in AMD

Abdelilah Majdoubi, PhD | Yale University
Mentor: Brian Hafler, MD, PhD

Microglia in the retina are the focus of this project, which will expand our understanding of how these retinal immune support cells react to damage in age-related macular degeneration. Researchers will genetically analyze an unusually expansive bank of tissues for this work, which they expect to yield treatment targets, especially related to the C3 complement pathway, an immune response pathway closely implicated in age-related macular degeneration.

Ciliary Lipids in RPE Repair: A Novel Target for AMD

Ke Ning, MD | Stanford University
Mentors: Yang Sun, MD, PhD & Vinit Mahajan, MD, PhD

Researchers have discovered a novel role of an organelle, the antennalike retinal pigment epithelium (RPE) cilia, involving control of RPE repair in mice. Having shown that loss of these organelles promotes cell proliferation and wound healing, this group will study how the RPE cilia mediates these two processes. The results will facilitate understanding of how this organelle works in RPE proliferation, highlighting targets for drug development.

A Newly Discovered Eye Immune Environment in AMD

James Walsh, MD, PhD | Washington University in St. Louis
Mentor: Jonathan Kipnis, PhD

The goal of this project is to explore a newly identified local immune environment in the choroid, a supportive layer for the retina at the back of the eye. The work is novel as a first look at this local immunity in the eye and its potential role in age-related macular degeneration. Uncovering immune targets specific to the eye in this disease could lead to rapid development of treatments affecting these targets.

Genes & Age-Related Macular Degeneration

Most forms of macular degeneration are linked to various gene irregularities called single nucleotide polymorphisms (SNPs) rather than a single genetic mutation. SNPs, influenced by factors like age, health, and environmental exposures, can increase susceptibility to age-related macular degeneration (AMD). Targeted gene research aims to lower AMD risk by blocking or replacing harmful gene signals and defending retinal pigment epithelium cells against oxidative stress.

The Role of Mitochondrial Dysfunction in AMD

Navdeep Gogna, PhD | The Jackson Laboratory
Mentor: Patsy M. Nishina, PhD

This project aims to characterize the effects of a risk-related gene, ARMS2, on mitochondrial dysfunction and fat processing in age-related macular degeneration. This work is the first to investigate how a specific ARMS2 variant influences mitochondrial function and fat processing and leads to increased risk for age-related macular degeneration. Researchers expect the findings to highlight new treatment targets for the disease.

Investigating Genetic or Immune Factors in AMD

Michelle Grunin, PhD | Hebrew University of Jerusalem (Israel)
Mentors: Shai Carmi, PhD & Jonathan L. Haines, PhD

Researchers will use novel technological tools and newly available diverse ancestry reference panels to identify new genetic risk factors for age-related macular degeneration and new genetic or immune system-related treatment targets. This group will use the genetics available through the International Age-Related Macular Degeneration Genomics Consortium, with over 50,000 samples, to investigate these issues on a large scale. Inclusion of multiethnic participants will support discovery of rare genetic variants.

Mouse Models for Subretinal Fibrosis

Patsy M. Nishina, PhD | The Jackson Laboratory
Co-Principal Investigator: Jürgen K. Naggert, PhD

Tissue damage in the back of the eye may lead to formation of scar tissue, or fibrosis, that causes vision impairment. In this study, researchers will characterize two new genetic models of subretinal fibrosis, a common complication of wet age-related macular degeneration, and provide insights into pathways that may underlie the disease.

Gene Regulation of RPE Maintenance

Lev Prasov, MD, PhD | University of Michigan

This group has identified a new gene that controls expression of other genes in the retinal pigment epithelium (RPE) and leads to dysfunction. Researchers will evaluate the role of this gene in maintaining adult RPE function and its ability to protect against stresses that lead to age-related macular degeneration. The findings may open new avenues for treatment of the disease by targeting this gene or its downstream targets.

Functional Characterization of Genetic Regulatory Effects of AMD Risk Variants

Rinki Ratnapriya, PhD | Baylor College of Medicine
Mentor: John Timothy Stout, MD, PhD

Researchers will integrate findings from genome-wide association studies with findings related to the transcriptome (representing protein-coding regions of genes) and epigenome (representing molecular tags on DNA that affect its use). The aim is to identify underlying causal genetic variants, regulatory elements, and target genes to address major gaps in mechanistic understanding of age-related macular degeneration.

Machine Learning to Predict AMD-Associated Genetic Variant Impact

Leah VandenBosch, PhD | Seattle Children's Hospital
Mentor: Timothy Cherry, PhD

Researchers will apply machine learning to human retinal and retinal pigmented epithelium genomic data. They aim to predict how variations in the noncoding regions, which are stretches of DNA that do not code for proteins, contribute directly to age-related macular degeneration.

Geographic Atrophy

Some people with age-related macular degeneration (AMD) develop geographic atrophy, a severe form of dry AMD that can lead to permanent vision loss due to cell death in the retina. The first treatments for geographic atrophy were approved by the Food and Drug Administration in 2023, and several other promising treatments are in clinical trials. Macular Degeneration Research is funding innovative research into new drugs and management strategies for this complex condition.

Cellular Scale Characterization of the RPE-Photoreceptor Complex in a Model for Geographic Atrophy Progression

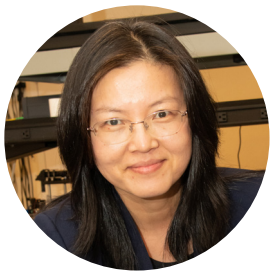
Kristen Bowles Johnson, PhD, OD | Indiana University
Mentors: Donald T. Miller, PhD & Jennifer J. Hunter PhD, University of Rochester

In this study, researchers will use a camera called an adaptive optics ophthalmoscope to take pictures of fluorescent clumps in retinal pigment epithelium cells and measure how sick photoreceptors become as the disease progresses. The results could characterize biomarkers for identifying patients most likely to benefit from a specific treatment and for determining treatment efficacy.

Investigating Multiarmed Cell Death (PANoptosis) in Dry AMD Progression

Lucia Celkova, PhD | Trinity College Dublin (Ireland)
Mentor: Matthew Campbell, PhD

The aim of this research is to explore a master "decision maker" that could integrate and process these triggers and guide the fate of retinal pigment epithelium (RPE) cells toward either survival or death. Through this work, researchers expect to gain a better understanding of the complex process underlying RPE cell death and to identify potential new targets and strategies for therapeutic intervention in dry age-related macular degeneration.



Imaging Tiny Blood Vessels in the Eye for Markers of AMD

Yali Jia, PhD | Oregon Health & Science University

Researchers will develop an imaging device that tracks blood flow in the eye as a disease marker in age-related macular degeneration. With this cost-effective tool, researchers will identify features that specifically undergo changes during progression of the disease to characterize biomarkers of the process. The tool is expected to allow prediction of development and progression of specific features of age-related macular degeneration, including geographic atrophy.

Innovative Approaches to Treatments

One day, early detection of age-related macular degeneration (AMD) may allow for preventative measures. Macular Degeneration Research is funding studies on protecting the retinal pigment epithelium and retina before sight damage occurs, including drugs to enhance immune function and improve the eye's ability to clear waste. New imaging techniques and gene therapy are also being explored to track and treat AMD progression.

Functional Imaging of the Human Retina Using Noninvasive Technology

Andrew Browne, MD, PhD | University of California, Irvine
Mentor: Krzysztof Palczewski, PhD

In this study, researchers will develop a camera for use in humans and directly examine the causes of age-related macular degeneration. Researchers will combine microscopy technology that is already used to study models with a device that can noninvasively acquire images at high enough resolution to reveal events inside the cell.

Identifying FDA-Approved Drugs to Reverse Dry AMD

Steffi Daniel, PhD | University of Minnesota, Twin Cities
Mentor: John Hulleman, PhD

This study will employ a novel "disease in a dish" system to screen for more than 1,500 Food and Drug Administration-approved drugs for their ability

to reverse disease. Lead drugs from this screen also will be extensively and rigorously tested in a preclinical model system. If successful, the results from this study will contribute toward transforming age-related macular degeneration therapeutics.

This grant is supported by the Ivan Bowen Family Foundation.

What Squirrels Can Teach Us About Treating AMD

Sangeetha Kandoi, PhD | Johns Hopkins University School of Medicine
Mentor: Deepak A. Lamba, MBBS, PhD, University of California, San Francisco

The goal of this project is to trace how the squirrel eye rescues the retina from hibernation stress damage that is similar to age-related macular degeneration. Researchers will explore the molecular steps that the eyes of the 13-lined ground squirrel undergo for these repairs. The goal of this work is to develop therapies that could, as with these squirrels at each annual wakening, restore damaged vision.

Advanced Imaging Studies in a Model of Type 3 Neovascular AMD

Tyson Kim, MD, PhD | University of California, San Francisco
Mentors: Douglas Gould, PhD, Aparna Lakkaraju, PhD & Dan Schwartz, MD

This project focuses on the formation of chorioretinal anastomoses, fusions that arise between the retinal and choroidal vascular networks. Using models of neovascular age-related macular degeneration, researchers will develop an advanced imaging method for looking deep into the living eye at cellular resolution to gain molecular information. They also will measure blood flow in individual microvessels. The findings will support the development of more effective treatments for neovascular age-related macular degeneration.

Dark Matter: Developing a Nanoantioxidant-Based Therapeutic System for AMD

Yongsu Kwon, PhD | University of North Carolina at Chapel Hill
Mentor: Zongchao Han, MD, PhD

The aim of this study is to develop a new combination antioxidant system to scavenge free radicals, which are the toxic waste products that gradually build up in cells over time. The findings may demonstrate long-term effects and reduced damage in age-related macular degeneration.

Stem Cell Therapy for Early AMD

Narendra Pandala, PhD | University of Iowa
Mentor: Budd Tucker, PhD

This project aims to use adult-derived stem cells to restore tiny blood vessels in the eye lost at the onset of age-related macular degeneration. To

encourage the stem cells to repopulate the lost capillaries, researchers will test a biomaterial that supports targeted injection of the cells. They expect their work to yield an injectable stem cell delivery system with possible clinical applications.

Innovative Night Vision Tests for Age-Related Macular Degeneration

Maximilian Pfau, MD | Institute of Molecular and Clinical Ophthalmology Basel (Switzerland)

Age-related macular degeneration (AMD) causes devastating vision loss over time. However, best-corrected visual acuity—the most common vision test—does not reveal dysfunction in early AMD. Thus, clinical trials focus mostly on late AMD, despite the limited treatment potential. This project will establish vision tests that evaluate dark adaptation following exposure to bright light. Using retina tracking, researchers will test small retinal regions prone to subtle photoreceptor dysfunction in an unprecedentedly accurate manner, making disease progression measurable at the earliest stage.

Immune Cell Traps in Inflammation and Wet AMD

Matthew Rutar, PhD | University of Canberra (Australia)

The aim of this project is to explore the role of neutrophil extracellular traps, or NETs, in neovascular age-related macular degeneration. Researchers will use mouse models and donor tissues to test candidate inhibitors of NET activity. Current therapies are focused on limiting rogue growth of blood vessels, so identifying new targets related to inflammation offers new opportunities for treatment.

The Development of a Transplant-Independent Therapy for RPE Dysfunction

Shintaro Shirahama, MD, PhD | Schepens Eye Research Institute of Mass. Eye and Ear

Mentor: Bruce Ksander, PhD

Aging is a critical risk factor for developing age-related macular degeneration (AMD), which implies that young retinal pigment epithelium (RPE) cells can successfully combat the underlying causes of the disease. Conversely, as RPE cells age, they undergo alterations, rendering them more susceptible to AMD. The research team seeks to reverse the biological age of RPE cells so that these younger cells can successfully combat the disease, stopping further progression and restoring functional vision.

Stem Cell-Based Approaches to Identify New Drugs for Treating Dry AMD

Srinivasa Rao Sripathi, PhD | Retina Foundation of the Southwest

The aim of this project is to develop novel treatments for age-related macular degeneration by utilizing stem cell-derived retinal pigment epithelium (RPE) cells

to screen for molecules (potential drugs) that inhibit RPE damage and reduce epithelial-mesenchymal transition, to help RPE cells maintain their integrity.

Understanding the Link Between Blood Vessels in the Eye and Vision Loss

Benjamin Thomson, PhD | Northwestern University-Chicago Campus

Typical wet age-related macular degeneration is most commonly seen in patients of European ancestry, but similar disease in patients of Asian and African ancestry is more commonly associated with polypoidal choroidal vasculopathy (PCV). This work will characterize the role of a recently identified, important blood vessel regulatory system (known as the angiopoietin signaling pathway) in PCV and test new drug candidates targeting this pathway.

A Novel Method for Treating Wet AMD Reversibly with a Single Intraocular Injection

Shusheng Wang, PhD | Tulane University
Co-Principal Investigator: Bo Yu, PhD

The study aim is to establish a novel gene regulation system that can turn off vascular endothelial growth factor, or VEGF, a gene responsible for the growth of new blood vessels. The aim is to reduce levels of VEGF protein in wet age-related macular degeneration. This gene system combines potency, tight control of VEGF, and safety and can be used to treat the disease with just one intraocular injection.

This grant is supported by the Free Family Foundation.

Regenerating Damaged Cells

Unlike human skin, the eye's nerve cells do not typically regenerate after damage. However, new research aims to overcome this limitation by regenerating and reconnecting retinal cells damaged by age-related macular degeneration (AMD) and restoring retinal pigment epithelium cells. Grant recipients are using human induced pluripotent stem cell (iPSC) technology to recreate parts of the eye and studying cell regeneration in animal models for potential human therapies.

Regenerative Response in Spiny Mice

Manas R. Biswal, PhD | University of South Florida

Degeneration of the neural retina and in the retinal pigment epithelium (RPE) is associated with the advanced atrophic form of dry age-related macular degeneration (AMD). Since photoreceptors in the neural retina and RPE cannot be replaced once they die, treatments boosting the endogenous factors to stimulate retinal tissue regeneration could be a novel therapeutic strategy. Researchers will study ocular regeneration following tissue injury in an animal model that could facilitate studies to develop potential treatments for dry AMD in humans.

This grant is supported by the Free Family Foundation.

Discovery of New Methods to Regenerate Cone Photoreceptors

Mark Emerson, PhD | The City College of New York

Cone photoreceptors are the critical light-sensing sensory cells that are lost in age-related macular degeneration. Researchers will use high-resolution molecular techniques to identify genes that are normally active in forming cone photoreceptors. The team will identify gene candidates that can turn other retinal cells into cones to develop new cone replacement therapies for age-related macular degeneration.

The Generation of Cone Photoreceptor Outer Segments

Heike Kroeger, PhD | University of Georgia

The loss of cone photoreceptor cells during age-related macular degeneration (AMD) can lead to irreversible vision loss. Repairing these specialized cells could change the overall approach of AMD therapies and complement current treatment options. This research investigates how cone photoreceptor outer segments are formed and regenerated using novel research models. The team's findings will identify a new strategy and potential new therapeutic targets to improve and prevent loss of cone photoreceptor cell function during AMD.

Uncovering Immune-Related Factors Driving Retinal Pigment Epithelium Repair

Lyndsay Leach, PhD | University of Texas at Austin

In this project using zebrafish as a lab model of tissue damage repair, researchers will examine how the immune response affects retinal pigment epithelium (RPE) repair. They expect to uncover novel factors in regenerating RPE that, in turn, represent candidates for treating or even reversing tissue loss in age-related macular degeneration.

Killifish: A Novel Model of AMD

Nicole C. L. Noel, PhD | University College London (UK)
Mentor: Ryan MacDonald, PhD

This work provides a unique opportunity to develop killifish as a retinal aging model. With this model, researchers will determine the cellular mechanisms that lead to age-related macular degeneration. They will also assess how healthy retinal aging can be promoted in this model of age-related retinal degeneration.

Regeneration of Cone Photoreceptors in the Human Retina

Juliette Wohlschlegel, PhD | University of Washington
Mentor: Thomas Reh, PhD

The human retina cannot regenerate after diseases like age-related macular degeneration, which often leads to blindness. However, a few species can regenerate new retinal cells that eventually restore visual function. The regenerative process is driven by the Müller glia, a support cell in the retina. This project aims to reprogram Müller glia into functional cone photoreceptors to replace those that progressively degenerate in macular degeneration.

Understanding Early-Stage Age-Related Macular Degeneration

Age-related macular degeneration (AMD) is linked to many causes, with age being the strongest risk factor. AMD is believed to start in the retinal pigment epithelium (RPE), which helps to nourish the retina and dispose of waste. The RPE's function can be compromised by age, genes, oxidative stress, and inflammation. Macular Degeneration Research funds scientific exploration into the causes of AMD to open new and earlier treatments.

Investigating AMD-Like Disease in Animal Models

Brittany Carr, PhD | University of Alberta (Canada)

Age-related macular degeneration (AMD) research is hindered by the lack of models that encapsulate its complex features. An important feature of AMD is retinal deposits of fat and protein debris, but researchers know little about where they come from and how they may confer an increased risk of severe AMD in the people who have them. To address this, researchers have created two animal models that develop two different types of AMD-associated retinal deposits, providing insights into the origin, treatments, and relationship to severe AMD.

Regulation of Capillary Blood Flow in the Choroid Vasculature

Albert Gonzales, PhD | University of Nevada

Researchers will examine how blood vessels can respond to light and change blood flow in the eye. This process is important not only for the delivery of vital oxygen and nutrients for cell survival but also for the removal of waste deposits that can lead to diseases like age-related macular degeneration. The completed work is expected to yield insights into the active physiological role of capillaries in the choroid vasculature.

Discovering an Invisible Layer in the Retina and Its Ties to AMD

Yifan Jian, PhD | Oregon Health and Science University
Mentor: Brandon Lujan, MD

In this study, researchers are developing a novel retina imaging device capable of volumetric directional optical coherence tomography. The aim is to measure a new candidate biomarker, the true thickness of the outer nuclear layer (ONL). The ability to measure ONL could lead to an improved understanding of the retinal degeneration in age-related macular degeneration and the effects of therapeutic interventions.

Identifying New Factors That Play a Role in Early-Onset Drusen Maculopathy

Yara T. E. Lechanteur, MD, PhD | Radboud University Nijmegen Medical Centre (The Netherlands)
Mentor: Frans Cremers, PhD

Researchers will evaluate young-onset cases of drusen maculopathy by studying family members of those who are affected and by looking at genetic factors and specific markers in blood samples. The aim is to identify new factors involved in this disease. Better knowledge about the disease can aid in the development of future therapies and may represent a step closer toward treatment.

Understanding Early Molecular Events in Age-Related Macular Degeneration

Sandeep Moothedath Subrahmanian, PhD | Pennsylvania State University College of Medicine
Mentor: Michael Dennis, PhD

A significant challenge in addressing age-related macular degeneration (AMD) is the lack of understanding of the early molecular events that contribute to its development. This project aims to explore a novel molecular switch that plays a role in the failed antioxidant and inflammatory responses in retinal pigment epithelium with aging. The findings are expected to identify new targets for therapeutics that are preventative or provide interventions early in the development of AMD.

Identifying Signals That Draw Immune Cells to Damaged Tissues in Age-Related Macular Degeneration

Kelly Mulfaul, PhD | University of Iowa

Researchers aim to identify the molecules that attract immune cells to damaged tissue in age-related macular degeneration. These cells are predicted to sometimes do more harm than good and be involved in the death of choroid cells of the eye. An understanding of what draws these immune cells to the choroid at various stages of age-related macular degeneration will support the search for treatments based on the target stress signals.

Exploring How NRF2 Protein Reduces RPE Cell Damage by Cigarette Smoke

Krishna Singh, PhD | Johns Hopkins University School of Medicine
Mentor: James Handa, MD

In age-related macular degeneration (AMD), retinal pigment epithelial (RPE) cells are damaged by oxidative stress. The NRF2 protein protects against oxidative stress; however, NRF2 signaling declines in AMD. Researchers propose to find a cause for NRF2 signaling decline, called acetylation, a process that modifies proteins to change how genes are produced. If successful, researchers will have a favorable strategy for treating AMD.

The Potential Role of the Cell's Sugar Coat in Age-Related Macular Degeneration

Jaclyn Swan, PhD | University of California, San Diego Health Sciences
Mentor: Pascal Gagneux, PhD

For this project, researchers will take a first look at the potential roles of the cell's glycocalyx, its carbohydrate coating, in age-related macular degeneration. The glycocalyx is important for cell communication and immunity but has received little attention in this condition. This project will fill that gap and test the hypothesis that glycocalyx changes could lead to immune dysregulation linked to age-related macular degeneration.

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