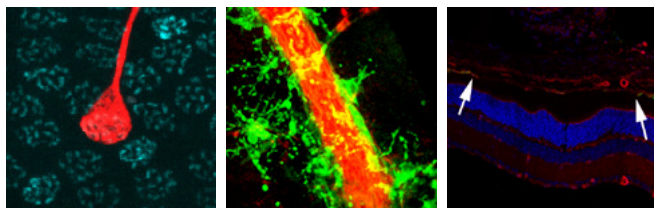


This Is How.

Projects Inspiring Promise



**Current Macular
Degeneration
Research Projects**

As of December 2020



**BrightFocus[®]
Foundation**

**Macular
Degeneration
Research**

Macular Degeneration Research, a BrightFocus Foundation Program

We're funding 45 projects worldwide this year in research.

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Cover photos, left to right:

Cone photoreceptors, like the one shown in red, are responsible for high-definition central vision, the kind lost in macular degeneration. (Courtesy of Mrinalini Hoon, PhD and Raunak Sinha, PhD, University of Wisconsin-Madison)

Inflammation is a major player in AMD, and can trigger growth of fragile, leaky blood vessels that damage retinal cells. Here, immune cells (green) interact with blood vessels (red) in an animal retina. (Courtesy of David Alvarez, PhD Harvard Medical School, Boston, MA, and Ye Sun, MD, PhD)

Between the arrows, this cross section of central retinal tissue shows a complete loss of green-stained retinal-pigmented epithelium cells due to geographic atrophy. (Courtesy of Claudio Punzo, PhD, University of Massachusetts Medical School, Worcester)

Advanced forms of age-related macular degeneration (AMD) are a leading cause of vision loss and irreversible blindness in Americans age 60 years and older, as well as throughout the world.

Currently, as many as 11 million Americans have some form of macular degeneration, including both wet and dry AMD. The advanced form of dry AMD is also called geographic atrophy. This number is expected to double by 2050. Much more work is needed to develop effective treatments and cures. Through the generosity of our donors, Macular Degeneration Research, a BrightFocus Foundation program, has awarded nearly \$35 million to fund research projects on the causes and potential prevention, treatment, and cure of this disease.

Macular Degeneration Research invests in several promising avenues of research to defeat AMD. We fund a broad array of scientific approaches, encompassing innovative projects falling into the following categories:

- Understanding Early AMD
- Insights into Geographic Atrophy
- Role of Cell Metabolism in AMD
- Drusen Formation and Immune Response
- Genes and AMD
- How Diet and Nutrition Affect AMD Risk
- Innovative Approaches to AMD Treatment
- Regenerating Cells Damaged by AMD

The scientific images at right were furnished by current MDR grantees and show various aspects of their work. Look inside for a brief description of what's depicted in each image.

Co-principal investigator (co-PI) institutions are listed only when they differ from PI institution.

Images at right, top to bottom:

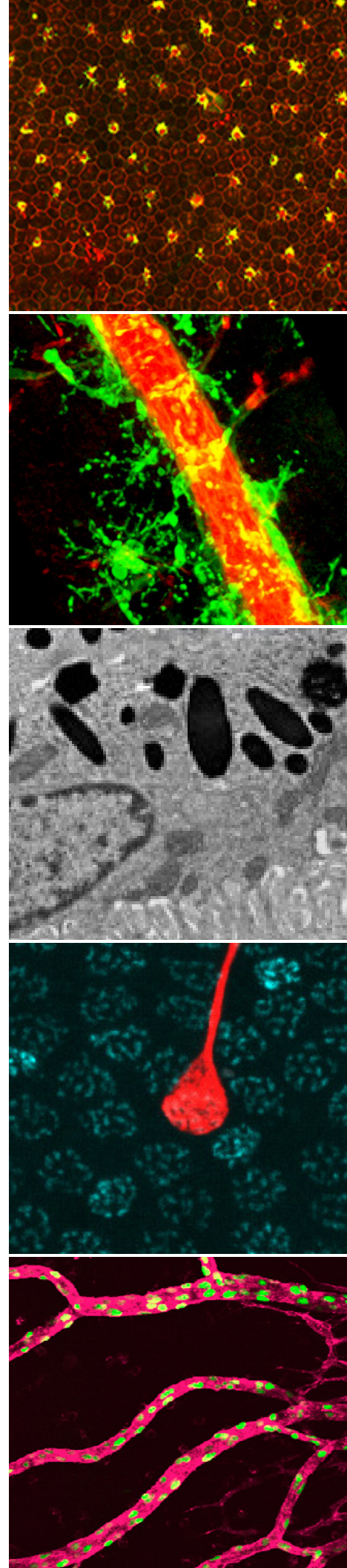
Courtesy of Claudio Punzo, PhD, University of Massachusetts Medical School, Worcester, MA

Courtesy of David Alvarez, PhD Harvard Medical School, Boston, MA, and Ye Sun, MD, PhD

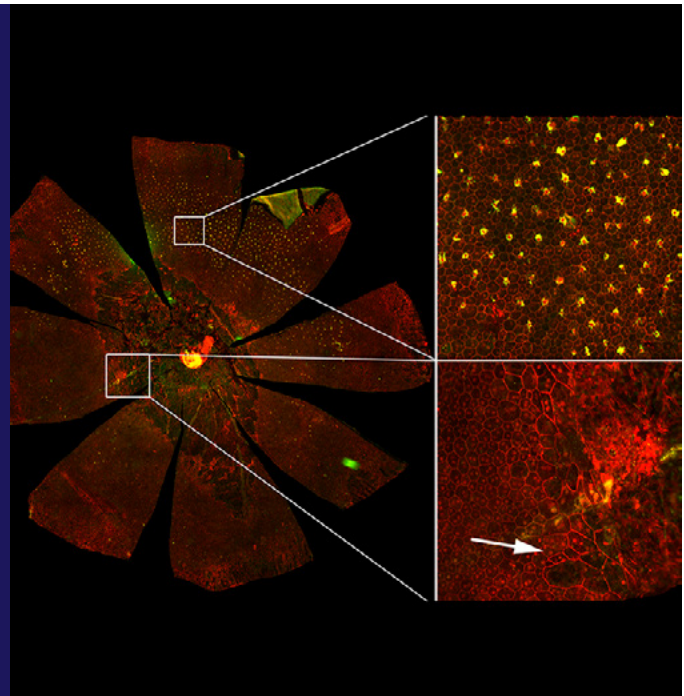
Courtesy of Sheldon Rowan, PhD, Tufts University, Boston, MA

Courtesy of Mrinalini Hoon, PhD and Raunak Sinha, PhD, University of Wisconsin-Madison

Courtesy of Ross Poché, PhD, Baylor College of Medicine, Houston, TX



Understanding Early AMD



Macular degeneration is a disease linked to not just one, but many, causes. Foremost are changes in the eye that happen with age—the strongest risk factor. It is generally thought that age-related macular degeneration (AMD) begins in the retinal pigment epithelium (RPE), a layer of cells next to the retina, whose job is to transport molecules in and out to nourish the retina and dispose of waste. The RPE's ability to do its job can be compromised by age, oxidative stress, inflammation, and other factors

causing the immune system to kick in and overact. The scientific exploration that Macular Degeneration Research is funding will expand our understanding and open new and earlier treatment avenues.

Above: In an animal model of geographic atrophy, retinal-pigmented epithelium cell boundaries (in red) are lost in the central region, and microglia (in green) are recruited to the area to protect the tissue. (Courtesy of Claudio Punzo, PhD, University of Massachusetts Medical School, Worcester)



Kapil Bharti, PhD

(9/1/20 - 8/31/22)

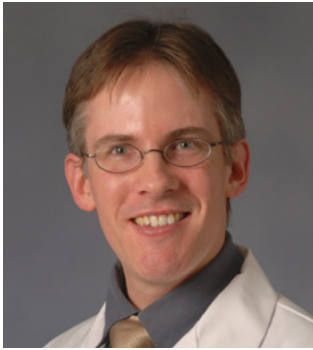
The National Eye Institute, Bethesda, MD

Co-Principal Investigator: Eric Nguyen, PhD

Engineered Eye Tissue Models to Analyze Mechanisms of Age-Related Vision Loss

This research project uses 3D bio printed human tissue models to clarify the role of retinal blood vessels in initiating and progressing macular degeneration. The completion of this project is expected to determine whether the retinal blood vessels can be effective therapeutic targets for countering macular degeneration and suggest novel therapeutics against the disease.

www.brightfocus.org/grant/M2020258



Tim Corson, PhD
Indiana University, Indianapolis

(7/1/19 – 6/30/21)

A New Way to Target Abnormal Blood Vessel Growth in Wet AMD

Researchers in this study will design and produce chemicals that will inhibit a newly discovered protein that, when blocked, will prevent blood vessel growth.

www.brightfocus.org/grant/M2019069



Bradley Gelfand, PhD
University of Virginia, Charlottesville

(9/1/20 - 8/31/22)

Examining the Role of Choroidal Blood Flow in AMD

In this proposal, researchers will use donor eyes and cutting-edge computer modeling to understand whether choroidal blood flow predisposes and contributes to AMD. Insights obtained from these studies could inspire new diagnostic and therapeutic tools targeting the choroidal blood vessels to improve AMD management.

www.brightfocus.org/grant/M2020114



Haijiang Lin, MD, PhD
University of Massachusetts Medical School, Worcester
Co-Principal Investigator: Bo Tian, PhD

(7/1/19 - 6/30/21)

Investigation of Novel Pathogenesis and Therapeutic Strategy for AMD

This study will identify new factor(s) contributing to the progression of AMD and explore methods to halt or reverse AMD retinal lesions. Overall goal is to gain a better understanding of the molecular mechanism of this disease and to develop novel effective therapies.

www.brightfocus.org/grant/M2019074



Chi Luu, PhD
Centre for Eye Research Australia, East Melbourne

(7/1/18 – 3/31/21)

Co-Principal Investigators: Robyn Guymer, PhD and Gregory Dusting, PhD

The Role of “Good Cholesterol” in AMD

The overall aim of this research project is to explore the role and therapeutic benefit of “good cholesterol” in AMD.

www.brightfocus.org/grant/M2018144

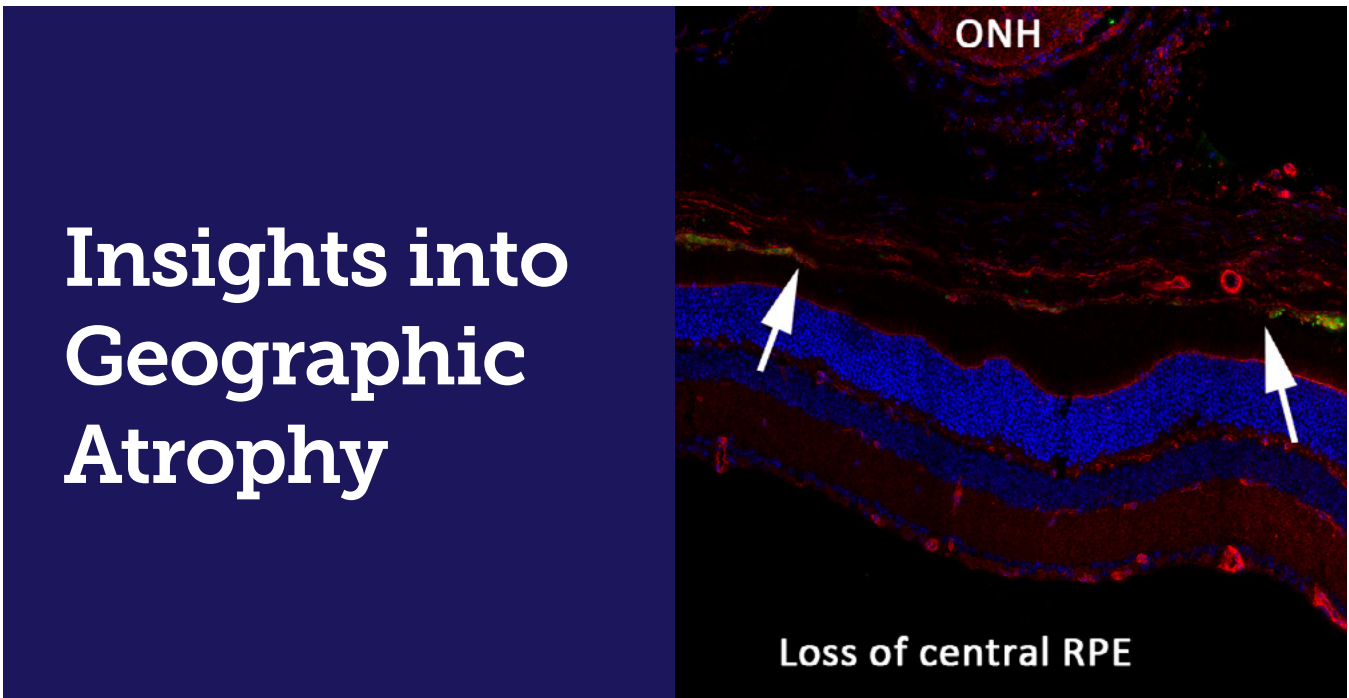


Ming Zhang, MD, PhD (7/1/19 – 6/30/21)
 Augusta University Research Institute, GA

Association Between Cytomegalovirus Infection in the Eye and the Development of AMD

The purpose of this study is to investigate if cytomegalovirus (CMV), a common virus, that stays dormant in the human eyes and how reactivation of this virus contributes to the development of AMD. This study will further explore strategies to inhibit virus reactivation and alleviate development of AMD induced by CMV reactivation in the eye.

www.brightfocus.org/grant/M2019035



Geographic atrophy (GA) is an advanced form of age-related macular degeneration (AMD). It is sometimes referred to as “dry AMD” because it lacks the fragile, leaky blood vessels seen in late-stage “wet” AMD. Instead, photoreceptors weaken and die (“atrophy”), resulting in dead zones and an expanding blind spot near the center of the visual field. Currently there is no approved treatment for GA, although several are in discovery and/or development. Macular Degeneration Research is

funding investigations into new drugs and ways to manage and treat this devastating disease. This urgently needed research could one day result in the first successful therapies.

Above: Between the arrows, this cross section of central retinal tissue shows a complete loss of green-stained retinal-pigmented epithelium cells due to geographic atrophy. (Courtesy of Claudio Punzo, PhD, University of Massachusetts Medical School, Worcester)



Paul Baird, PhD

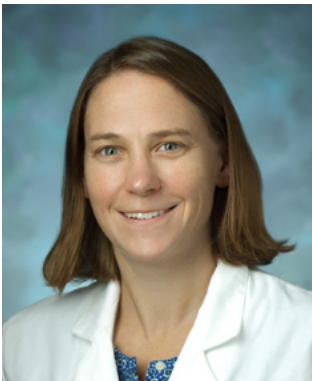
(7/1/19 – 6/30/21)

Co-Principal Investigators: Adam Kowalczyk, PhD and Alice Pebay, PhD
The University of Melbourne, Australia

A New Method for Prediction of the Two Advanced Types of AMD

This proposal brings together different areas of medicine and biology and applies advances in high throughput computing and big data analysis to aid our understanding and advancement of treatments for AMD; particularly the dry form. This study will identify genes that interact with each other as well as with other factors known to be involved in increased risk of AMD such as age, sex of an individual and smoking.

www.brightfocus.org/grant/M2019093



Malia Edwards, PhD

(9/1/20 - 8/31/22)

Wilmer Eye Institute, Johns Hopkins University, Baltimore, MD

Understanding the Role of Support Cells, Known as Glia, in Geographic Atrophy

This proposal will take a novel approach to studying GA by investigating the role of glial cells. These cells, traditionally considered only support cells, are altered in GA. The proposed studies will investigate how changes to these cells may influence disease progression and the effectiveness of treatments.

www.brightfocus.org/grant/M2020174

This grant was made possible in part by the support of the Victor and Anna Mae Charitable Foundation.



Yingbin Fu, PhD

(7/1/18 – 6/30/21)

Baylor College of Medicine, Houston, TX

A Novel Method to Treat Both the Wet and Dry Forms of AMD

The objective of this project is to develop a highly innovative and effective treatment strategy to target the underlying causes of both the wet and dry forms of AMD.

www.brightfocus.org/grant/M2018142



Claudio Punzo, PhD

(9/1/20 - 8/31/22)

University of Massachusetts Medical School, Worcester, MA

Elucidating How Smoking Causes Advanced AMD

Among the non-genetic risk factors smoking, confers the highest risk for progression to the advanced stages of GA and wet AMD; however, how smoking contributes to AMD remains elusive. In this study, researchers propose that smoking causes advanced AMD pathologies by depletion of the second most abundant protein present in the serum.

www.brightfocus.org/grant/M2020016

Role of Cell Metabolism in AMD



The retinal pigment epithelium (RPE) is a single layer of cells at the back of the eye next to the retina. The health of RPE cells, and their ability to support the nerve cells of the retina, depend on well-functioning RPE cell metabolism as a source of energy. Grantees are currently looking at the decline in the cellular and mitochondrial (“cell powerhouse”) energy production in the RPE and other retinal cells as possible triggers to AMD. Macular Degeneration Research-funded studies are trying to

understand how an imbalance between energy needs and production may contribute to the disease and are finding ways to restore health to the aging eye by improving cellular metabolism.

Above: The Skowronska-Krawczyk lab has its own logo depicting the lab’s research focus on understanding aging and age-related changes in the eye. It was designed by artist Ewa Henry-Dawson, who collaborated with the grantee on an art-science project aimed at making science more approachable for the lay audience.



Jianhai Du, PhD

(9/1/20 - 8/31/22)

West Virginia University Research Corporation, Morgantown

Co-Principal Investigator: Deborah Ferrington, PhD

Targeting Proline Metabolism in AMD

In this proposal, researchers will test mechanisms for utilization of an amino acid, proline, in AMD, and will investigate approaches to rescuing defects in the RPE cells from AMD by targeting proline metabolism.

www.brightfocus.org/grant/M2020141



Michael Paulaitis, PhD

(7/1/17 - 12/31/20)

Wilmer Eye Institute, Johns Hopkins University, Baltimore, MD
Co-Principal Investigator: James T. Handa, MD

MicroRNAs and Mitochondrial Dysfunction in AMD

The overall goal of this project is to test the novel concept that a recently discovered class of small non-coding ribonucleic acids (RNAs), which are called microRNAs and are packaged and secreted by RPE cells, have gone 'haywire' in AMD. These microRNAs can predict the status of mitochondrial function in these cells and influence mitochondrial function in neighboring RPE cells through vesicle-mediated intercellular transfer of the microRNAs.

www.brightfocus.org/grant/M2017060



Raju Rajala, PhD

(7/1/19 - 6/30/21)

University of Oklahoma Health Sciences Center, Oklahoma City

Defective Energy Utilization in AMD

RPE cells of the retina provide nourishment to the photoreceptor cells for normal visual functions. Recent studies show that in AMD patients' retinas and tissues from aged mouse, expression of two metabolic enzymes is increased in the RPE and is decreased in the photoreceptors which are opposite to that seen in normal retinas. This proposal aims to study these two enzyme alterations and also reprogram their expression to reduce the AMD phenotype.

www.brightfocus.org/grant/M2019168

Recipient of The Elizabeth Anderson Award for Macular Degeneration Research.



Magali Saint-Geniez, PhD

(7/1/18 - 6/30/21)

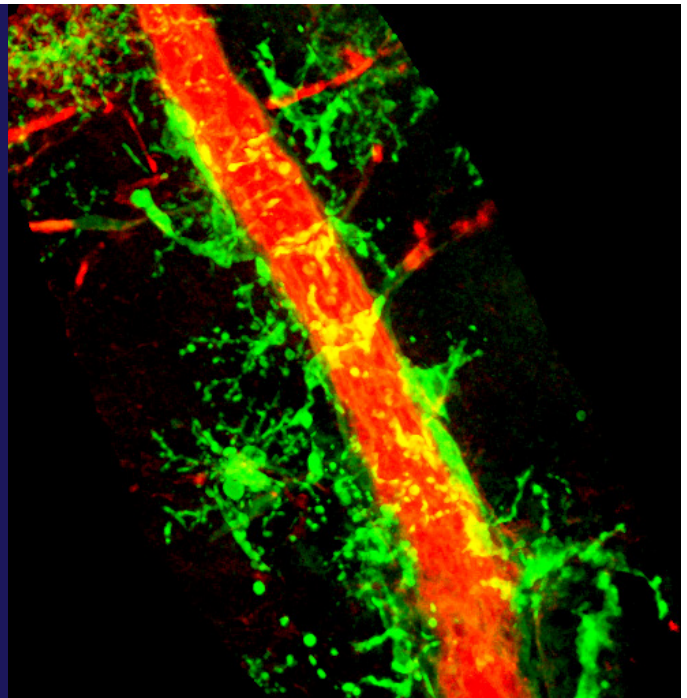
The Schepens Eye Research Institute/Massachusetts Eye and Ear, and Harvard Medical School, Boston

Investigation of a New Target in AMD

This project aims to study a novel pathogenic mechanism responsible for impaired RPE metabolism and progression to the advanced "wet" form of AMD. Results from this study may open up new avenues for efficient and specific therapeutic strategies.

www.brightfocus.org/grant/M2018064

Drusen Formation and Immune Response



As the eye ages, it becomes less efficient at removing waste. Deposits of extra cellular waste products containing fats and proteins known as drusen may collect within and beneath the retinal pigment epithelium (RPE) cell layer and trigger an immune response. In fact, when spotted on a comprehensive eye exam, drusen often are the first sign of age-related macular degeneration (AMD), and increases in the number and size of drusen may cause the immune system to kick into overtime. Ultimately, an out-of-control immune response may reach a tipping point and

damage cells in the macula, or central part of the eye, which provides sharp central vision. Thus, researchers are focusing on specific aspects of the immune response, including numerous inflammatory factors, and the eye's own built-in defense molecules, called microglia, to learn exactly how they interact and participate in AMD.

Above: Inflammation is a major player in AMD, and can trigger growth of fragile, leaky blood vessels that damage retinal cells. Here, immune cells (green) interact with blood vessels (red) in an animal retina. (Courtesy of David Alvarez, PhD Harvard Medical School, Boston, MA, and Ye Sun, MD, PhD)



John Hulleman, PhD

(7/1/18 - 9/30/21)

University of Texas Southwestern, Dallas

Conditional Control of Inflammation in Retinal Degenerative Diseases

The goal of this project is to slow or prevent damage to the RPE by using small molecules to stop local inflammatory signals and complement activation that has been associated with macular degeneration.

www.brightfocus.org/grant/M2018099

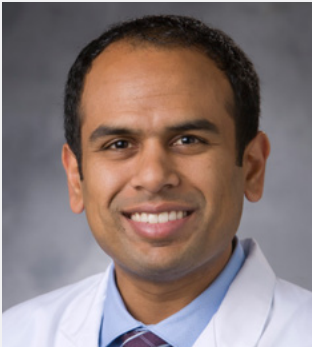


Alexander Marneros, MD, PhD (7/1/19 – 6/30/21)
Massachusetts General Hospital and Harvard Medical School, Boston

Inhibiting Inflammation to Prevent Wet AMD

This study aims to identify which cell types in the eye are important for mediating the effects of the inflammasome, a protein complex identified as a likely contributor to the inflammation that promotes “wet” AMD. This will enable the researchers to selectively target these specific cell types and to develop novel pharmacologic treatments while reducing therapeutic side effects in other cell types.

www.brightfocus.org/grant/M2019184



Priyatham Mettu, MD (9/1/20 - 8/31/22)
Duke University Eye Center, Durham, NC

Evaluating a Novel Mechanism and Target for Wet AMD

This study proposes that the severe form of wet AMD is caused by inflammatory cells called macrophages and have identified a novel molecular target that controls the activity of these inflammatory cells. The purpose of this project is to better understand this molecular target and determine whether medicines that block this target could be effective novel treatments for patients with wet AMD.

www.brightfocus.org/grant/M2020168



Dorota Skowronska-Krawczyk, PhD (9/1/20 - 8/31/22)
University of California, Irvine
Co-Principal Investigator: Daniel Chao, MD, PhD
University of California, San Diego

Role of Lipids (Deposits) in Causing Dry AMD

Researchers in this study propose to characterize the role of a new protein which is involved in processing lipids, a process which has long thought to play an important role in macular degeneration. This study will explore the relationship of inflammation with this protein in creating these lipid deposits in the eye and will explore the function of this protein in human cell lines to see whether this can serve as a target for AMD.

www.brightfocus.org/grant/M2020271

Recipient of The Elizabeth Anderson Award for Macular Degeneration Research.



Ye Sun, MD, PhD
Boston Children's Hospital, MA

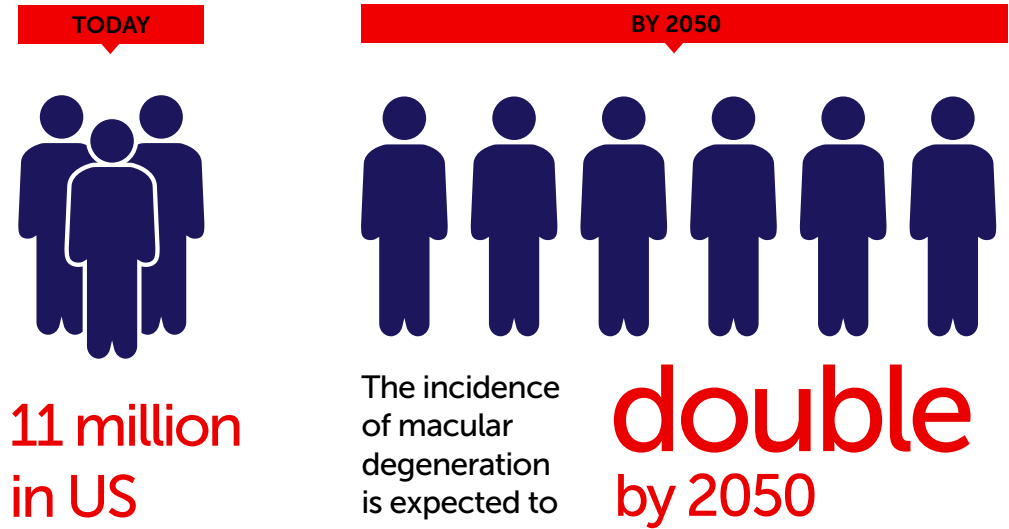
(7/1/19 – 6/30/21)

A Novel Negative Immune Regulator to Control Wet AMD

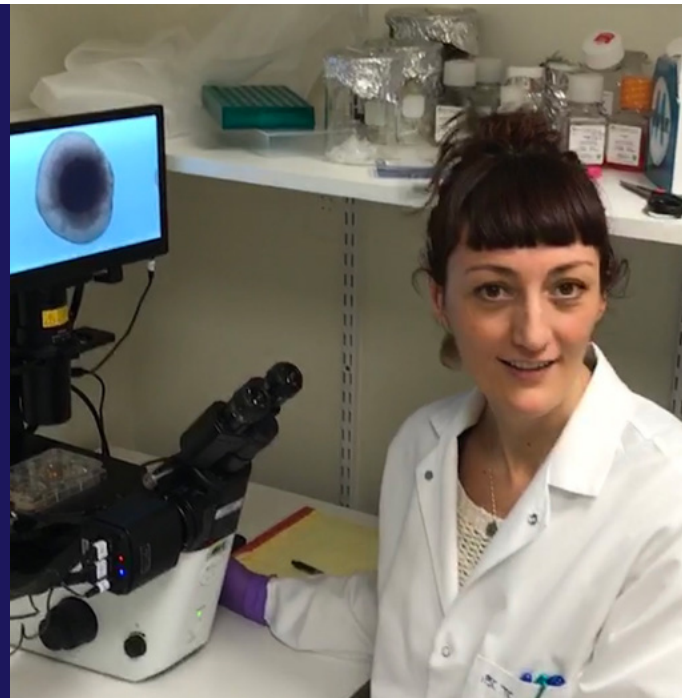
This study aims to investigate a novel negative-immune regulator that may suppress inflammation-induced abnormal vessel growth in AMD by altering the immune-vascular crosstalk. Furthermore, novel activators of this immune regulator will be evaluated in a pre-clinical animal model of AMD to determine if this treatment is effective in preventing or slowing development of AMD-like pathologies.

www.brightfocus.org/grant/M2019114

This grant is made possible by support from Dr. H. James and Carole Free.



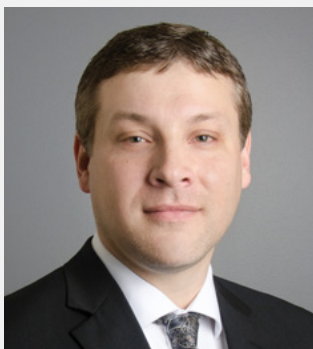
Genes and AMD



Most forms of macular degeneration are not linked to any single genetic mutation. Instead, susceptibility to age-related macular degeneration (AMD) is scattered over a number of small irregularities of genes called single nucleotide polymorphisms (SNPs). SNPs may arise spontaneously or be inherited, and their impact is tempered by other factors, such as age, overall health and nutrition, and exposure to cigarette smoke, sunlight, and other toxins. Despite their relatively indirect influence, genes

may be one way to lower the risk of AMD, if researchers can block or replace signals from genes that trigger disease, and promote the survival and integrity of the retinal pigment epithelium (RPE) cells when they encounter oxidative stress from aging and other causes.

Above: Dr. Fernandez-Godino capturing images of retina using an inverted microscope. (Courtesy of Rosario Fernandez-Godino, PhD, Massachusetts Eye and Ear and Harvard Medical School, Boston)



Michael Farkas, PhD
University of Buffalo at New York

(7/1/19 – 6/30/21)

The Role of Long Non-Coding RNAs in HTRA1 Regulation

This study aims to elucidate the role of two novel long non-coding RNAs in the regulation of HTRA1, a gene associated with high risk of developing AMD.

www.brightfocus.org/grant/M2019108



Rosario Fernandez-Godino, PhD (7/1/18 - 12/30/20)
Massachusetts Eye and Ear and Harvard Medical School, Boston

The Relationship Between Genetic Predisposition and Age in AMD

This study aims to create a cell-based model to discover the primary mechanisms activated by the combination of aging and genetic variants in complement genes in patients with early AMD. Based on the results, drugs could be designed to stop these mechanisms before they lead to major damage and complete loss of vision.

www.brightfocus.org/grant/M2018115

This grant is made possible in part by support from the Ivan Bowen Family Foundation.



Willard Freeman, PhD (9/1/20 - 8/31/22)
Oklahoma Medical Research Foundation, Oklahoma City
Co-Principal Investigator: Ana J Chucair-Elliott, PhD

Immune Cell Specific DNA Modifications and Gene Expression in AMD

Aging is the major risk factor for AMD but how aging, along with gender, lead to the development of the disease is not understood. This study will look at how DNA alterations, known as epigenetic modifications, are able to influence gene expression and retina function/acuity in specific immune cells like the microglia and Müller cells, respectively, considering age and sex as parameters.

www.brightfocus.org/grant/M2020207



Mark Kleinman, MD (7/1/18 - 6/30/21)
East Tennessee State University, Johnson City

A New Method to Regulate Gene Expression Pathways in AMD

The goal of this project is to utilize CRISPR/Cas9 gene editing to study epigenetic signatures/influences on inflammatory genes in experimental models of AMD.

www.brightfocus.org/grant/M2018193



Jurgen Naggert, PhD (9/1/20 - 8/31/22)
The Jackson Laboratory, Bar Harbor, ME

Generating Precision Model for AMD Research

This proposal aims at developing animal models that mimic human disease and allow us to determine the function of human genes that increase the risk of developing AMD. This has the potential to greatly facilitate development of new treatment strategies.

www.brightfocus.org/grant/M2020284



Philip Ruzycki, PhD (9/1/20 - 8/31/22)
Washington University in Saint Louis, MO
Co-Principal Investigator: Rajendra Apte, MD, PhD

Profiling of Immune Cell Subtypes in AMD Patients and Controls

This project seeks to understand the genetic basis of AMD. By leveraging the most innovative genomic techniques available, researchers in this study will gain insights into biomarkers for disease progression and identify novel targets for preventative therapeutics.

www.brightfocus.org/grant/M2020115

This award is made possible by support from The Ivan Bowen Family Foundation.



William Scott, PhD (7/1/18 - 12/31/20)
University of Miami, Miami, FL
Co-Principal Investigator: Margaret A. Pericak-Vance, PhD

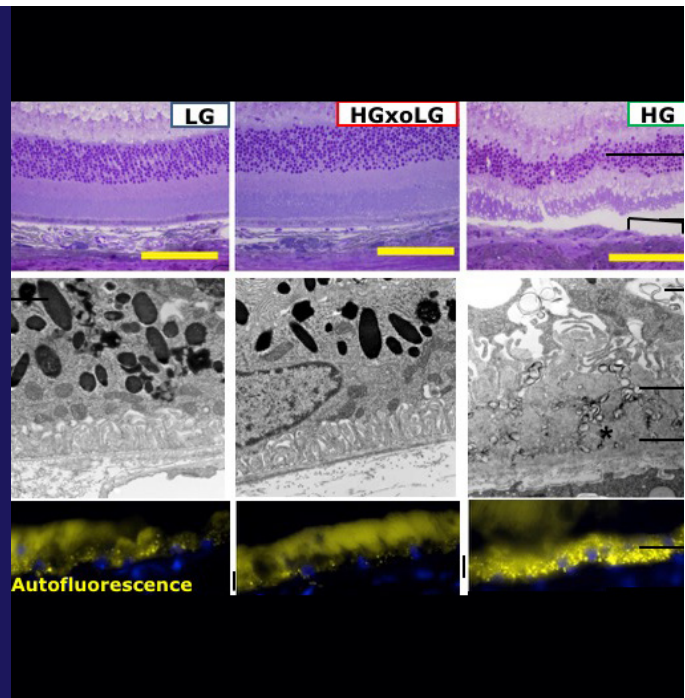
Using Genetics and Retinal Imaging to Predict Progression to Advanced AMD

The goal of this project is to identify genetic factors that influence progression of AMD from early stages, where vision loss is less severe, to late stages, where there is significant visual impairment. Identifying genetic factors that predict faster or slower progression could also provide targets for the development of potential therapies.

www.brightfocus.org/grant/M2018112

This grant is made possible by support from Dr. H. James and Carole Free.

How Diet and Nutrition Affect AMD Risk



Currently, eye vitamins that follow the AREDS2 [Age-Related Eye Disease Study 2] formula are the standard treatment aimed at preventing intermediate-stage age-related macular degeneration (AMD) from worsening to advanced AMD (dry or wet). The formula for these AREDS2 eye vitamins combines specific dosages of vitamins C and E, the carotenoids lutein and zeaxanthin, and the minerals zinc, and copper. Research is showing there may be additional ways to lower risk, given how sensitive the eye is to nutritional intake and possible deficiencies. Carotenoids (molecules that give the bright red, yellow, and orange colors to fresh produce) are vital to macular health, and there may be ways to increase the body's uptake of this important nutrient. Our diets may also influence how our body responds to disease and help shape

a healthy immune response by influencing the composition and function of the microorganisms that live within our body (aka, our gut bacteria). The hope is that all these findings may rapidly translate to current clinical practice and be incorporated into "vision-healthy" lifestyles.

Above: Sheldon Rowan's work contrasts retinal tissue in animals fed a low glycemic diet (left), a high glycemic (HG) diet (right), and transitioning from one to the other (middle). At right, the images show evidence of macular degeneration, including photoreceptor degeneration and atrophy of surrounding tissue (top row); empty vacuoles and loss of protective pigmentation (middle); and autofluorescence (yellow staining) from accumulation of lipofuscin and other waste products. (Courtesy of Sheldon Rowan, PhD, Tufts University, Boston, MA. Adapted from Rowan et al, Proc Natl Acad Sci U S A. 2017 May 30;114(22):E4472-E4481. doi: 10.1073/pnas.1702302114)



Christopher Hammond, MD, MRCP, FRCOphth (9/1/20 - 8/31/22)
King's College London, United Kingdom

Exploring the Role of Gut Bacteria in Early AMD

The gut microbiome can influence and modify the body's immune responses and may be of relevance in AMD. Therefore, the aim of this project is to explore the role of the gut microbiome in AMD which may help us better understand the disease to develop new therapies for AMD.

www.brightfocus.org/grant/M2020277



Amy Millen, PhD (9/1/20 - 8/31/22)
University of New York at Buffalo

The Gut Bacteria and AMD in Aging Women

The proposed research to study the gut bacteria as a modifiable risk factor for AMD is relevant to public health. Evidence of a protective association between certain profiles of the gut bacteria content and AMD could lead, in the long term, to easily implemented, low-cost interventions to modify the gut bacteria with diet, or highlight potential metabolic pathways for treatment, to prevent AMD.

www.brightfocus.org/grant/M2020227



Sheldon Rowan, PhD (7/1/17 - 12/30/20)
Tufts University, Boston, MA

Importance of Gut Bacteria in a Model of AMD

The goal of this proposal is to test whether the risk for developing AMD is based in part on our diet and nutrition, and relates to the composition and function of the micro-organisms that live within our guts, collectively known as the gut microbiome.

www.brightfocus.org/grant/M2017147

Recipient of The Elizabeth Anderson Award for Macular Degeneration Research.



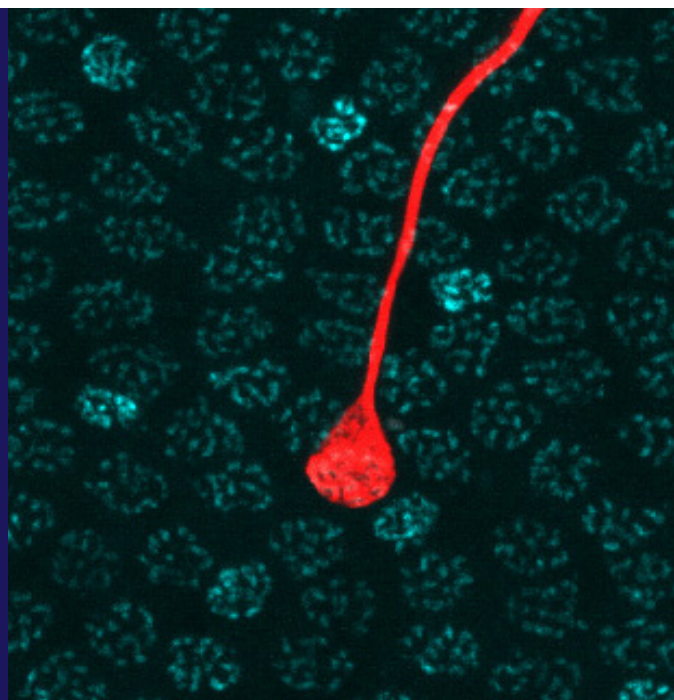
Dimitra Skondra, MD, PhD (7/1/18 - 6/30/21)
University of Chicago, Chicago, IL

Role of Diet and Gut Microbes in Macular Degeneration

The goal of this proposal is to study whether gut microbiome could be the missing link that connects lifestyle factors, like diet, and genetic risk, to the development of AMD.

www.brightfocus.org/grant/M2018042

Innovative Approaches to AMD Treatments



One day, we may be able to detect signs that age-related macular degeneration (AMD) is developing and take early steps to defend against it. Macular Degeneration Research is funding research into unique ways to protect the retinal pigment epithelium (RPE) and retina at earlier stages, before damage to sight has occurred. These include drugs that enhance immune functioning and improve the eye's ability to clear lipids/fats and other waste that might otherwise lead to inflammation in AMD.

New imaging techniques are being developed that will help us to do a better job of tracking disease progression over time. Knowledge of genetics is advancing to the point that gene therapy is being evaluated as a possibility to treat AMD.

Above: Cone photoreceptors, like the one shown in red, are responsible for high-definition central vision, the kind lost in macular degeneration. (Courtesy of Mrinalini Hoon, PhD and Raunak Sinha, PhD, University of Wisconsin-Madison)



Stephen Aller, PhD

(7/1/19 – 6/30/21)

University of Alabama at Birmingham

Co-Principal Investigator: Alecia K. Gross, PhD

The Three-Dimensional Structure of a Protein that Causes AMD

A critical part of our visual process is the recycling of a special molecule, called a chromophore, after exposure to light by a molecular pump, called ABCA4 that allows the cell to regenerate the active form of the chromophore. A misfolding and malfunction of the pump in the eye can eventually lead to blindness in patients with early-onset macular degeneration. The researchers in this study propose to determine the three-dimensional structure of the active form of ABCA4, as well as to develop a drug selection process to discover new drugs that can correct folding defects of the ABCA4 pump to restore vision.

www.brightfocus.org/grant/M2019212



Sabrina Carrella, PhD

(11/1/20 – 10/31/22)

Telethon Institute of Genetics and Medicine, FONDAZIONE TELETHON, Italy

Co-Principal Investigator: Alessia Indrieri, PhD

A New Therapeutic Strategy to Treat AMD

Researchers in this study have identified two small non-coding ribonucleic acids (RNAs), called microRNAs, that are able to control many fundamental cellular processes and whose inhibition can protect the cells in the eye from damage and rescue vision. This proposal will test the beneficial effects of the inhibition of these two microRNAs in macular degeneration models and pave the way for novel therapeutic strategy for AMD.

www.brightfocus.org/grant/M2020184



Jennifer Chao, MD, PhD

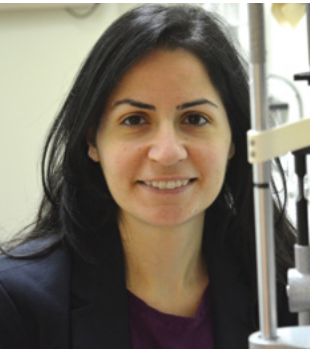
(9/1/20 - 8/31/22)

University of Washington, Seattle, WA

A Novel Method for Modeling AMD in a Dish

The goal of this proposal is to develop and study a three-dimensional model that mimics the microvascular networks and structure formed by the retinal pigmented epithelial (RPE) cells and choriocapillaris of the eye. This model will allow to study the essential elements of RPE-related diseases, such as drusen deposition, blood flow effects, and blood vessel permeability.

www.brightfocus.org/grant/M2020217



Joelle Hallak, PhD

(7/1/19 – 6/30/21)

The University of Illinois, Chicago

Co-Principal Investigators: Daniel Rubin, MS, MD and Theodore Leng, MD, FACS

Stanford University, CA

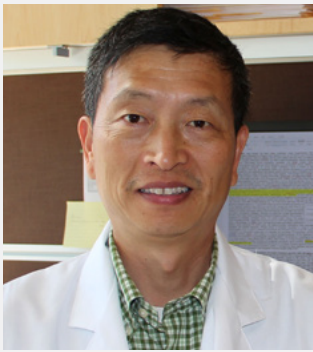
Co-Principal Investigators: Luis de Sisternes, PhD

Carl Zeiss Meditech Incorporation, San Francisco, CA

New Automated Method to Predict AMD Progression

This proposal aims to develop a tool to predict the chances of AMD progression on a personalized, patient-by-patient basis by using images of the retina, and the patient's genetic, historical, demographic and behavioral data.

www.brightfocus.org/grant/M2019155



Zongchao Han, MD, PhD (7/1/19 – 6/30/21)
The University of North Carolina at Chapel Hill

A Selective Anti-Oxidant Nanoparticle to Treat AMD

The goal of this project is to test the ability of a novel solution, generated by this team of researchers, to serve as a selective waste collector to pick up any specific free radicals (toxic waste products that gradually build up in the cells over time).

www.brightfocus.org/grant/M2019063



Raunak Sinha, PhD (7/1/19 – 6/30/21)
University of Wisconsin, Madison

Understanding the First Step in Human Vision

Our everyday visual experience -- including our ability to read this text -- is dominated by signaling in a specialized region of the eye called the fovea, which is at the very center of the macula and constitutes an exquisite "high definition" array of photosensors, called cones. This study aims to provide the first detailed insight into how the sensors in the fovea work, to be able to devise vision restoration treatments for eye diseases such as AMD that affect the fovea.

www.brightfocus.org/grant/M2019131

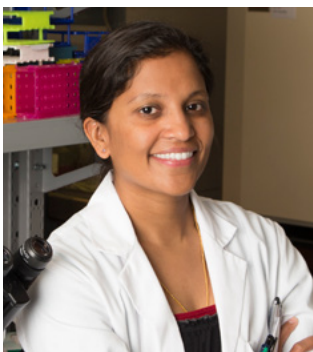


MD Imam Uddin, PhD (7/1/19 – 6/30/21)
Vanderbilt Eye Institute, Nashville, TN

A Novel Gold Nanoparticle for the Treatment of AMD

The goal of researchers in this study is to demonstrate, for the first time, how engineered gold nanoparticles can be used to treat AMD- specific genes, thereby overcoming the limitations of existing therapy. They will test this new technology for its safety, high sensitivity, and specificity in cells and in animal models of "wet" AMD

www.brightfocus.org/grant/M2019023



Elizabeth Vargis, PhD (7/1/19 – 6/30/21)
Utah State University, Logan

A New Approach to Modeling Subretinal Tissue

This team of biological engineers proposes to design a multi-layered model with human retina cells and blood vessels that realistically mimics the back of the eye. This model will be subjected to varying disease conditions to test and develop treatments that can effectively stop vision loss.

www.brightfocus.org/grant/M2019109



Shusheng Wang, PhD (9/1/20 - 8/31/22)
Tulane University, New Orleans, LA
Co-Principal Investigator: Bo Yu, PhD

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

This study aims to establish a novel gene regulation system that can turn off the VEGF gene to reduce VEGF levels in wet AMD. This gene system combines potency, tight control of VEGF, and safety and can be used to treat AMD with just one ocular injection.

www.brightfocus.org/grant/M2020166



Zhichao Wu, PhD (7/1/19 - 6/30/21)
Centre for Eye Research Australia, East Melbourne

New Visual Function Tests to Enable Treatment Trials of AMD

This project examines whether a new and better method exists to measure the eye's ability to perceive different light levels within the area where tissue loss is occurring, thus enabling better evaluation of promising new treatments.

www.brightfocus.org/grant/M2019073



Ji Yi, PhD (7/1/18 - 6/30/21)
Wilmer Eye Institute, Johns Hopkins University, Baltimore, MD

A New Imaging Method to Predict Neovascular AMD

This project proposes a non-invasive imaging technique to detect disease progression. If successful, the technique can be readily applied in clinics, and may directly impact the diagnosis and treatment of AMD patients as a way to stall disease progression and prevent blindness.

www.brightfocus.org/grant/M2018132



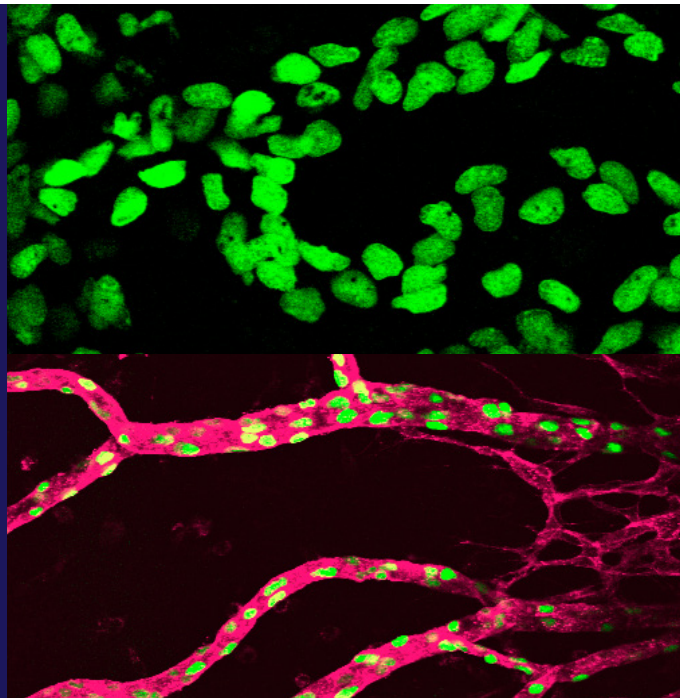
Glenn Yiu, MD, PhD (9/1/20 - 8/31/22)
University of California, Davis

Development of Gene Editing as a Permanent Cure for Wet AMD

This research proposal will address this healthcare crisis by developing a potential cure for wet AMD using a powerful gene-editing technology called "CRISPR." This innovative gene-editing system can permanently change the genes that cause wet AMD and can hopefully be used someday to save the vision of the aging population.

www.brightfocus.org/grant/M2020247

Regenerating Cells Damaged by AMD



Unlike skin and other parts of the human body, the nerve cells of the eyes do not, for the most part, regrow or regenerate after damage has occurred. However, there is hope, as work is moving forward to regenerate and reconnect the eye's retinal cells that have been damaged by age-related macular degeneration (AMD), and to restore the underlying retinal pigment epithelium (RPE) cells that provides its nourishment and support. Grantees are recreating parts of the eye using induced

pluripotent stem cell (iPSC) technology, which are stem cells created from living adult tissue. Also, cell regeneration in other animal models is being studied with the hope of glean information that may be translated to therapy.

Above: In an animal model, blood vessels of the eye are shown in red, and nearby, in green, are cells expressing a signaling molecule (Wnt) that determines cell fate. Researchers, including Dr. Poche, are looking for a way to induce eye cells to regenerate. (Courtesy of Ross Poché, PhD, Baylor College of Medicine, Houston, TX)



Mark Emerson, PhD

(9/1/20 - 8/31/22)

The City College of New York, The City University of New York

Discovery of New Methods to Regenerate Cone Photoreceptors

Cone photoreceptors are the critical light sensing sensory cells that are lost in AMD. This project will use high-resolution molecular techniques to identify the genes normally found in forming cone photoreceptors that are sufficient to turn other retinal cells into cones to develop new cone replacement therapies for AMD.

www.brightfocus.org/grant/M2020157



Ross Poché, PhD

(7/1/18 - 6/30/21)

Baylor College of Medicine, Houston, TX

Reawakening the Ability of the Damaged Retina to Regenerate and Restore Vision

The project's main goal is to determine the biological reason why the human retina normally cannot undergo self-repair, also known as tissue regeneration.

www.brightfocus.org/grant/M2018022



Karl Wahlin, PhD

(7/1/18 - 12/31/20)

University of California San Diego

Identifying Drugs that Block AMD Using Stem Cells with AMD-Associated Mutations

Using genetically engineered pluripotent stem cells harboring mutation in the complement gene, this study will develop a laboratory assay to monitor the progression of sub-RPE deposits. These cells will then be used to perform a small-molecule drug screen aimed at reducing sub-RPE deposits, which may in turn lead to new therapeutic targets for AMD.

www.brightfocus.org/grant/M2018175



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