50 1970 2020 ANNIVERSARY

DISCOVERY
THE DISCOVERY EYE FOUNDATION

The Discovery Eye Foundation supports cutting-edge research related to sight-threatening eye diseases and their treatments.

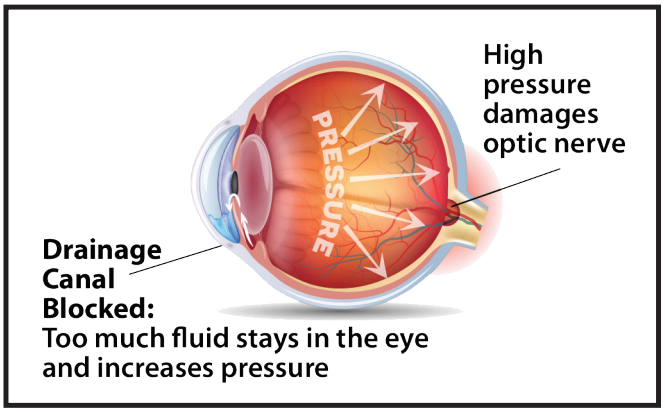
Supporting vision-saving research at the University of California, Irvine's Gavin Herbert Eye Institute since 2002.

Thanksgiving 2022

DEF Puts Pressure on Glaucoma

Those dealing with glaucoma are getting new hope, thanks to a little help from The Discovery Eye Foundation, mitochondria and age-related macular degeneration (AMD).

Glaucoma is an aging disease that affects 67 million people worldwide. The disease is caused by an imbalance between the amount of fluid that is produced in the eye (the "aqueous humor") and the amount that is drained from the eye. If there is either too much fluid produced or not enough fluid drained, then the pressure inside the eye becomes very high. When that happens, the pressure compresses the retinal ganglion cells — long nerve cells that go from the retina all the way to the brain — and damages the optic nerve, causing vision loss and blindness.



Conventional pressure-lowering treatments for glaucoma have been medication, laser treatment or surgery to correct the imbalance by either decreasing the amount of fluid that's produced or increasing the drainage. However, researchers have found that even if you keep the eye pressure low, there still can be damage to the optic nerve cells and continued loss of vision. They've also found that mitochondria play a key role in this nerve degeneration.

(continued inside)

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DEF Puts Pressure on Glaucoma

(continued from front)

"At DEF, we know a lot about mitochondria and their role in macular degeneration, which is also an aging disease," DEF Research Director Dr. Cristina Kenney says. "So we are starting a new project to apply some of the technology and techniques we've learned from other aging diseases, such as AMD, Alzheimer's and Parkinson's, to glaucoma.

"We're going to focus on the role mitochondria play in the death of nerve cells, because that's what's happening with glaucoma — the retinal ganglion cells, which are really nerve cells, have sick mitochondria and are dying. We want to know how to keep them alive. In our AMD project, we have identified drugs that target and rescue the damaged mitochondria. We're going to apply the knowledge we've gained specifically to the glaucoma field."

Above: How someone with and without glaucoma might see the same photo.

While AMD affects the cells in the outer part of the retina, and glaucoma affects the cells in the inner part, the damage is very similar at a molecular level. Kenney's research has already yielded results in treatments that can improve the health of the mitochondria and cells in the back of the eye, and she believes these treatments may improve the health of the ganglion cells in the front part of the retina — and save vision.

"Currently, there are no drugs that target the mitochondrial degeneration that's occurring with glaucoma," Kenney says. "Thanks to preliminary funding from DEF, we are looking at a whole new approach to treating the disease with a new classification of medications."

What Will Your Legacy Be?

DEF's Vision Legacy society offers an easy and meaningful way to make a vision-saving difference beyond your lifetime. Call (310) 623-4466, or visit **www.discoveryeye.planningyourlegacy.org.**

Meet the Researcher: **Jacob Dohl**

Jacob Dohl had spent his entire life in Maryland, and his move to Southern California coincided with the onset of the COVID-19 pandemic.

"I was actually a little sad, because I planned this whole big trip with my friends," Dohl says. "We were going to hit up New York, go into Canada, then come back down to Denver and do this big cross-country thing. And then that all got shot, and I just drove across the country by myself for a few days. It was still an interesting experience, but not quite what I was expecting."

Going into research wasn't what he'd expected to do either. On a "med-school track" as an undergrad majoring in biochemistry and molecular biology at University of Maryland, Baltimore County, Dohl got a job doing research at Walter Reed National Military Medical Center. He fell in love.

"I really loved coming in and figuring out something new every day and having the same projects to work on," he says. "I liked having a long-term project that I could really sink my teeth into to understand and contribute to the scientific community." He applied to both medical school and graduate school before deciding to pursue his PhD.

"I really enjoy mitochondria — they're very undervalued organelles."

"When I worked at Walter Reed, I did a lot of work looking at mitochondria," he says. "That is still my main focus. Everybody gets taught in grade school that it's the 'powerhouse of the cell.' I really enjoy mitochondria — they're very undervalued organelles, in my opinion."

With his passion for mitochondria, it's no wonder he wound up in the lab of DEF Research Director Dr. Cristina Kenney at the Gavin Herbert Eye Institute at University of California, Irvine. Kenney is one of the world's foremost mitochondrial researchers.

Dohl is studying the connection between mitochondrial function and age-related macular degeneration (AMD). He is continuing research on damaged mitochondria in AMD patients using cybrids — cell lines that contain identical nuclei but mitochondria from different individuals with AMD — to look for novel treatments for AMD.

Dohl recently received a very prestigious National Science Foundation (NSF) Graduate Research Fellowship Program award. "[The NSF] wants to see that you are not only a good scientist, but that you're a good community member and someone who can put a good face to the scientific community," he says. "I was honored they selected my application. And, since it pays for my salary for the next three years, Dr. Kenney no longer has to field that. That frees up funds for the lab to be able to do a lot of fun things."

Dohl is also the recipient of the 2022 Outstanding Research Award through the DEF Research Scholar Program, which recognizes young scientists making contributions in eye diseases, such as AMD, keratoconus and glaucoma.

He is extremely grateful to DEF donors: "If they've donated, then that's an absolutely beautiful thing. I promise to do the absolute best with whatever they've given to progress science and help anyone suffering from any eye-related illnesses. That's our No. 1 goal, and I really hope they trust that we'll be able to do great things with those donations."

Renowned Glaucoma Researcher Brings Wealth of Knowledge to DEF Project

Dr. Donald Minckler, one of the world's most well-known experts on glaucoma, grew up on a "gentleman's horse farm" in Oregon. His father was a physician, a pathologist — and a farmer.

"I was the youngest child and stationed at the back end of the horses," Minckler says. "So I moved a lot of horse manure from one place to another."

Minckler knew by the age of 3 that he "wanted to follow daddy's footstep" — not on the farm, but into medicine. He earned an MD from the University of Oregon, as well as an MS from the University of Southern California. He served as a flight surgeon in the Navy during Vietnam, at the end of which he was "convinced I never wanted to see another living person, so pathology made sense."

With two residencies, two fellowships and some 40 years in clinical practice, Minckler has published more than 200 peer-reviewed journal articles and received numerous awards and honors. "My most honorific national accomplishment was being appointed editor-in-chief of the American Academy of Ophthalmology's journal, *Ophthalmology*," Minckler says.

"Basic science is the golden process in science, because it's what lasts."

"My job on the farm moving horse manure around was perfect editor training."

He worked for some 50 years at the Doheny Eye Foundation, which is now affiliated with the University of California, Los Angeles. In the mid 2000s, he moved to the University of California, Irvine (UCI), School of Medicine, where he served as director of ophthalmic pathology until his retirement in 2020.

Retirement might be too strong a word, as he is currently serving as an adviser to DEF Research Director Dr. Cristina Kenney on her mitochondria and glaucoma project (see front page).

"People with [Dr. Kenney's] talents can actually do some really important basic science, and in my view, basic science is the golden process in science, because it's what lasts. Clinical studies — for example, 'Does this drug work better than the other drug?' — don't last very long. But basic science, like we're talking about — what's going on with mitochondria — can serve very useful purposes for a long, long period of time.

"It's a good combination to have somebody with clinical experience talking to the basic-science people. Many basic scientists don't fully understand what clinicians are dealing with or what patients are having to deal with. It's very useful to have that kind of input."

"Dr. Minckler is one of the fathers of glaucoma research, and having him as an adviser is so important," Kenney says. "The collaboration and insights he offers as a clinician and a scientist are invaluable."

When he's not working on glaucoma, Minckler is, well, working on glaucoma. He participates in many meetings via Zoom, and he is particularly looking forward to attending DEF's annual symposium, "Bench to Bedside," which concentrates on translating science into clinical use. He believes it to be "the best ongoing program UCI's Gavin Herbert Eye Institute has."