



## ARVO 2018 Annual Meeting Emerging Trends and Hot Topics

**Honolulu, Hawaii** – In their own words, First Authors at the 2018 Annual Meeting of the Association for Research in Vision and Ophthalmology explain their findings. Their abstracts were designated as some of the newest and most innovative research being conducted in various specialties and are being presented on Tuesday, May 1. To view abstracts, enter the program number or title in the "Search" field of the [Online Planner](#) or [mobile app](#).

### **Clinical/Epidemiologic Research**

3010. Mediterranean diet and incidence of advanced AMD: The EYE-RISK CONSORTIUM. 11:30am

2599. Five-year progression of newly diagnosed untreated diabetic retinopathy in a real-world setting from a large US claims database. 8:15am

Many patients with diabetes develop diabetic retinopathy (DR), a progressive eye disease associated with vision loss and blindness if left untreated. In this study, we used a large US-based insurance claims database to look at DR outcomes from more than 14,000 patients who had untreated DR. We found that approximately 25% of patients who did not have vision-threatening DR at the start of the study got worse over 5 years and developed a vision-threatening form of DR. Worsening generally occurred within about 2 years. Taken together, these findings suggest that patients should have their DR checked regularly and that treatment may be helpful to prevent DR worsening and vision loss.

3786 - C0013. Polymerase Chain Reaction (PCR) for Varicella Zoster Virus (VZV) in VZV Keratitis. 3:30pm

Inflammation of the cornea (keratitis) from Varicella Zoster Virus (VZV) is often considered to be caused by a response from the immune system rather than an active viral infection. If the keratitis were infectious as opposed to immunologic, the treatment would change from anti-inflammatory medications (steroids) to antiviral medications. We identified a significant number of patients with VZV keratitis with viral particles, which challenges the current thinking and may guide treatment and outcomes for future patients.

### **Cornea**

2575. Caspase-8 Promotes Inflammation-Induced Lymphangiogenesis and Allograft Rejection in the Cornea. 8:45am

Graft rejection remains a major hurdle in transplantation medicine. Lymphangiogenesis plays critical roles in graft rejection. In 2015, our group reported that caspase-8 mediates FOXP3 degradation and play crucial roles in regulatory T cells phenotype and function under inflammatory conditions (PNAS, 2015, 112:E3246-3254). In this study, we identified the key roles of caspase-8 and NLRP3 inflammasome in lymphangiogenesis and allograft rejection in cornea. We found an innovative mechanism that a caspase-8/NLRP3 inflammasome pathway functions as an amplification system to promote lymphangiogenesis and allograft rejection, and provide potentially preventive and therapeutic targets for graft rejection and other lymphatic disorders. Therefore, we believe that our findings will be of great interest to the readers of ARVO.

2573. In Situ Hybridization Visualizes Bacterial Clusters on Cells of the Human Conjunctival Epithelium. 8:15am

The surface of a healthy human eye is inhabited by a very small but distinctive population of bacteria. We have used sensitive microscopic methods to locate and visualize these in samples gently collected using a sterile swab. We were surprised to find nearly all of these bacteria are located in clusters that are tightly bound to individual cells. These cells may provide niches just below the surface of the eye, where small numbers of these bacteria escape the anti-microbial properties of the tear film, and are able to multiply. Such "healthy" bacteria could play an important role in regulating the eye's immune mechanisms, and in protecting it from invasion by disease-causing bacteria.

## **Glaucoma**

3498. Macular and Optic Nerve Head Vessel Density and Progressive Retinal Nerve Fiber Layer Loss in Glaucoma. 4:00pm

Assessment of optic nerve head and macula vessel density may add significant information to the evaluation of the risk of glaucoma progression and prediction of rates of disease worsening.

3024. Construction of a deep learning algorithm to automatically diagnose glaucoma using a fundus photograph. 11:30am

A deep learning algorithm to automatically diagnose glaucoma using a fundus photograph was developed.

## **Lens**

3043 - A0014. TEM analysis of  $\alpha$ A66-80 peptide-induced protein aggregates and amyloid fibrils in human and guinea pig  $\alpha$ A-crystallins. 11:15am

Age-related nuclear cataract (opacification in the center of the lens) is a major cause of blindness globally, but its mechanism of formation is not well-understood. It is believed that age-related protein fragments (peptides) in the lens nucleus can bind to intact proteins, causing them to aggregate, resulting in cataract. We studied the binding of one such peptide ( $\alpha$ A66-80 peptide, commercially obtained) to three different lens  $\alpha$ A-crystallin proteins (produced using recombinant DNA techniques), one human and two guinea pig ( $\alpha$ A and  $\alpha$ A<sup>ins</sup>), using transmission electron microscopy. The  $\alpha$ A66-80 peptide is known to be similar to  $\beta$ -amyloid protein, which is associated with Alzheimer's and Parkinson's disease. When the peptide was incubated with either guinea pig  $\alpha$ A- or  $\alpha$ A<sup>ins</sup>-crystallin for 24 hours, distinct peptide/ $\alpha$ A-crystallin amyloid fibrils were produced, but by very different

mechanisms of formation. In contrast, with human  $\alpha$ A-crystallin, the peptide induced peptide/ $\alpha$ A-crystallin linear aggregate chains, but not fibrils, despite the fact that human and guinea pig  $\alpha$ A-crystallins each contain 173 amino acids with only 8 differences in the two sequences. The results may help to explain the mechanism of formation of nuclear cataract, as well as other protein aggregation diseases such as Alzheimer's and Parkinson's.

### **Multidisciplinary Ophthalmic Imaging Group**

2842 - B0260. Projection-Resolved Optical Coherence Tomography Angiography of Retinal Plexuses in Retinitis Pigmentosa and Usher Syndrome Type 1. 8:15am

Retinal circulation is arranged in three layers. Different diseases affect these layers in different ways. Detection of these changes might help in better understanding of retinal diseases, opening the door for the development of better diagnosis and management strategies. In this study we use a novel technology to investigate the effect of retinitis pigmentosa and Usher syndrome, two inherited vision-threatening diseases, on retinal blood vessels.

2880 - B0298. Accurate visualization and quantification of choriocapillaris with swept source OCTA through averaging repeated volume scans. 8:15am

Choriocapillaris (CC) layer is hard to visualize and quantify with OCTA due the limited lateral resolution and highly scattering nature of retinal pigment epithelium layer above CC. In order to overcome such limitations and develop a reliable approach for CC visualization and quantification, we have proposed a novel approach that can co-register and average multiple repeated scans and reach to a better CC visualization, thus allowing more reliable CC quantification. With our registered CC SS-OCTA images, we developed a novel quantitative analysis for CC that includes multiple meaningful indices and showcased the quantitative differences between CC under central fovea and in peripheral regions.

### **Physiology/Pharmacology**

3479. Effect of intracranial pressure on conventional outflow facility in rats. 4:15pm

### **Retina**

3468. A novel subtype of retinal angiomatous proliferation (RAP): Cilioretinal RAP. 4:45pm

In this work we describe a case series of new subtype of retinal angiomatous proliferation (RAP) where the feeding arteriole is not retinal but choroidal. This unusual vasculature of the lesion may help us to understand the pathogenesis of RAP.

### **Retinal Cell Biology**

2598. Molecular determinants of photoreceptor pre-synapse morphogenesis. 9:45am

The nervous system, which includes the brain and retina, relies on cell-to-cell circuits to transmit information signals. In the retina, photoreceptors are the neurons that receive light signal and send it to other neurons for further processing. The two kind of photoreceptors (rods and cones) have a unique presynaptic structure that is essential for their proper function. Our study focuses on identification of genetic factors that control how this structure forms during development and determine how changes in morphology affect function.

3473. Hemodynamic shear stress in the inner choroid primes endothelium for complement damage.  
4:30pm

Blood flow imparts mechanical stresses that influence the behavior of vascular endothelial cells. Here, we measured the quantity of these forces in the choroid, and identified a novel pathogenic effect that these stresses impart. These findings may shed new insight into the role of blood flow in choroidal health and vision loss.

2594. Conditional knockout of mTORC1 in retina blocks developmental formation of the astrocyte network and retinal vasculature. 8:45am

Light is detected and vision formed in the neural retina at the very back of the eye. During eye formation in the human fetus and newborn mouse blood vessels spread to supply oxygen and nutrients to the growing retina. Recently, many studies have examined the role of a protein called mTOR in the normal growth and function of cells and organs, but almost nothing is known about the role of mTOR in retina formation and vision. mTOR exists as part of two protein complexes called mTORC1 and mTORC2. In this study we explored the role of mTORC1 function in mouse retina formation and vision. We accomplished this by deleting genes for mTOR and Raptor, a protein that is necessary for formation of mTORC1, from retinal cells in the mouse embryo. We found that lack of mTORC1 in the retina caused striking abnormalities in retinal blood vessel formation. This was associated by formation of abnormally thin retinas with less than normal numbers of neurons. The lack of mTORC1 in the retina also caused very profound loss of vision in these mice. The results show for the first time that mTORC1 plays an important role in retinal development.