Optometry Times

DIFFERENTIATING OCULAR ALLERGY
How the Essilor-Luxottica deal will affect optometry

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References:

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FEBRUARY 2017
VOL. 9, NO. 02

Ocular allergy can be broken down into acute and chronic diseases (see Table 1).

Acute diseases include:
- Seasonal allergic conjunctivitis (SAC; H10.403)
- Perennial allergic conjunctivitis (PAC; H10.403)

Chronic forms include:
- Vernal keratoconjunctivitis (VKC; H16.263)
- Atopic keratoconjunctivitis (AKC; H10.13)
- Giant papillary conjunctivitis (GPC; H10.13)

Ocular surface disease (OSD) is a commonly diagnosed condition in the general population. It is estimated that over 30 million people in the United States suffer to some extent from dry eye.1 As the U.S. population continues to age, the number of patients with dry eye also increases.

Laser vision correction outcomes continue to improve, the occasional limiting factor for the patient's success is the ocular surface. Ocular surface disease (OSD) is a commonly diagnosed condition in the general population. It is estimated that over 30 million people in the United States suffer to some extent from dry eye.1 As the U.S. population continues to age, the number of patients with dry eye also increases.

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Optometrists are speculating how the $49 billion deal between Italian frames manufacturer Luxottica and French spectacle lens manufacturer Essilor will affect optometry.

The two companies recently formed a holding company, EssilorLuxottica, that will be co-run by both groups.

What the deal means for you now

EssilorLuxottica will have a large market share in most aspects of eye care, from retail optical to managed vision care to frames to lenses to labs and more.

“Each company will remain separate and operate as independent companies,” says Optometry Times Advisory Board and Essilor Advisory Board member Jim Owen, OD, MBA, FAAO.

By Colleen E. McCarthy
Contributing Writer

How the Essilor-Luxottica deal will affect optometry

Ocular surface disease limits surgical options

Prepare your patient by assessing and treating the ocular surface

By Jim Owen, OD, MBA, FAAO

As laser vision correction outcomes continue to improve, the occasional limiting factor for the patient’s success is the ocular surface.

Ocular surface disease (OSD) is a commonly diagnosed condition in the general population. It is estimated that over 30 million people in the United States suffer to some extent from dry eye.

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See Surgical options on page 16

Differentiating ocular allergy

Understanding the condition leads to better treatment

By Len V. Koh, OD, PhD

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See Differentiating allergy on page 18

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It’s about ocular health, not sales

By Ernie Bowling, OD, FAAO
Chief Optometric Editor

The author makes us sound like a greedy bunch of SOBs because we happen to fit contact lenses. I really don’t care where my patients buy their lenses. But I do care that lenses fit properly and are healthy for patients’ eyes. That’s my job. I’m accepting responsibility for the fit. That Chrysler dealer is not accepting responsibility for your driving habits.

It all comes down to a point the author missed: ocular health. Contact lenses are medical devices. I can write it again and again. These are not commodities. You’re not buying a pair of shoes. And I, as your eye doctor, accept responsibility both clinically and legally for that fit.

So yeah, let’s start selling them out of vending machines like snacks. Might be a boon for the medical side of my practice. Patients would present with a whole host of corneal conditions, but hey, don’t worry about that. Just give them two for one, sell ‘em in the name of crony capitalism.

I recommend you read the government’s own Centers for Disease Control study on risks for contact-lens–related infections.

The study found there are about one million visits to eye doctors for keratitis or compliance problems. The patient’s own compliance is the real problem. Think that number might go up if contact lenses become unregulated?

I’m going to an extreme here. I think most patients come to trust and value the opinion of their eye doctors. When judicious clinical advice is followed, a patient can enjoy a lifetime of safe and successful contact lens wear.

Opening the door to the commoditization of contact lenses is fraught with peril, endangering the ocular health of consumers. It is obvious the author has no idea what we do. It all comes down to patient education. I give thanks to the American Optometric Association (AOA) for being out in front on this topic. Perhaps Mr. Peters should stick to cars; it’s clearly what he understands.

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It’s all about allergy this month. Start on the cover or page 10.
10 tips to surviving an insurance audit

Insurance audits can be random or can be targeted to your practice due to billing patterns that fall outside the norm. Dr. Carl Spear reveals his ten tips to survive the audit, and why it is important to have a plan in place.

OptometryTimes.com/InsAudit

5 tips to keep your exam on track

Have you ever sat in the exam room with a patient and felt like the exam had gotten away from you? Dr. Melanie Denton gives her five tips to keep your exams moving along without taking away from the patient.

OptometryTimes.com/OnTrack

TOP HEADLINES

1. Identifying common macular conditions with OCT
   OptometryTimes.com/MacularOCT

2. How to prevent no-shows in your practice
   OptometryTimes.com/NoShows

3. 6 financial challenges ODs will face in 2017
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How the Essilor-Luxottica deal will affect optometry

Continued from page 1

sory Board member John Rumpakis, OD, MBA. “But when the deal closes later this year and over the next three years, they will be taking a look at synergies where they can integrate and work together.”

Industry experts say that it will be a long time before changes will have real impact.

“These things take time—it’s like two huge ships. They can’t turn overnight,” says Dr. Rumpakis.

Optometry Times Editorial Advisory Board member Bryan Rogoff, OD, MBA, predicted big consolidation moves in 2017 in our recent story “6 financial challenges ODs will face in 2017.” He says he saw Luxottica’s cost-cutting measures over the last year and expected a deal of some sort was in the works—but he didn’t expect this.

While it evokes a lot of emotions in the eyecare community, he says the deal probably won’t mean change in day-to-day business for ODs. Due to the sheer size and breadth of the companies involved, the deal is expected to take months to finalize and full integration will likely take years.

He says EssilorLuxottica gives vision—both the industry and the subject matter—a louder voice in the role it plays globally, not only in people’s ability to see but in their ability to contribute to their families by being able to work.

“When I first heard this, it was ‘wow’ for me, too,” he says. “I’ve had more time to think about it than others have. Now, I’m imagining the possibilities.”

Examples of possibility include:

- Improving supply-chain management
- Bringing innovation to frames and lenses to improve patient experience
- Escalating engagement with premium products, programs such as Think About Your Eyes, and consumer awareness for eye exams
- “This deal does not change Essilor’s support of the independent eyecare professional,” Dr. Purcell says.

However, not all ODs think the Essilor-Luxottica deal is good for optometry.

Consolidating healthcare delivery is bad for everyone except the shareholders, says Paul Driggers, OD, in League City, TX. Consolidating takes away doctors’ abilities to make decisions based on the interests of their patients instead of corporate interests, provides patients with compromised care or limited options, and funnels too much of the chain of care through the same corporation.

“If either company had a better track record of showing a genuine interest in fostering the doctor-patient relationship,” he says, “I would be more optimistic. As it stands, each corporation is comprised of numerous entities, some with a record of circumventing optometrists in favor of foreign, online financial interests.”

Dr. Purcell says Essilor has not required Vision Source member doctors to use Essilor products, and he does not anticipate any change in policies due to the deal.

Vision Source and EyeMed

As with Essilor’s acquisition of Vision Source in 2015, optometrists worry that the new deal means that Vision Source member doctors will be required to use the company’s products.

Dr. Purcell says Essilor has not required Vision Source ODs to use Essilor products, and he does not anticipate any change in policies due to the deal.

Let’s give this a chance before we decide it’s awful or it’s great. We’re in a position we’ve not been in in the past to influence industry —Howard Purcell, OD, FAAO

IN BRIEF

Lens Ferry expands to include all modalities

PLEASANTON, CA—LensFerry S has expanded beyond daily disposable contact lenses to include all contact lens modalities, including monthly, two-week, and daily disposables from multiple manufacturers. The service launched in April 2016, focusing on daily disposable lenses, through EyeCare Prime, a subsidiary of CooperVision.

LensFerry S provides patients with automatic monthly payments and quarterly or semi-annual contact lens deliveries while maintaining a central role for the eyecare professional, according to the company. The service was developed to help practices increase annual supply sales and includes all major manufacturers’ contact lens brands.

“The subscription industry has rapidly grown to generate $5 billion in revenue annually in the U.S. Consumers are utilizing subscriptions to buy everything from makeup to razors, diapers to laundry detergent, and dinners to movies,” says Mark Lindsey, global general manager of EyeCare Prime.

“We have partnered with eyecare practices to take advantage of this growing business model by applying it to contact lenses with LensFerry S,” he says, “which enables them to retain more contact lens sales and offer contact lens wearers the convenience they have become accustomed to with other retailers.”

When patients enroll in LensFerry S, the annual cost of their contact lenses is divided into automatic monthly payments, and they receive a three- or six-month supply of lenses, depending upon modality. The prescribing eyecare practitioners’ practices receive the sales revenue as if the lenses had been paid for in-office.

LensFerry S does not force patients to switch to different contact lenses by requiring them to request only one type of contact lens product. Patients’ eyecare professionals retain fitting and prescription control and flexibility.

According to the company, early adopters of LensFerry S have reported up to a 20 percent increase in annual supply sales.

LensFerry S is available to all eyecare practices in the United States. Fees for the contact lens delivery service are $49 per month, plus $2.50 per shipment.
to the deal at this time.

“We have kept choice, including our competitors,” he says. “We have demonstrated we can do this, even going back 10 years to when Essilor bought its first labs. Look at the history. We have done what we said.”

Although Essilor and Luxottica are based in Europe, all countries in which both companies do business, including the United States, will evaluate the deal

Vision Source administrator and Optometry Times Editorial Advisory Board member Scott Schachter, OD, sees the deal as a boost to Vision Source.

“We are now part of a bigger team with more power and resources and an eye on the future in a rapidly evolving marketplace,” he says. “In the eyecare world of 2017, I believe it is more important than ever to be part of a team invested in your success.”

Regarding EyeMed, Dr. Purcell says he recognizes that the area of managed care is an emotional one for eyecare providers—but it’s just too early in the deal to give any specifics.

While he says he can’t promise the company will be able to address everything ODs don’t like about EyeMed, Dr. Purcell says that Essilor now has a say and will use the opportunity to voice its customers’ opinions.

“We have a voice now we didn’t have before,” he says. “The holding company has created a board and [Essilor] is equal in terms of its voting rights. So we have an equal voice in trying to influence things that people liked as well as didn’t like.”

Looking ahead

Dr. Rumpakis says he believes the deal will ultimately be a good thing for independent practitioners and will help to give them a voice.

Dr. Purcell agrees.

Historically, Luxottica has had no reason to care about the independent OD—and in some ways, it has competed against them. But now, the company has chosen to invest in the independent and give that demographic a voice, he says.

Currently Essilor consults with an OD advisory panel to gain insight into the community. Now, EssilorLuxottica will form a new, larger advisory committee featuring not just ODs but also opticians and ophthalmologists.

Ultimately, Dr. Purcell asks that the eyecare community give the company a chance to prove itself before it jumps to any conclusions. Although he is nervous, he says his optimism about the deal outweighs the nerves.

“Let’s give this a chance before we decide it’s awful or it’s great. We’re in a position we’ve not been in in the past to influence industry,” says Dr. Purcell. “I hope my optometry colleagues will feel the same and that they’ll share their thoughts and concerns so we can be aware of their sentiments.”

Deal regulation

Given the large role Essilor and Luxottica play in their respective industry sectors, ODs have questioned if the formation of the new company may violate antitrust or monopoly laws.

Although both companies are based in Europe, Dr. Purcell says that all countries in which Essilor and Luxottica do business, including the United States, will evaluate this deal.

“When you really look, there’s very little overlap between the two companies of what businesses we play in,” he says. “You could argue that there’s a small overlap in frames. If you look at the rest of our businesses, there’s almost no overlap, so it doesn’t necessarily increase market share in particular categories. Our counsel believes we’re in a good position, but it will be determined over time.”

Powerhouses combine

In its announcement, EssilorLuxottica said it will have more than 140,000 combined employees and sales in more than 150 countries. Based on the companies’ 2015 results, the new company would have posted a combined net revenue of nearly $16 billion. The company expects to have $424 million to $636 million in cost synergies after the deal is completed.

In addition to being leaders in the lens and frame markets, respectively, each company also owns a variety of other big eyecare players.

Some Essilor brands and subsidiaries include:

- Vision Source
- Transitions
- Costa
- Kodak Lens
- Professional Eyecare Resource Co-Operative (PERC)

Some Luxottica brands and subsidiaries include:

- EyeMed
- LensCrafters
- Pearle Vision
- Sunglass Hut
- Target Optical
- Sears Optical
- Glasses.com

According to The New York Times, the deal brings together two of the industry’s largest players, with Luxottica having 14 percent market share and Essilor having 13 percent share. For comparison, the next largest player in the industry is Johnson & Johnson with a 3.9 percent share.
Hackathon series puts focus on digital eye care

Innovative technologies improve patient outcomes and educate ODs, students

How do we move from the 21-point eye exam to 21st century digital eye care? Since the start of the 21st century, technology has revolutionized how we care for our glaucoma, retina, contact lens, low vision, and refractive surgery patients. However, the primary-care eye exam has remained relatively unchanged.

We have certainly taken excellent care of our patients for many years, but what does this status quo have to do with patient outcomes or a reliance on our own comfort levels?

There has been a revolution in higher education over the last decade transitioning to digital learning and away from linear, analog learning processes.

Evolution of digital thinking

Digital thinking, augmented/virtual reality, and non-traditional methods of teaching have certainly not replaced standard teaching methods, but they have found important niches—and have grown exponentially.

The optometric profession seems to have a fascination with ocular disease. Some have long argued that we no longer place enough emphasis on refraction and binocular vision.

The more widespread use of medical imaging and digital eye care should allow us to not only be more efficient but also obtain more accurate objective findings yielding improved patient outcomes.

Only then would optometrists be able to spend more time on binocular vision and other visual anomalies when appropriate.

On May 6 and November 18, 2016, approximately 50 people (including State University of New York [SUNY] College of Optometry faculty, residents, students, alumni, researchers, other optometrists, industry experts, and other professionals) participated in the first two SUNY New Technologies Unit Hackathons.

Hackathon provides chance to learn

The SUNY Hackathon Series aims to create new models of patient care, education, and communication with the goal of improving patient outcomes.

Hackathons are digital-era tools designed to connect participants, both in person and digitally, for the purpose of breaking down existing processes into discrete new units and rebuilding them from the ground up.

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By Thomas A. Wong, OD

Hackathons are designed to connect participants for the purpose of breaking down existing processes into discrete and new units and rebuilding them from the ground up.

The term “hacking” refers to taking something apart and rebuilding it to make it better, give it a new function, or do something surprising and disruptive.

A “hackathon” is an event in which participants “hack” on a problem or focus area for an allotted period of time with the goal of building or creating a solution (via a product, service, tool, etc.).

Hackathons look to identify opportunities by understanding the user’s experience.

The events start with an overview presentation and end with a series of short presentations that are judged on several categories, e.g., innovation, ability to be implemented, and quality of the presentation.

The first hackathon’s goal was to design the “Future Eye Exam.” Participant groups were given the task of creating a six-minute presentation to the National Eye Institute on how eye examinations should be conducted.

The second hackathon centered on “The Future of Optometric Education.” Participant groups were asked to design a mobile app to be used for optometric student/intern and resident education, optometric continuing education, and optometric board certification review.

Hackathon II utilized zoom videoconferencing cloud meeting technology allowing both the University of Waterloo and Western University to participate.

Both Western and Waterloo Universities are intellectual partners in designing and implementing the mobile app for optometric education—scheduled to be unveiled at the American Optometric Association’s (AOA) Optometry’s Meeting in June 2017.

The third hackathon will be held in June 2017 in Washington, DC, during the American Optometric Association Optometry’s Meeting.

This third event—and last of the Hackathon Series—will be an inter-professional hackathon in collaboration with the nursing profession. The goal will be to create new models of patient education to communicate the importance of vision in the learning process with patients, parents, and families.

Results of Hackathons I and II

After analysis of Hackathon I on the Future Eye Exam, common themes were found:

- Integrated patient portal
- Use of wavefront aberrometry for refraction and diagnostic testing
- Wide-angle fundus photography and similar convergent technologies as screening procedures
- Automated visual acuity (VA) technology with contrast sensitivity and real-
world simulations
- Virtual and augmented reality simulations
- Delegation of data collection to technicians—Os to perform data interpretation
- Use of cloud-based services for biomedical informatics

Many of the above themes are already in wide use—and how eye examinations evolve is a complex process that is ongoing.

Mobile app designs from Hackathon II on the Future of Optometric Education are currently being developed by a team from SUNY, Western University, and the University of Waterloo.

SUNY’s Hackathon Series has been modelled after Georgetown University’s hackathon, Designing the Future University from the Inside. Also, organizational concepts were derived from Stanford University’s Collaborative Stanford-Centered Hackathon Experience, and MIT’s Hacking Medicine Series. Prior to each hackathon, participants were sent TEDx videos to watch on innovation, creativity, and new concepts in education. Hackathon participants were encouraged to move away from linear, analog thinking that has been the basis of education to digital learning processes that are important for success.

Optometry needs to evolve digitally
Digital learning processes are important to optimally utilize new technologies in medicine and eye care. We now live in a connected world without boundaries. Mobile health applications have been at the center of medical education for well over a decade.

For our optometric profession to advance and fulfill its critical role in the delivery of health care, we need to utilize innovative technologies to improve patient outcomes and educate optometrists, optometric faculty, residents, and students.

The ability to utilize innovative technology to enhance inter-professional relationships and integrate culturally competent care is essential to improving patient outcomes.

A ‘hackathon’ is an event in which participants ‘hack’ on a problem to build or create a solution

Dr. Wong is a Diplomate of the American Board of Optometry and a member of the AOA Ethics committee and ASBO Ethics SIG. He is a past president of the Maryland Optometric Association, and an appointee to the American Medical Association’s Physician’s Consortium for Performance Improvement-PCPI’s Technical Advisory Panel for Eye Care Metrics. He lectures on the topics of medical ethics, technology and innovations in eye care, ocular disease, mobile health apps, and contact lenses.

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If you don’t have the MiBo you’re NOT TREATING DRY EYE
How to combat vernal keratoconjunctivitis

Understanding historical background, stepwise approach key to treatment

How do you tell a parent her child will have to “power through” the next decade of life with a condition that will cause blepharospasm, discomfort, and mucous discharge upon awakening?1

It is a precarious position considering the desire to find the perfect remedy—yet with vernal keratoconjunctivitis (VKC), there is no magic bullet.

I was taught in my early years of training to research an enigmatic disease state and to pivot to where you can to succeed in treating the condition. I have learned that VKC can be treated effectively with a stepladder strategy by understanding the historical background and pathophysiology.

What history tells us

The first known description in the literature of VKC came from Arlt in 1846 where he reported the limbal findings representing the “pavement-like granulations” of the conjunctiva which has become one of the hallmark signs of this inflammatory/immunological disease state.2

These doyens of ophthalmology, along with many others, classified at different times the condition as spring catarrh, phlyctenula pallida, circumcorneal hypertrophy, recurrent vegetative conjunctiva, verrucosa conjunctiva, and aestivale conjunctiva, calling attention to the various aspects of this disease.3 Even though these authors accepted VKC as an allergic entity, there were and still are many gaps in the knowledge of the etiology and pathophysiology.

The groundwork was laid to pursue more research in immunology. This was done to discern whether this disease state had deeper implications than a mere Type 1 hypersensitivity reaction.

Pathophysiology

With a breadth of cytological, immunohistological, and molecular biological studies peering at the multifaceted nature of VKC, this persistent and severe form of ocular allergy is now classified as both IgE and non-IgE mediated hypersensitivity.4,5

Supporting the IgE front are the abundance of CD4+ T helper cell type 2 (Th2) lymphocytes and expression of costimulatory molecules in the conjunctiva. This facilitates the release of multiple cytokines and chemokines onto the ocular surface, inducing local production of IgE and subsequent mast cell degranulation.5

These overexpressed cell types lead to a paucity of Th1 cytokines in the tears and serum, causing perpetual eosinophilic late phase action (Type IV hypersensitiv-

The most common and most severe cases present are from hot, arid environments such as the Mediterranean basin, West Africa, and the Indian subcontinent.7

Epidemiology and intervention

As with many conditions, subtypes can make some treatment decisions easier to discern based on severity. VKC can be broken down into conjunctival, limbal, and a mixed reaction with a male gender preference along with an age range of 1 to 22 years (mean 6 ±3.7 years).8,9

The most common and most severe cases present from hot, arid environments such as the Mediterranean basin, West Africa, and the Indian subcontinent. Patients showing signs of VKC in my clinic and others range from European, Hispanic, South American, and Asian descent.1,12,13

Conjunctival signs of micropapillae without corneal involvement are easily managed with chronic daily antihistamines exhibiting mast-cell stabilizing properties. These are commercially available as generic olopatadine 0.1%, Pazeo (olopatadine 0.7%, Alcon), Bepreve (bepotastine, Bausch + Lomb), and Lastacaft (alcaftadine, Allergan).

These agents in varying degrees competitively and reversibly block histamine receptors in the conjunctiva and lids. This inhibits the actions of the primary mast-cell–derived mediator, helping to reduce the late phase of the allergic response. In combination with mast-cell stabilizers, these agents inhibit mast-cell degranulation by limiting the release of histamine, tryptase, and prostaglandin D2 (PGD2).14,15

A word of advice: To avoid a headache, do not use either an antihistamine or a mast-cell stabilizer as isolated units. They may be unsuccessful—leading to a delay in appropriate treatment.

Signs and therapy

When there are giant papillary signs consistent with an environmental burden.2,5

Specific IgE are identified in only 50 percent of patients, corroborating the concept that non-IgE-mediated activation pathways are present. Not all cases illustrate a positive response to skin tests for common allergens or flare-ups consistent with an environmental burden.2,5

The presence of a smorgasbord of pro-inflammatory cell types and mediators in the conjunctiva, tears, and serum of VKC patients lends credence to the potential complex interaction of the immune, endocrine, and nervous systems.8,10

Signs and therapy

When there are giant papillary signs cou-
Kind of a

BIIG DEAL

The first prescription eye drop FDA-approved to treat both the signs and symptoms of Dry Eye Disease

Xiidra is a lymphocyte function-associated antigen-1 (LFA-1) antagonist, the first medication in a new class of drugs.¹

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Indication
Xiidra® (lifitegrast ophthalmic solution) 5% is indicated for the treatment of signs and symptoms of dry eye disease (DED).

Important Safety Information
In clinical trials, the most common adverse reactions reported in 5-25% of patients were instillation site irritation, dysgeusia and reduced visual acuity. Other adverse reactions reported in 1% to 5% of the patients were blurred vision, conjunctival hyperemia, eye irritation, headache, increased lacrimation, eye discharge, eye discomfort, eye pruritus and sinusitis.

To avoid the potential for eye injury or contamination of the solution, patients should not touch the tip of the single-use container to their eye or to any surface.

Contact lenses should be removed prior to the administration of Xiidra and may be reinserted 15 minutes following administration.

Safety and efficacy in pediatric patients below the age of 17 years have not been established.

Please see the adjacent page for Brief Summary of Safety Information and visit Xiidra-ECP.com for Full Prescribing Information.
BRIEF SUMMARY: Consult the Full Prescribing Information for complete product information.

INDICATIONS AND USAGE
Xiidra® (lifitegrast ophthalmic solution) 5% is indicated for the treatment of the signs and symptoms of dry eye disease (DED).

DOSAGE AND ADMINISTRATION
Instill one drop of Xiidra twice daily (approximately 12 hours apart) into each eye using a single use container. Discard the single use container immediately after using in each eye. Contact lenses should be removed prior to the administration of Xiidra and may be reinserted 15 minutes following administration.

ADVERSE REACTIONS
Clinical Trials Experience
Because clinical studies are conducted under widely varying conditions, adverse reaction rates observed in clinical studies of a drug cannot be directly compared to rates in the clinical trials of another drug and may not reflect the rates observed in practice. In five clinical studies of dry eye disease conducted with lifitegrast ophthalmic solution, 1401 patients received at least 1 dose of lifitegrast (1287 of which received lifitegrast 5%). The majority of patients (84%) had ≤3 months of treatment exposure. 170 patients were exposed to lifitegrast for approximately 12 months. The majority of the treated patients were female (79%). The most common adverse reactions reported in 5-25% of patients were instillation site irritation, dysgeusia and reduced visual acuity. Other adverse reactions reported in 1% to 5% of the patients were blurred vision, conjunctival hyperemia, eye irritation, headache, increased lacrimation, eye discharge, eye discomfort, eye pruritus and sinusitis.

USE IN SPECIFIC POPULATIONS
Pregnancy
There are no available data on Xiidra use in pregnant women to inform any drug associated risks. Intravenous (IV) administration of lifitegrast to pregnant rats, from pre-mating through gestation day 17, did not produce teratogenicity at clinically relevant systemic exposures. Intravenous administration of lifitegrast to pregnant rabbits during organogenesis produced an increased incidence of omphalocoele at the lowest dose tested, 3 mg/kg/day (400-fold the human plasma exposure at the recommended human ophthalmic dose [RHOD], based on the area under the curve [AUC] level). Since human systemic exposure to lifitegrast following ocular administration of Xiidra at the RHOD is low, the applicability of animal findings to the risk of Xiidra use in humans during pregnancy is unclear.

Animal Data
Lifitegrast administered daily by intravenous (IV) injection to rats, from pre-mating through gestation day 17, caused an increase in mean preimplantation loss and an increased incidence of several minor skeletal anomalies at 30 mg /kg /day, representing 5,400-fold the human plasma exposure at the RHOD of Xiidra, based on AUC. No teratogenicity was observed in the rat at 10 mg /kg /day (460-fold the human plasma exposure at the RHOD, based on AUC). In the rabbit, an increased incidence of omphalocoele was observed at the lowest dose tested, 3 mg /kg /day (400-fold the human plasma exposure at the RHOD, based on AUC), when administered by IV injection daily from gestation days 7 through 19. A fetal No Observed Adverse Effect Level (NOAEL) was not identified in the rabbit.

Lactation
There are no data on the presence of lifitegrast in human milk, the effects on the breastfed infant, or the effects on milk production. However, systemic exposure to lifitegrast from ocular administration is low. The developmental and health benefits of breastfeeding should be considered, along with the mother’s clinical need for Xiidra and any potential adverse effects on the breastfed child from Xiidra.

Pediatric Use
Safety and efficacy in pediatric patients below the age of 17 years have not been established.

Geriatric Use
No overall differences in safety or effectiveness have been observed between elderly and younger adult patients.

NONCLINICAL TOXICOLOGY
Carcinogenesis, Mutagenesis, Impairment of Fertility
Carcinogenesis: Animal studies have not been conducted to determine the carcinogenic potential of lifitegrast. Mutagenesis: Lifitegrast was not mutagenic in the in vitro Ames assay. Lifitegrast was not clastogenic in the in vivo mouse micronucleus assay. In an in vitro chromosomal aberration assay using mammalian cells (Chinese hamster ovary cells), lifitegrast was positive at the highest concentration tested, without metabolic activation. Impairment of fertility: Lifitegrast administered at intravenous (IV) doses of up to 30 mg/kg/day (5400-fold the human plasma exposure at the recommended human ophthalmic dose [RHOD]) of lifitegrast ophthalmic solution, 5% had no effect on fertility and reproductive performance in male and female treated rats.

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US Patents: 8367701; 9353088; 7314938; 7745460; 7790743; 7928122; 9216174; 8168655; 8084047; 8592450; 9085553; 8927574; 9447077; 9353088 and pending patent applications.
Last Modified: 12/2016 S26218
Tacrolimus has been studied in a randomized, placebo-controlled clinical trial with a 0.1% suspension in 56 patients with VKC/AKC refractory to conventional treatment. The results showed that tacrolimus caused improvement in objective signs and was well tolerated by patients. It is important to discuss with patients and document the conversation that these agents are all off-label for this condition and pediatric population.

**Final future thoughts**

There are more chemical entities on the horizon in known classes such as humanized monoclonal antibodies or kinase inhibitors (Syk/JAK) to undiscovered entities. Consequently, there is no need to share tough love with a parent regarding the successful management of her child’s VKC.

**REFERENCES**


Dr. Cooper is a consultant to Allergan, BioTissue, Johnson & Johnson Vision Care, Alcon Surgical, Valeant/Bausch + Lomb, TearLab, Epocrates and has received past honoraria from Alcon Vision Care and Infantive Health.

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**TABLE 1  Allergy signs, symptoms, and treatments**

| Cool compresses and sterile saline rinses | – Mild itch  |
| Mast-cell stabilizers and antihistamines | – Burn |
| Topical corticosteroids | – Watering |
| Immunomodulating agents | – Micropapillary reaction |
| Surgical intervention | – No corneal involvement |
| | – Macropapillary reaction (cobblestone) |
| | – Mucous accumulation |
| | – Corneal neovascularization |
| | – Macropapillary reaction (cobblestone) |
| | – Maerogenesis (corneal) |
| | – Shield ulcers |
| | – Horner-Trantas dots |
| | – Corneal plaque |
| | – Refractory giant papillae (sessile) |
OD education must keep up with industry changes

Optometry must evolve independently within the healthcare landscape

In Malcolm Gladwell’s classic book The Tipping Point, we are reminded that critical events bring about outside change. We are at that point in optometry: poised for momentous professional responsibility and growth. This transformation is due to the convergence of science, technology, economics, communication—and resulting patient needs and expectations.

At this moment, optometric leaders are seemingly wedged between fighting against online refractions and spectacles and fighting for “follow the money/ophthalmologic care.”

Yet, both directions fail miserably at delivering enhanced quality of care to the patient—beyond expediency and treatment of acute emergencies, infections, and surgery.

As Internet-savvy consumers demand more and as unscrupulous insurance executives bottom feed for simple refractions, academics within our colleges of optometry continue to dismiss discussion of wellness, prevention, and environmental optometry as irrelevant. As multiple stressors bear down on our profession for more than the medical “detect and treat” model, the ivory tower has no choice but to teach students what consumers demand.

Thinking inside out

The 2016 American Academy of Optometry Nutrition, Disease Prevention, and Wellness Special Interest Group (held in Anaheim, CA, on November 10, 2016) provided a glimpse of the hidden world of the gastrointestinal system.

The microbiome, a 10-trillion-cell civilization of microbes lives within each of us, impacting our inflammatory, cardiovascular, and neurologic systems that affect eye health and function. Caring for the patient now means caring about his gut health and factors that can disrupt it. Factors such as systemic antibiotics, modern farming practices, sugar, gluten, environmental toxins, and GMOs must be discussed with this in mind.

Photobiology

Modern living has become an indoor phenomenon as humans have moved from full-spectrum outdoor living to incandescent lighting—and further toward modern highly energetic blue light-emitting diode (LED) exposure. Indeed, myopia prevention is correlated with the opposite: outdoor living. The shift to (unnatural) blue LED lighting is poised to become a $42.5-billion industry by the year 2020.

Yet ODs require remedial training on the benefits of sunlight for vitamin D production, overemphasis of sunblock, maintenance of the circadian rhythm, mitochondrial benefit of near infrared light, color temperature adjustment on televisions, color index, blue light protection, and smartphone-induced pediatric dry eye.

Consumers are looking for actionable advice about which light bulbs to purchase, what tints to use, how to adjust their television color temperature, how to reduce blue light at night emanating from electronic screens, color choice for night lights, and which carotenoids to consume.

This isn’t your grandfathers’ patient-optometrist encounter.

Vitamin D3 testing is important at any age—particularly for housebound elderly patients with age-related macular degeneration (AMD) living in northern, sun-deprived latitudes.

Serum 25-hydroxyvitamin D liver-reseve status is associated with retinal pigment epithelium (RPE) disease, AMD neovascularization, and the geographic extent of post-bleed retinal AMD fibrotic damage—and all chronic diseases.

Think insulin resistance

Insulin resistance (IR), short of diabetes mellitus, is an epidemic and the universal foundation of poor health.

IR has an immense contribution to cardiovascular diseases and negatively impacts retinal vessel health early on. Kerry Gelb, OD, and I have shown that multispectral imaging of the retina strongly correlates with pre-diabetic insulin resistance.

IR responds to a host of interventions, such as exercise, mineral/nutrient/vitamin D repletion, elimination of toxins such as BPA, healthy microbiome, intermittent fasting, far infrared saunas, sleep quality, circadian rhythm health, and more.

Presbyopic adults with pre-diabetes and needing reading eyeglasses are certainly a vulnerable sub-population of patients who present periodically in their 40s and 50s to the same optometrist.

As mentioned in my June commentary (“Insulin resistance is more important than you think”), many Americans have become sedentary “screen huggers,” stress-induced overeaters, sweetened-beverage and processed-food consumers, poor quality-manufactured/restaurant-food aficionados, and multiple-pharmaceutical takers that further reduce the nutrients needed to process banquets of ubiquitous sugar and protein.

How long is academic optometry going to ignore these facts and merely address ophthalmologic end-stage disease?

Here is an opportunity for the OD to perform primary care and not just talk about it. Why not become a pre-diabetes, diabetes educator and certified nutrition specialist, helping to reduce this public health burden? How long are colleges of optometry going focus on detection rather than prevention?

Brain health plays role

Brain health is intimately related to ocular health and vice versa.

Reading, visual-spatial perception, sacadic eye movements, hyperacuity perimetry, useful field of vision (UFOV) deficits, as well as contrast sensitivity loss are a handful of abnormalities encountered in early Alzheimer’s disease.
The pupil’s response to mydriatics, the presence of thinning skin, thinning corneas, thinning superior optic nerve fiber layer, peripheral lenticular amyloid beta protein, and apoptotic cells in the retina, are important objective clues to declining brain function.8,9

Particularly exciting is the discovery of dietary ocular carotenoids (lutein and zeaxanthin) as the dominant carotenoids of the brain as well as the retina. With a simple macular pigment optical density (MPOD) measurement, the OD is informed about the functional health of both the eye and brain.10

That is, MPOD is related to cognitive function. It is not unusual to attend a CE event where few ODs know the numerical value of their own MPOD.

REFERENCES
Ocular surface disease limits surgical options

Continued from page 1

In 2016, OSD became the most common complication of laser vision correction. The incidence peaks at one week, and up to 48 percent of patients still have some dry eye symptoms at three months.

Also, dry eye symptoms and irritation associated with contact lens wear is one of the most common reasons why patients elect laser vision correction.

This means diagnosing and treating dry eye in the management of refractive surgery patients and identifying those patients at risk prior to surgery is important. From history there are many factors that identify at risk patients.

Treatment, diagnostics continue to evolve

Female patients have an increased risk of dry eye in the general population and an increased risk of dry eye after laser-assisted in situ keratoileusis (LASIK) surgery.

Research found females to be 32 percent more likely to have dry eye symptoms after surgery. Hyperopes are also more likely to have dry eye symptoms. While hyperopic treatments remove a larger amount of tissue—albeit in the periphery of the cornea—it is believed that more corneal nerves are damaged, leading to the increase in dry eye.

It was also reported that there is not an increase in dry eye as corneas get steeper in hyperopic treatment.

There is an increased risk of dry eye in treatments for patients over -6.00 D. Asians and patients who are on medicines that may dry the eyes are at an increased risk of post-operative dry eye as well.

Diagnosing patients with ocular surface disease continues to evolve as we learn more about the tear film and its in-office test that detects MMP-9, an inflammatory marker that is consistently elevated in the tears of patients with dry eye disease. MMP-9 may be associated with poor epithelial healing, epithelial ingrowth, and corneal ulceration after refractive surgery. Testing MMP-9 levels prior to surgery may help guide treatment if inflammation is detected and look for other causes of symptoms of it is normal. For example, in patients with anterior basement membrane dystrophy (ABMD) and conjunctival chalasis MMP-9 levels are likely to be normal.

Meibomian gland health also plays role

Meibomian gland disease (MGD) has been found to be a leading cause of ocular surface disease. Meibomian gland expressability is a simple yet effective diagnostic test to determine the functionality of the glands. Evaluating the meibum expressed from the gland is clinically significant and relates to its free fatty acid (FFA) composition. The Nichols grading system identifies meibum as either clear, cloudy, yellow, or absent. Grading the meibomian glands may correlate to meibomian gland loss as well as tear break-up time (TBUT) and corneal staining.

Lipid layer thickness can be objectively measured with interferometry and may be thinner in patients with obstructive meibomian gland disease.

Meibomian gland disease plays a larger role in ocular surface disease than previously understood. Today there are diagnostic devices that allow the clinician to image and as show the patient the damage to those glands.

It is not completely understood if or how atrophied glands can be revived. It may be that a significant loss of meibomian glands leads to dry eye symptoms. The lower glands seem to have a greater impact and along the lower lid the nasal glands may have the greatest impact.

Blink rate major factor

Why meibomian glands become damaged is not completely known, but it appears to be related to inflammation and blink rate. Blinking is the mechanism that causes the release of meibum into
the tear layer.1

Today, we spend more time exposed to digital devices such as phones, tablets, and computer monitors, which all lead to a lower blink rate and poorer quality of blink.10

Observing a patient’s blink rate and pattern can identify which patients are at greater risk for damaged meibomian glands. It is not uncommon to observe patients and only every fourth or fifth blink is a complete blink. This leaves the cornea exposed and as important the meibum not expressed from the gland.

Meimography is an imaging technology that allows the clinician to evaluate a digital image of the meibomian glands. The clinician is able to identify distorted, truncated, or atrophied glands. While a patient can be sign and symptom-free with a minimal number of functioning glands, there appears to be a correlation between functioning glands and ocular surface disease—functioning glands on the lower lid are more important than upper lid glands.11

A patient with fewer glands may require more aggressive treatment. Patient qualification is key

Using an objective and consistent method of qualifying and quantifying patients’ symptoms prior to surgery is valuable. Several validated dry eye questionnaires provide useful information.

The Ocular Surface Disease Index (OSDI) is a 12-question survey to evaluate the symptoms of dry eye disease and how they affect the quality of vision. The Standard Patient Evaluate of Eye Dryness (SPEED) survey is eight questions aimed at identifying the frequency and severity of dry eye symptoms.12

A number from one of these questionnaires can aid the doctor in categorizing the patient. It can also help identify if and where there is a disconnect between signs and symptoms of the disease. While staining, tear break-up time and Zone Quick are still used in the diagnosis of ocular surface disease, we now have an array of new tests that help refine both the diagnosis and treatment.

It is easier to explain to a patient prior to surgery why he is at greater risk of dry eye then trying to solve that riddle after.●

REFERENCES

Dr. Owen has served as the president of the Optometric Cornea, Cataract and Refractive Society (OOCR) and sits on its board of directors. He participates in clinical research and lectures on laser vision correction, cataract surgery, dry eye, and contact lenses. encinitasod@gmail.com
Differentiating ocular allergy

Continued from page 1

H10.413)

Although acute allergic conditions may present with severe signs and symptoms, they are milder and easier to manage because they are more responsive to therapy.

Chronic allergic diseases tend to associate with confounding atopic predisposition, and they require more regimented therapy and closer monitoring. Remodeling of the ocular surface tissues can lead to irreversible cornea damage and vision loss in chronic cases.1

Allergic conjunctivitis (AC) is a very common ocular disease that affects more than one third of the U.S. population. It can occur in isolation but is more often associated with allergic rhinitis. 2,3 The prevalence of ocular symptoms increased 3.3-fold in the U.S from 1980 to 1984.4

In a recent study, 187 consecutive patients using standard questions relating to red, itchy, and watery eyes. Almost all (95 percent) of the patients had positive symptoms of AC.5

It may not be surprising that AC is so highly linked to allergic rhinitis because the ocular surface, including the conjunctiva, can be viewed as an upper end of the respiratory system. It consists of an area of several hundred square millimeters where allergens can enter and drain into the nose through the nasolacrimal duct. This pathway also explains the effectiveness of ocular allergy medication in alleviating allergic nasal symptoms.6

Incidence of AC is likely under-reported because many patients are merely diagnosed with allergic rhinitis; thus, many patients with AC may be undiagnosed and untreated.

We can play a proactive role in asking our patients about allergic rhinitis and AC symptoms of red, itchy, puffy, and watery eyes.

Operationally, a total ocular symptom score (TOSS) questionnaire can be implemented as part of the prefilled intake forms, similar to ocular surface disease index (OSDI) questionnaire for dry eyes.7

Allergy in general tends to arise seasonally, so seasonal emphasis on AC is warranted because the overall impact of AC on quality of life is comparable to the nasal symptoms of allergic rhinitis.6

Ocular itching is the pathognomonic symptom of AC, but other comorbid symptoms of lacrimation, burning, photophobia, vasodilation, and chemosis are often present. Itching is predominantly a bilateral manifestation but can be asymmetrical.8

Acute allergy is milder and easier to manage because it is more responsive to therapy

with allergic rhinitis were directly questioned using standard questions relating to red, itchy, and watery eyes. Almost all (95 percent) of the patients had positive symptoms of AC.5

Figure 1. Limbal pannus and neovascularization.

Although AC shares overlapping ocular signs and symptoms, each type has different underlying pathophysiology and may require distinct therapeutic regimen.

SAC is the most common form of ocular allergy, accounting for more than half of the patients, followed by PAC with frequency of about 20 percent. VKC accounts for less than 10 percent, and AKC is the least common of all ocular allergies.10

Allergic reaction is mainly immunologically mediated, manifesting in two temporal components: early phase and late phase.

The early phase is driven predominantly by the activation of mast cells and the release of histamine and associated inflammatory mediators. Histamine release peaks at five minutes after exposure but can last 30 to 40 minutes. The late phase of the allergic reaction can arise six to 72 hours after initial allergen exposure, culminating in accumulation of inflammatory cells, such as basophils, eosinophils, T cells, and neutrophils within the conjunctiva.11

SAC and PAC

SAC is the result of a classic type I hypersensitivity reaction in which allergens from trees, grasses, or ragweed get into the eyes and bind to the immunoglobulin E (IgE) receptors on the surface of mast cells.

The activated mast cells degranulate and release inflammatory mediators, particularly histamine, which cause ocular itching, hyperemia, tearing, and chemosis, culminating in a glassy appearance of the eye.12 The seasonality of SAC corresponds to the tree pollens in early spring, grasses in May through July, and weed pollens and outdoor molds from August through October.13

Although PAC is also mediated by type I
hypoallergenic reaction, it differs from SAC by its persistent allergen exposures and chronic activation of mast cells, which trigger the recruitment of eosinophils that secrete cytotoxic proteins and cytokines and can lead to structural damage and fibrosis.13

Multiple indoor allergens, such as animal dander, molds, and dust mites, account for the perennial exposures.14 Similar symptoms of bilateral ocular itching, tearing, and chemosis are felt in PAC as in SAC, but they can occur at any time throughout the year.

To manage clinically, I perform anterior segment photography of the condition and work with the patient to understand the source of allergens and possible avoidance. I recommend eyewashes and cold compresses as initial support therapy.

I also write a prescription of dual-action antihistamine-mast cell stabilizers such as Pazeo (0.7% olopatadine, Alcon), Pataday (0.2% olopatadine, Alcon), or Patanol (0.1% olopatadine, Alcon), Lastacaft (Alcaftadine, Allergan) or over-the-counter Zaditor (ketotifen, Alcon). I follow the patient in two weeks or sooner.

Alcaftadine is the latest dual-action drug with 10 times greater affinity to histamine H1-receptor than that of olopatadine. Additionally, alcaftadine is the only ocular anti-allergic drop with pregnancy category B and approved for kids as young as age of 2.15

If the patient does not have insurance and prefers the over-the-counter option, ketotifen is recommended with the caution that a prescription strength may be needed. Concurrently, many patients may already take oral antihistamines or fluticasone (Flonase, GlaxoSmithKline) for their allergic rhinitis but still need ophthalmic treatment for ocular manifestations.

Dry eyes are a common comorbidity, so dry eye management is also warranted (see Table 2).

**GPC**

GPC is often seen in patients who wear contact lenses which repeatedly rub on the upper palpebral conjunctiva. It is an allergic reaction secondary to chronic mechanical irritations.

These patients complain of mild to intense itching, a foreign body sensation, photophobia, and mucous discharge. Giant papillae (>1 mm) on the upper palpebral conjunctiva are the hallmarks of GPC.19

I recommend patients discontinue their contact lens wear for two to four weeks while the acute allergic reaction is treated with Lotemax (loteprednol, Bausch + Lomb) or Pred Forte (prednisolone acetate, Allergan) qid for the same duration. Lastacaft or Pazeo is prescribed concurrently to quell the symptoms immediately and used for long term as needed in the future.

Patients are followed up at one- to two-week intervals and intraocular pressures (IOPs) are monitored.

Once the acute episodes subside, patients can be refitted See Differentiating allergy on page 20.

**SEASONALITY OF SAC**

**EARLY SPRING**

**TREE POLLENS**

**MAY-JULY**

**GRASSES**

**AUGUST-OCTOBER**

**WEED POLLENS**

**MOLDS**

See Differentiating allergy on page 20.
Differentiating allergy

Continued from page 19

with daily disposable hydrogel contact lenses with peroxide disinfesting solutions such as Clear Care (Alcon). Enzymatic cleaning may be considered for recurrent GPC. Examples include Opti-Free SupraClens (Alcon) for soft and gas permeable contact lenses and Boston one-step liquid enzymatic cleaner (Bausch + Lomb) for gas permeable contact lenses.

**VKC and AKC**

Vernal, as the name indicated, is a misnomer because the majority of VKC patients have severe symptoms throughout the year, not only in the spring.\(^\text{16}\)

VKC has a predilection toward children and adolescents in hot and dry climates. Boys are three times more likely to have VKC than girls. Additionally, half of VKC patients have prior history of atopy, including asthma, allergic rhinitis, and eczema.\(^\text{17}\)

Intense itching, severe photophobia, tearing, and stringy mucous discharge are common symptoms of VKC. Tarsal cobblestone-like papillae are often seen in the upper lids and can rub on the cornea, resulting in a shield ulcer. Limbal gelatinous nodules with neovascularization or Trantas’ dots are other possible signs of severe VKC.\(^\text{18}\)

AKC tends to affect men between the ages of 30 to 50 years with family history of allergies and asthma; however, it can show up in pediatric patients in the first decade.\(^\text{19}\) Moreover, many patients have eczema since childhood without ocular symptoms until adulthood. Therefore, AKC is a severe form of allergic conjunctivitis with atopic dermatitis that can cause corneal complications.\(^\text{20}\)

Intense itching is felt not only in the eyes but in the periorbital lid skin. Tearing, burning, photophobia, and rope-like mucus discharge are similar to symptoms of VKC. Atopic blepharitis, tylosis (dry thickened skin), and Dennie-Morgan folds (infraorbital skin folds) are often present on the lower lids.\(^\text{19}\)

**TABLE 1**

<table>
<thead>
<tr>
<th>Seasonal allergic conjunctivitis</th>
<th>Giant papillary conjunctivitis</th>
<th>Atopic keratoconjunctivitis</th>
<th>Vernal keratoconjunctivitis</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Itching is the hallmark symptom</td>
<td>• Mechanical irritation is the main cause</td>
<td>• Severe ocular surface allergy</td>
<td>• Intense itching, tearing, mucous discharge, photophobia</td>
</tr>
<tr>
<td>• Chemosis, redness</td>
<td>• Concomitant allergy</td>
<td>• Perennial, can worsen in the winter</td>
<td>• Severe inflammatory reactions: limbal gelatinus nodules, Trantas’ dots, superior cobblestone papillae, shield ulcer</td>
</tr>
<tr>
<td>• Severity relates to level of allergen exposure</td>
<td>• History of atopic dermatitis</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**TABLE 2**

**Stepwise management of allergic conjunctivitis**

<table>
<thead>
<tr>
<th>First line</th>
<th>Second line</th>
<th>Third line</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Allergen identification, avoidance</td>
<td>• Preservative-free drops</td>
<td>• Allergy specialist</td>
</tr>
<tr>
<td>• Avoid eye rubbing and contact lens wear</td>
<td>• Allergen subcutaneous therapy or sublingual immunotherapy</td>
<td>• Immunomodulator</td>
</tr>
<tr>
<td>• Use of cool compress</td>
<td>• Comanagement with allergy specialist</td>
<td>• Omalizumab</td>
</tr>
<tr>
<td>• Antihistamine: mast cell stabilizers</td>
<td>• Short course of topical corticosteroid</td>
<td></td>
</tr>
<tr>
<td>• Oral antihistamines</td>
<td>• Short course of oral corticosteroid</td>
<td></td>
</tr>
<tr>
<td>• Fluticasone (Flonase)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Treatment of dry eyes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Allergy drug pipeline**

As advances are made in understanding the pathophysiology of ocular allergy, novel drug therapies are being investigated in various clinical trials. For example, mapracorat, a new topical corticosteroid, showed similar potency as dexamethasone with a more favorable safety profile on intraocular pressure.\(^\text{24}\) Other immunomodulatory agents and immunotherapy are being investigated for ocular
surface disease.\textsuperscript{11}\!

The pipeline for new anti-allergy drugs is strong and will add to the multiple effective approaches we have to quell itchy eyes.\textsuperscript{14,20}

\textit{Thanks to Dr. Ernie Bowling for his editing inputs.}

REFERENCES


Dr. Koh earned his Doctor of Optometry degree at the New England College of Optometry and completed a residency in primary care at the Pennsylvania College of Optometry. He is currently a Diplomate of the American Academy of Optometry. lenvkoh@gmail.com

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Allergy
By Lindsay A. Sicks, OD, FAAO

Systemic allergies affect about 20 percent of the population, and about 20 percent of these systemic allergy patients also have ocular involvement.1 Ocular allergy is a common clinical disorder that includes dry eye syndrome in its differential diagnosis. Since many of the symptoms of dry eye and ocular allergy overlap, the clinical diagnosis becomes more challenging, highlighting the importance of diagnostic testing such as tear film osmolarity. We may even see dry eye syndrome present years after diagnosis, a long-lasting result of tear film imbalance and ocular inflammation.

The major type 1 immunologic hypersensitivity reaction involving the conjunctiva is commonly referred to as allergic conjunctivitis. This is a spectrum of disorders including seasonal allergic conjunctivitis (SAC) and perennial allergic conjunctivitis (PAC).

Seasonal allergic conjunctivitis is the most common form of ocular allergy. It is an acute disorder and is contrasted from perennial (year-round) allergic conjunctivitis by its seasonal onset. Seasonal allergens can include tree pollen, grass pollen, ragweed, or outdoor molds. Perennial allergens can include dust mites, animal dander, cockroaches, and indoor molds.2

A spectrum of more chronic presentations of ocular allergic disorders includes vernal keratoconjunctivitis (VKC), atopic keratoconjunctivitis (AKC), and giant papillary conjunctivitis (GPC).1,3

Pathophysiology
The acute phase of a Type 1 hypersensitivity response in ocular allergy involves immunoglobulin E (IgE) mediated mast-cell degranulation. There is minimal presence of migratory inflammatory cells.2 A sensitized individual contacts a specific antigen, and then antigen-specific antibodies, such as IgE and IgG, cross-link and trigger mast cell degranulation. This leads to release of pre-formed allergic mediators, such as histamine, from the mast cell.

Other mediators, such as prostaglandins, thromboxanes, and leukotrienes, are formed through activation of the inflammatory cascade. Along with chemotactic factors, these mediators stimulate the early phase of IgE-mediated hypersensitivity.3 Histamine receptor stimulation (H1 is related to itching, and H2 is related to increased vascular permeability) leads to the onset of symptoms. Further activation of the inflammatory cascade and migration of eosinophils and neutrophils result in the later phase ocular allergic response.

Signs and symptoms
Diagnosis of ocular allergic disease is typically made based on history and clinical examination. A hallmark of ocular allergy is the symptom of itching, but signs of redness, chemosis, tearing, lid edema, and papillary reaction can also be present.2 (See Figure 1.)

The more chronic forms of allergic eye disease are often accompanied by remodeling of the ocular surface tissues. In severe cases, the patient experiences extreme discomfort and can sustain long-lasting damage to the ocular surface tissues. (See Figure 2.)

Treatment and management
For all allergic eye disease, the only true “cure” is elimination of the offending antigen because the presence of the antigen itself is what triggers the allergic cascade in a sensitized individual.

This requirement can make it difficult to pinpoint and/or impossible to remove the off-
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fending allergen triggers from the patient’s daily life. Consider suggesting a patient give up his family pet for adoption, for instance, in a case of perennial allergic conjunctivitis due to animal dander—not a fun conversation to have chairside.

Non-pharmacological treatment approaches can include supportive therapies such as saline rinses, avoidance of eye rubbing, and cold compresses. Frequent application of chilled topical lubricants can dilute the allergens and improve symptoms. Preservation-free versions of artificial tears are preferred due to the more frequent dosing in such cases.

Other recommended activities may involve reducing the burden of allergens:

- Staying indoors to avoid outdoor allergens
- Wearing sunglasses to reduce ocular exposure
- Showering at night to remove offending allergens from the body
- Frequent washing of bed linens
- Using a vacuum with a HEPA filter

Pharmacologic therapies can include antihistamines and anti-inflammatory agents. Acute forms of ocular allergy tend to respond well to topical antihistamines, antihistamine/vasoconstrictor combinations, antihistamine/mast-cell stabilizer combination agents, NSAIDs, or short courses of topical corticosteroids.

For longer term symptoms or perennial cases, prophylactic use of the topical antihistamine/mast-cell stabilizer combination agents is recommended.

For late-stage cases, treatment options can also be effective providing in long-term relief for patients in whom a specific triggering allergen or set of allergens has been identified.

The role of osmolarity

Ocular surface disease (also known as dry eye syndrome) is thought to be related to inflammation of the ocular surface. We know that the presence of ocular surface damage as well as the presence of pro-inflammatory cytokines in allergic conjunctivitis signal

Dry eye syndrome may not be fully investigated by allergists or primary care physicians in every patient diagnosed with systemic allergies

be more limited. Topical corticosteroids can be used in moderate to severe cases of ocular allergy, but with that treatment comes the risk of cataract formation and elevated intraocular pressure.

Treatment of concomitant systemic allergy symptoms with oral antihistamines or nasal allergy involvement with topical nasal spray may also help reduce overall symptoms. Immunotherapy (allergy shots) that inflammation is also involved.

However, studies specifically examining alterations of the tear film in patients with allergic conjunctivitis are relatively rare. It is thought that the increasing incidence of dry eye syndrome may actually be contributing to a rising incidence of conjunctival allergies because a robust tear film is necessary to wash away allergens and irritants from the ocular surface. So, is there a connection between the two conditions that we are missing? What tests can we do perform to clarify the true cause of our patient’s symptoms, knowing that many of the presenting symptoms overlap in these two conditions?

One test to assess the tear film of ocular allergy patients is tear osmolarity. The Tear Lab measurement device is used to measure tear osmolarity, a classic hallmark of ocular surface disease as supported by the 2007 Dry Eye Workshop (DEWS) report. The manufacturer suggest a cutoff value of 308 mOsm/L (higher osmolarity means dry eye disease). It also suggests that when presented with a patient who has symptoms such as irritation but a normal osmolarity, another etiology such as allergic conjunctivitis may be a factor.

Examining the research

A 2006 study supports the notion of alterations of the tear film in allergic conjunctivitis. The authors conducted Schirmer test, tear film break-up time, fluorescein staining, and tear film lipid layer interferometry in patients with SAC and radioallergosorbent test (RAST)-confirmed allergic status and compared the results with those of healthy control subjects. Notably this study did not test for tear osmolarity, although it was mentioned as a next step in the process of find-
ing alterations in the tear film of allergic conjunctivitis patients. This author presented a small-scale pilot study at the American Academy of Optometry meeting in 2013 with data suggesting that there exists an inverse correlation between tear osmolarity and pollen counts. Additionally, no statistically significant relationship was found between dry eye symptology by OSDI survey and tear osmolarity. Some of the limitations of this study were its small sample size, desert climate, performance in the winter months, and choice of pollen as the only specific allergen measured. A 2014 study by Bielory and colleagues presented at the American College of Allergy, Asthma & Immunology Meeting compared the prevalence and severity of dry eye disease in a national cohort of 9,216 ophthalmology patients (mean age 55 years) and 68 allergy patients (mean age, 49 years). Patients completed a dry eye symptom questionnaire and were tested for tear hyperosmolarity (defined in this study as osmolarity > 285mOsm/L with levels above 308 mOsm/L were considered to be consistent with dry eye disease). The study found that the allergy patients with concomitant dry eyes were more likely to have more severe disease. In addition, mean hyperosmolarity was more severe in allergy patients with dry eye disease than in ophthalmology patients with dry eye disease (337 vs 323 mOsm/L; P < 0.0001). Despite the fact that this study shows that dry eye and allergy symptoms often overlap, dry eye syndrome may not be investigated in the allergy setting. It is important for primary eye care providers to use additional objective testing (such as Schirmer testing, tear break up time, conjunctival staining assessment) and also ask thoroughly about other symptoms (such as itching, foreign body sensation, or eye watering) to help these patients find the correct therapy because they may not be getting it from other healthcare providers. A small-scale study investigated the correlation between tear osmolarity in both keratoconus and allergic conjunctivitis patients in Brazil. Researchers found no difference in average osmolarity among healthy eyes, keratoconic eyes, and eyes with allergic conjunctivitis. Further, there was no correlation between ocular surface disease index (OSDI) and tear osmolarity. However, the OSDI was able to distinguish healthy eyes from the keratoconic and allergic eyes. The authors also suggested their location may have played a role in their results. Allergy patients with concomitant dry eyes were more likely to have more severe disease, found Bielory and colleagues in 2014.

**Other options**

While the recent research appears to be mixed regarding the role of osmolarity specifically in ocular allergy, there are other types of diagnostic testing to consider. The use of in-office diagnostic testing for matrix metalloproteinase-9 (MMP-9) may help practitioners identify and treat ocular inflammation chairside. Point-of-care testing specifically for ocular allergy using IgE markers is also in the pipeline (ATD TearScan). Research is examining new treatments specifically targeting the immunopathophysiology of ocular surface disorders in hopes of providing new potential targets and therapeutic strategies for treatment. Many of these new immunobiological modulator therapies have focused on regulating the immune-mediated inflammatory pathways that inhibit various cytokines, antibodies (like IgE), and other surface markers of various cell lines. You may be on the lookout for new topical glucocorticoids, leukotriene receptor antagonists, or interleukin antagonists in your office in the future. We may be using these therapies to treat all aspects of ocular inflammation—whether from ocular surface disease, ocular allergic disease, or a combination of both.

**REFERENCES**


**Dr. Lindsay A. Sicks** is a graduate of the Illinois College of Optometry. She completed a residency in cornea and contact lenses at Northeastern State University Oklahoma College of Optometry. She is involved in patient care, teaching, and research at ICO. LSicks@ico.edu

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Combating dry eye with punctal plugs

Both silicone and absorbable plugs can help you better manage OSD patients

By Leslie E O’Dell, OD, FAAO

As awareness of the prevalence of dry eye disease (DED) increases, many doctors are prioritizing strategic dry eye treatment within their practices. Because dry eye affects millions of Americans—many of whom are asymptomatic—I evaluate every patient for dry eye.

**Plugs and dry eye**

Recently, much discussion has taken place within the dry eye community regarding the role of punctal plugs in the treatment of dry eye. In my own practice, punctal occlusion has increased in conjunction with expanded utilization of advanced diagnostic tools, such as the TearLab Osmolarity System (TearLab Corporation) and InflammaDry test (Rapid Pathogen Screening, Inc.) that detects matrix metalloproteinase 9 (MMP-9), an inflammatory marker.

Through trial and error, I have learned that punctal occlusion can be a great tool to manage dry eye disease in the appropriate patients. Ensuring there is no significant inflammation in the tear film prior to plugging is critical because leaving inflamed tears on the ocular surface can result in a less than optimal outcome.

A positive InflammaDry test indicates anti-inflammatory treatment is required prior to considering maintenance therapy with punctal occlusion. After a negative result from the InflammaDry test is determined (indicating no detectable levels of MMP-9 present), plugs can be considered.

In my experience, patient subgroups who do especially well with plugs are those with autoimmune diseases—including rheumatoid arthritis, lupus, or Sjogren’s—thyroid patients, contact lens wearers, and avid computer users. Patients who do not fully blink or who have lagophthalmos or inadequate nocturnal lid seal may also benefit because the plugs aid in increasing the volume of tears.

**Diagnosis and treatment**

At my practice, all patients are screened in the exam room with tear break-up time (TBUT), staining of the cornea and conjunctiva, and transillumination. If any concerns are discovered, a formal dry eye evaluation, including point-of-care testing with TearLab Osmolarity and InflammaDry and meibography with LipiView II (TearScience), is scheduled. This allows for more time with the patient for education, another critical part of successful dry eye management.

Prior to any treatment, I establish a proper diagnosis of DED: Is the patient aqueous deficient or evaporative, a combination of both, affected by allergies, or suffering from a corneal problem, such as anterior basement membrane dystrophy or recurrent erosions?

The type of DED will help determine the appropriate treatment. My diagnostic protocol involves assessing the health of the cornea, conjunctiva, lids, and overall health of the glands through the use of all point-of-care testing currently available, including a validated survey, such as the SPEED questionnaire and staining with both fluorescein and lissamine green.

Regardless of presenting symptoms, I transilluminate every patient’s meibomian glands at the slit lamp to evaluate the glands’ structure. Function is evaluated by the quality and quantity of oil expressed from the glands. My treatment protocols are derived from the work of Tear Film and Ocular Surface Society (TFOS) Dry Eye Workshop and Meibomian Gland Workshop.

For patients who are meibomian gland dysfunctional, plugs are particularly beneficial; however, it is important to first address any underlying clinical concerns first. LipiFlow (TearScience) is useful in diagnosing clogged glands, and we can then try to rehabilitate those glands. Once flow is improved, plugs are a suitable option. As a first-line treatment, I would plug patients who are solely aqueous deficient or who suffer from superior limbic keratoconjunctivitis (SLK), auto immune diseases, anatomically tight lids.

**As a first-line treatment,** I would plug patients who are solely aqueous deficient or who suffer from superior limbic keratoconjunctivitis (SLK), autoimmune diseases, anatomy problems, and filamentary keratitis.

**Permanent vs. absorbable plugs**

Both silicone and absorbable plugs are advantageous for dry eye management, and I decide which to use on a case-by-case basis. The exception is when plugging the upper punctum, in which case I prefer absorbable plugs because of the intra-cannilucular positioning. An absorbable plug is easier to fit, and there is no contact with the eye causing foreign body sensation for patients.

Silicone plugs typically have few complications and a satisfactory retention rate. Silicone plugs come in many sizes and are a great option when the punctum is excep-

**TAKE-HOME MESSAGE** Silicone and absorbable punctal plugs can help better manage dry eye patients, especially when used in conjunction with advanced diagnostic tools. Address underlying clinical concerns before plugging meibomian gland dysfunction patients. Silicone plugs offer few complications, good retention, and a variety of sizes. Absorbable plugs are more comfortable in the upper lid due to less tendency to rub against the eye and work well for patients with anatomically tight lids.

**LESLIE E O’DELL, OD, FAAO** is the director of the Dry Eye Center of PA, Wheatlyn Eye Care in York, PA.
Dry Eye

Dry Eye

While I use both silicone and 180-day absorbable punctum plugs (Comfortear and Comfortear Lacrisolve, Paragon BioTeck), my preference is often for absorbable. Absorbable plugs have several advantages, especially when used for upper lids. They are more comfortable for the patient due to fewer tendencies to potentially rub against the eye. Absorbable plugs also work well for patients with SLK or other conditions that create an anatomically tight lid that rubs above the superior conjunctiva.

Although dislodged silicone plugs may cause a foreign body sensation, produce some discomfort, or fall out entirely, they are a good option for patients who prefer a long-term solution.

Silicone plugs that remain in the punctum for extended periods of time can develop a biofilm which can contribute to further tear film disruption and ocular irritation. If this occurs, remove the plug and replace it with an absorbable plug. Planned replacement for silicone plugs requires more research but can help reduce these biofilms.

Correct measurements are also vital—plugs cannot only fall out of the eye, but also fall further into the punctum as well, potentially creating complications.

Because plugs can be difficult—if not impossible—to see once they have been inserted, there is a danger of multiple plugs being placed within the punctum (Figure 1). One advantage of the plugs I use is their violet coloring; they are visible using trans-illumination, allowing me to determine if a plug is already present (Figure 2).

Case examples

One elderly female patient presented with inferior staining on both of her corneas. Her previous doctor had noted her asymptomatic dry eye; however, nothing had been done to treat the condition.

When I initially examined the patient, staining was still present. My first protocol was to administer a corneal sensitivity test, which determined extreme diminishment in her left eye to the point she could...
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Punctal plugs
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not feel anything at all. This desensitivity was caused by chronic nocturnal exposure leading to corneal nerve deregulation.

Her treatment included punctal occlusion in both eyes using absorbable plugs. On the return visit, the patient’s corneal health and symptoms had improved significantly.

For this patient, plugs were important in her management due to her lack of symptoms. With corneal health and natural immunity on the decline, corneal infection was a concern.

Another referred patient suffered from contact lens intolerance. Surprisingly, her meibomian glands had never been evaluated.

Her previous eyecare provider had placed her on Lotemax (loteprednol etabonate ophthalmic gel, Bausch + Lomb) to see if her symptoms improved. When those symptoms persisted, she was referred to my practice for a dry eye evaluation. I discovered meibomian gland dysfunction with advanced gland truncation. She was treated with a combination approach using absorbable plugs as well as LipiFlow thermal pulsation to improve the function of the remaining glands.

For this patient, plugs were placed prior to meibomian gland treatment due to the severity of her evaporative disease with reduced TBUT. This combination approach improved her comfort allowing her to continue contact lens wear.

Recently, I have been considering expanded potential applications for plugs. Absorbable plugs would be very useful for cataract and corneal surgery patients because 87 percent of surgery patients suffer from dry eye post procedure. They would also be helpful in cases, such as bacterial ulcers, for which it is beneficial to retain medications on the eye for more extended periods of time. Glaucoma patients could benefit as well, considering the well-known issues many have with compliance and administration, provided that the medication used is a non-preserved or safe preservative medication.

With the positive changes I have already seen in my patients, I am excited to see what the future holds for plug usage.

REFERENCES
Stuart Richer OD, PhD, FAAO  Chief of optometry at DVA Medical Center, North Chicago; president of Ocular Nutrition Society

Ocular nutrition, playing the piano, and almost dying on the river

Q How did you get interested in aging and nutrition? I was seeing macular degeneration patients whose vision was improving when I placed them on Theragran-M (Bristol-Myers Squibb) vitamins. That was just a wonder to me; I couldn’t figure it out. I found that I needed a background in nutritional biochemistry. Today as president of the Ocular Nutrition Society, we’re setting up a program for ODs to learn nutritional biochemistry. They get paid for doing nutritional counseling in their practices. I’m coming full circle in my life as far as what was important to me and pass that on to the next generation.

Q Should there be more on nutrition-related disease in optometry school? Definitely. We’re in a stressed world with a diminishing quality of food. It behooves all ODs to educate themselves on what’s required to sustain both the eyes and the brain. The human body requires trace minerals, all of the lettered vitamins, three essential fatty acids, and a series of amino acids to function properly. These are not often in adequate supply in the modern diet because of changes in agriculture and sometimes unwanted additions to the food supply. It makes it challenging to maintain good eye and brain health as one ages.

Q If you could ask your fellow ODs to do one thing differently, what would it be? Join the Ocular Nutrition Society. Only $100 per year, there’s a wealth of information online, there’s like-minded colleagues, and we provide discounted tuition at two major meetings per year, the American Academy of Optometry, and one in St. Louis. You’ll understand the nutrients that it takes for maintenance and repair. You’ll become, in terms of your own health, less dependent on doctors and pharmaceuticals as you get older, so it will save you money, improve the quality of your life, and help build your profession.

Q Do you think some ODs are skeptical or avoid discussing nutrition with their patients? I don’t think ODs are skeptical; I think they’re disinterested because they cannot monetize it. There’s an economic disincentive for the average eye practitioner, particularly ophthalmologists, to talk about prevention—it’s unreimbursed. ODs spend more time with patients than ophthalmologists—they see the patient year over year, so they can continue the conversation about preventive medicine and nutrition year over year. So the optometrist can play a unique role. It’s the rare faculty member at optometry schools who is interested in this area.

Q What do you do for downtime? Organized religion is definitely part of my downtime. At least one day a week, I’m a Sabbathkeeper, so I like to be totally down on my Saturdays to visit with friends and read books of a spiritual nature. I’m pretty much on overdrive the other six days of the week. I play piano—one a week, I have a lesson at my house. My piano teacher is a philosophy professor, so we talk philosophy and books at the same time. We spend dinner together, so I have an hour with my own private philosopher piano instructor. I’ve been doing that probably 15 years. I have an ear for music like van Gogh, actually. I’m not that good.

Q What’s something you’d like to change in optometry? Not have 400 or 500 members of the Ocular Nutrition Society but have 1,000 members. And to have people pursue ocular nutritional biochemistry and preventive medicine with a passion in improving their own health and the health of other people. I’d like to see more people measuring macular pigment. I’d like to see more people expand their interest in optometry beyond eyeglasses and eye optics. We’re working on just a fraction of what our abilities are as ODs.

Q What’s the craziest thing you’ve ever done? When I was in my early 20s, I got involved with three guys in my optometry class who started a rafting company. I went down the American River with these guys, rushing white water on an unregulated raft, and I almost left my life on the American River. I think it was just divine intervention that I’m here today. I got caught underwater, driven a hundred feet, and almost got snagged by the brush. Later, I found a couple of classmates actually died on that river.

Photo courtesy Stuart Richer, OD, PhD, FAAO

To hear the full interview with Dr. Richer, listen online: optometrytimes.com/StuartRicher

Photo courtesy Stuart Richer, OD, PhD, FAAO

What’s your guilty pleasure food? Pizza because I’m gluten intolerant. I do that, and I later regret it.

What’s the craziest thing you’ve ever done? When I was in my early 20s, I got involved with three guys in my optometry class who started a rafting company. I went down the American River with these guys, rushing white water on an unregulated raft, and I almost left my life on the American River. I think it was just divine intervention that I’m here today. I got caught underwater, driven a hundred feet, and almost got snagged by the brush. Later, I found a couple of classmates actually died on that river.

—Vernon Trollinger
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² After 1 week of wear; data on file.
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References:

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¹Compared to MPS in symptomatic users.

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