Respecting and Stabilizing the Tear Film

Panelists discuss a daily disposable lens designed to work with the tear film to provide moisture with every blink.
MODERATOR

Kelly Nichols, OD, MPH, PhD, FAAO, Dipl PH
Dr. Nichols is a FERV Professor at the University of Houston College of Optometry, where she is director of The Ocular Surface Institute. She has stock options in TearLab and is a consultant/advisor to Alcon, Allergan, Bausch + Lomb and SarCode. She has received research support from Alcon, Allergan, SarCode, TearLab and Vistakon.

PANELISTS

Crystal Brimer, OD
Dr. Brimer is the owner of Crystal Vision, ODPA, a private practice in Wilmington, N.C. Her special interests are contact lenses and dry eye management. She is a consultant/advisor to Alcon.

Arthur B. Epstein, OD, FAAO
Dr. Epstein is cofounder of Phoenix Eye Care in Arizona, where he heads the Dry Eye – Ocular Surface Disease Center and also serves as director of clinical research. He is a consultant/advisor to Alcon, NiCox, Tear Science and Valeant Pharmaceuticals. He has received research support from Alcon. He is a lecturer for Alcon and VSP.

Kristopher A. May, OD, FAAO
Dr. May is the owner of a two-location practice in North Mississippi. He is an adjunct faculty member at Southern College of Optometry in Memphis, Tenn. He is a consultant/advisor to Alcon.
Respecting and Stabilizing the Tear Film

Panelists discuss a daily disposable lens designed to work with the tear film and deliver moisture with every blink.

Dr. Nichols: The tear film has become increasingly important in contact lens practice over the last decade, especially in terms of how we manage our patients in eye health and disease. Today, we will discuss a daily disposable contact lens with unique properties that work synergistically with the tear film.

What have we learned about the tear film? Why is it so important?

Complex System

Dr. Epstein: When I began fitting contact lenses, the tear film wasn’t even a consideration. Today, thanks to exceptional research in this area, we know that not only does a contact lens have to be compatible with the tear film, but it also has to exist within this extremely complex structure. We also recognize that the tear film isn’t comprised of discrete units as we once thought, but is actually a dynamic mixture of many components.

Dr. May: What we thought was an easily managed three-layer model — lipid, aqueous and mucin — is actually a giant polyelectrolyte matrix. This matrix organizes itself in a fraction of a second and holds itself together for hundreds of times that. Unfortunately, the tear film became adversarial for us when working with contact lenses. In the last several years, however, our perceptions have changed, and we’ve learned the importance of biocompatibility and how unbelievably complicated the system is.

Dr. Nichols: Dr. Brimer, many contact lens practitioners don’t routinely think about the tear film unless a patient has a problem. What are your thoughts?

Dr. Brimer: With the publication of so many influential clinical studies over the last 5 years, we have access to new information that is shaping our perspective. I think contact lens practitioners are beginning to realize the impact of the tear film on lens wear and the importance of being proactive to avoid problems before they start.

Dr. Epstein: Interest in the ocular surface and the tear film started for many of us when we recognized that end-of-day dryness was shortening patients’ lens-wearing times. Until then, we had considered dry eye a separate entity and contact lens fitting a separate discipline.

Dr. Brimer: Our patients’ visual demands have also become more challenging, particularly with the increased use of computers and hand-held electronic devices that are consuming their days. So, in addition to longer wearing times, patients are demanding better visual clarity and sustainability.

Contact Lens vs. Tear Film

Dr. Nichols: What’s the impact of a contact lens on the tear film and the effect of that interaction on comfort and vision?

Dr. Epstein: The tear film isn’t just mucin or lipid. It’s a complex and elegant system, a coacervate or a thin film of viscoelastic gel anchored to the epithelium by a foundation created by the glycolax and mucins, and an outer structure or roof created by complex lipids and phospholipids that stabilize it. When we place a contact lens on the eye, the lens divides the tear film into two zones: a precorneal post-lens layer and a pre-lens layer that is supported by the contact lens not the cornea. The tear layer is so much thinner than the lens that it literally stretches to accommodate it.
Respecting and Stabilizing the Tear Film

Dr. Nichols: It’s important that the lens doesn’t disrupt, rub or abrade the cornea.

Dr. Epstein: Yes, and at the same time, as clinicians, we have to be cognizant and respectful of the structure of the tears. The bulk of the tear layer is a viscoelastic gel that can accommodate the lens if lens surfaces remain wettable, but the outer layers of non-polar lipids and the phospholipids that bond lipids to the tears are critical and must not be disrupted. The lipids serve as a moisture barrier, to prevent the lens from being exposed to the atmosphere and drying. It may sound complicated, but it’s really not. Simply put, a contact lens should not change the tear film structure or interfere with its function.

Dr. Nichols: But, that being said, the tear film can interact with the lens.

Dr. Epstein: True, in fact it must interact if the lens is to be comfortably worn. Hydrophilicity is critically important, as well as synergy with the entire tear film. Also, we don’t want a lens that has a hydrophobic surface and attracts lipid, because then it’s competing with the lipid layer for available tear lipids and destabilizing the tears. It’s also forcing the meibomian glands to produce more lipids to maintain the stability of the outer tear film. We want tear-film stability at all costs.

Contact Lens vs. Ocular Surface

Dr. Nichols: Certainly if the tear film is stable over a contact lens, vision will be better. We keep coming back to vision, which I think is important to note.

Dr. Epstein: Something we haven’t discussed yet is lid wiper epitheliopathy, which Korb and colleagues (2002) described. Among the specialized areas of the eyelid is an area of stratified squamous epithelium, which is designed to tolerate abrasive forces. Much like a windshield wiper, that little strip sweeps up and down over the eye’s surface and never touches tissue or a contact lens. When lubricity or other factors break down and the lid wiper becomes abraded, the surface of the epithelium can be damaged. This has a high correlation to comfort.

Dr. Nichols: I believe the early work on lid wiper epitheliopathy was with contact lens wearers who were having discomfort.

Dr. Epstein: So, if you’re designing a contact lens using advanced thinking, why not design one that enhances lubricity, so the lid glides over a lubricious surface as nature actually intended.

Disrupted Tear Film

Dr. Nichols: Dr. Brimer, what are the typical clinical signs and symptoms that indicate the tear film isn’t functioning properly?

Dr. Brimer: During lens wear, when the tear film is disrupted, a cascade of events can occur. At the slit lamp, we’re likely to see rapid tear film breakup on the pre-lens surface, which can lead to lens dehydration, friction and increased deposition. It frequently manifests as fluctuating vision and discomfort, particularly at the end of the day. Patients may complain of red eyes, blurred vision and decreased wear time. If the problem is allowed to progress, it can even lead to contact lens-induced papillary conjunctivitis, causing itching and lens intolerance.

Dr. Nichols: Patients may experience some symptoms that they wouldn’t relate to the tear film.

Dr. Brimer: Yes, if the tear film is breaking up, the patient will need to blink repeatedly to maintain stable vision, and no one wants that. However, many patients may not realize it’s happening or if they do, they may not know it’s abnormal. Patients tend to tolerate a lot of symptoms, assuming it’s a normal part of contact lens wear.

Dr. Nichols: It impacts vision and comfort.

Dr. Brimer: This is especially true when patients are using computers and mobile devices.

Dr. May: It compromises the way the system was built to work fundamentally. It was built to function a certain way and we’ve got to maintain that as closely as we can.
Dr. Nichols: Pre-lens noninvasive tear breakup time — a test that is difficult to perform in clinical practice — may reveal important information related to contact lens discomfort. Let’s discuss the results of a recent study.

Study: Noninvasive Tear Breakup Time

Dr. Nichols: Wolffsohn and colleagues found that daily disposable lenses in general, and DAILIES® AquaComfort Plus® contact lenses (nelficon A, Alcon) in particular, offer some benefits with regard to pre-lens noninvasive tear breakup time. What is the impact of their findings?

Dr. May: That study changed the way I think about the tear film. If I place something that loves lipid — a contact lens — in that environment, it essentially flips the tear film upside down, creating a mini tear film over the lens. The lens is not a discrete object. It must interface with all of the components of the tear film. The study also changed the way I think about a contact lens and how I address patients’ complaints. Patients tell us repeatedly that their eyes are dry, so instinctively, we want to treat the dryness. I now know they may be experiencing an ocular surface issue or they may have an anterior-surface-of-lens issue.

Dr. Brimer: Not only do I think more about what’s happening in front of a contact lens, but also about the technology of the lens and its impact on the pre-lens tear film. Any lens will likely decrease a patient’s pre-lens tear film breakup time, but the lens technology plays a role in how significantly it is changed. The closer we can keep the tear film to its original state, the better the patient’s vision and comfort will be.

Dr. Nichols: Dr. Epstein, what did you take away from this study?

Dr. Epstein: Noninvasive tear breakup time gives us some insight into what the front surface of the contact lens is doing relative to tear-film stability. “Do no harm” is the mantra in medicine. When breakup time indicates the lens isn’t affecting the ocular environment, to me, that’s doing no harm.

Dr. Nichols: Does tear film stability matter?

Dr. Epstein: Tear film stability is absolutely key. The polymers in contact lenses are at their best when they’re hydrated, enveloped in a shield of tears or moisture. We want a lens that’s hydrophilic within the hydrophilic tear film, a lens that won’t disturb the normal architecture of the tear film, and a lens that won’t interfere with the outer lipid layer, which would cause rapid tear breakup time and instability.

Dr. Nichols: In discussing the tear film, we have described some of the characteristics we’d like to see in a contact lens. Our panelists have had the opportunity to use a daily disposable lens that works synergistically with the tear film. Let’s discuss some of the unique characteristics of this lens and how they affect comfort.

Stabilizing the Tear Film

Dr. Nichols: DAILIES® AquaComfort Plus® contact lenses are packaged in saline with added hydroxypropyl methylcellulose (HPMC). Polyethylene glycol (PEG) is also present in the saline and in the lens, and polyvinyl alcohol (PVA) is in the lens. Dr. Brimer, what mechanisms are involved with these moisture agents, and what is the overall impact on the tear film and lens wear?

Dr. Brimer: The science behind this lens is amazing. HPMC, which is the primary ingredient in many comfort drops, is in the blister pack solution to promote initial comfort upon insertion. PEG, a low
Respecting and Stabilizing the Tear Film

Differentiating Daily Disposables

Dr. Nichols: In recent years, manufacturers have been taking a more functional approach toward designing contact lenses, looking more closely at the structure of the eye. Dr. Epstein, how would you differentiate the currently available daily disposables in this regard?

Dr. Epstein: Some manufacturers continue to rely on older technology. For example, one daily disposable lens has a surface treatment of phosphorylcholine, which is a naturally-occurring compound that facilitates lubricity. It has a relatively long life span, is not reactive with the normal function of the eye and can be helpful for some patients, but it’s older technology. Another lens is designed to maintain hydration at all costs. It employs fairly advanced technology to maintain a hydrophobic surface, in an attempt to emulate the eye’s natural character. In reality, it’s the reverse of what you’d want in that environment. The very last thing you want in the wet ocular environment is a lens that becomes increasingly hydrophobic to preserve its own moisture. A lens has to work with the ocular environment — not against it. DAILIES® AquaComfort Plus® lenses elute molecules that interact with the tear film to help stabilize it.

Dr. Nichols: Does this affect the life span of the lens?

Dr. Epstein: DAILIES® AquaComfort Plus® lenses have a relatively finite life span. The lens maximizes its function within a short period, consistent with the labeling of the lens, and it becomes less comfortable as the moisture molecules are used and elute less, so it has built-in compliance.

Dr. May: A dramatic oversimplification of that concept is the difference between knowing your car is due for an oil change and having the “check engine” light come on. Patients know when they’re due for a lens change, but sometimes they need the “check engine” light to remind them they’ve gone too far.

Dr. Brimer: One of my favorite things about this lens is that it’s a true single-use material that’s not used in any other wear modality. I’ve had patients tell me they tried to reuse the lens, but it wasn’t as comfortable. I like that, because the last thing I want is for a patient to buy a 90-pack and wear a pair of lenses for 1 or 2 weeks at a time.

Dr. Epstein: I never mention to patients that the lens has built-in compliance, because I don’t want them thinking their compliance should be based on a design feature of the contact lens. I want them to make a decision, number one, based on my authority as a prescribing doctor, number two, based on the logic of why I prescribed that wearing modality, and number three, because it’s in their own best interest.

As researchers provide more insight, we’re learning what’s required to create a contact lens that helps to result in a stable tear film. We must optimize vision because, fundamentally, that’s our job, but we also must deliver comfort. From a tear film standpoint, our understanding and our ability have taken a huge jump forward.

— Kristopher A. May, OD, FAAO
“Fine” — The Most Dangerous Word in a Contact Lens Practice

Dr. Brimer: If the patient’s chart says 20/20, we know the patient can read the 20/20 line, but we don’t know how many times he had to blink before he could see it.

Dr. May: If the tear film isn’t cooperating, blinking 14,000 times a day gets really annoying.

Dr. Brimer: Patients don’t complain because they think it’s normal to feel their lenses at the end of the day or to have to blink numerous times to see clearly.

Dr. Nichols: What do you say to a patient who, according to your records, is happy in his contact lenses and is in your office for an eye examination? How do you find out if he’s really happy?

Dr. Brimer: I sit face to face, and ask him how he’s feeling in his contact lenses. If he says, “Fine,” then I’ll ask, “What about at the end of the day or at the end of the month when it’s time to replace your lenses? Is there a difference from the beginning to the end?” Usually, the patient will start thinking about his answers, and I’ll ask, “Are there days when you have to remove your contact lenses before you really want to? Do you have to use drops to improve your comfort?”

Dr. May: “Fine” is the most dangerous word in a contact lens practice. We’re losing patients, so obviously, all of our contact lens wearers are not fine. We need to probe for complaints.

Dr. Nichols: How do you do that?

Dr. May: Some practices use questionnaires, but I don’t think they’re as effective as a face-to-face conversation. We may have to use some examples, as Dr. Brimer described, and when we do this, it’s amazing how many complaints are suddenly revealed.

Dr. Brimer: When you ask questions face to face, it puts the patient on the spot, but it also shows him that you’re listening and that his answers are important.

Dr. May: It also empowers them to be honest.

Dr. Nichols: Practitioners risk complacency when a patient says he’s fine. We shouldn’t take the easy route and say, “Good. Let’s move on.” We need to make sure at every visit that patients are wearing the best modality for them.

Dr. Epstein: Yes, it’s actually quite a brilliant, intelligent design.

Respect the Tear Film

Dr. Nichols: Our discussion today has focused on the complexities of the tear film and the need for a contact lens that respects that structure with minimal disruption to deliver good vision and comfort.

DAILIES® AquaComfort Plus® lenses are designed to moisturize the lens surface and stabilize the tear film.

Dr. Brimer: Although the tear film is a complex structure, there is a certain simplicity of “more moisture is better.” And this simplicity is exemplified in the blink-activated matrix of DAILIES® AquaComfort Plus® lenses. The fact that the technology has moisturizing agents with a variety of molecular weights that control their release onto the surface throughout the day is incredible. Yes, it’s very complex, but it’s also so simple.

Dr. May: As researchers provide more insight, we’re learning what’s required to create a contact lens that helps to result in a stable tear film. We must optimize vision because, fundamentally, that’s our job, but we also must deliver comfort. From a tear film standpoint, our understanding and our ability have taken a huge jump forward.

Dr. Epstein: The tear film is a complex and rich structure that allows us to interface with our environment using the most critical sense (vision) we have for our survival and for the enjoyment of what we see. The beauty of a contact lens is to enable that. The DAILIES® AquaComfort Plus® daily disposable contact lens is the perfect embodiment of that dedication to science and clinical practice. The fact that we have a contact lens to stabilize and respect the tear film is great. I think our colleagues will be excited when they see how the surface of this contact lens mimics the surface of the eye in its elegance and beauty.

REFERENCES


See product instructions for complete wear, care, and safety information.

© 2013 Novartis 7/13 DAL13293AE
Other brands offer a comfortable lens. We thought that was a nice place to start.

ACUVUE® OASYS® contact lenses
~$1.00/day
Comfort

DAILIES® AquaComfort Plus® contact lenses
~$1.00/day
Comfort

Compliance††

Convenience

DAILIES® AquaComfort Plus®

DAILIES® AquaComfort Plus®

Contact Lenses

There's a reason we're called DAILIES® AquaComfort Plus® contact lenses. Give your patients comfort plus so much more for about the same price as ACUVUE® OASYS.1
To learn more, speak with an Alcon representative or visit dailies.com

*Compliance with manufacturer-recommended replacement and frequency. †Based on a survey of 1,654 contact lens wearers in the US. ‡ACUVUE and ACUVUE OASYS are registered trademarks of Johnson & Johnson.


See product instructions for complete wear, care, and safety information. © 2013 Novartis 2/13 DAL123823AD