



CONSIDERATIONS IN RESTORING THE OCULAR SURFACE



Be aware of the effects of long-term exposure to preservatives when treating chronic ocular conditions.

BY SELINA R. MCGEE, OD, FFAO

We all want our patients to achieve their best vision possible, and this begins by ensuring that their ocular surface is optimized. The tear film has the most refractive power in the visual system. An unstable tear film will result in poor, fluctuating, limited vision and can skew surgical outcomes by up to 3.00 D. Left unmanaged, an unstable tear film will lead to a loss of homeostasis, hyperosmolarity (where epithelial cells die), and light scatter, causing decreased visual quality.

CAUSES OF TEAR FILM INSTABILITY

An unstable tear film triggers the inflammatory cascade, and, eventually, neurosensory abnormalities can present. Desiccating stress, such as air, cosmetic products with certain ingredients, poor diet, lack of water, reduced blinks, and some medications—even eye drops—is a common cause of tear film instability, and the ocular surface is exposed to a barrage of such stresses daily. From the minute our eyes open each morning and the day's events begin, so does desiccating stress, potentially overtaxing the ocular surface.

PRESERVATIVES BREAKDOWN

Every day, we advise our patients to use prescription and OTC eye drops. As a community, we educate patients in great depth about active ingredients, the mechanism of action, and the roles that different molecules play. Drug delivery is becoming more widely understood, but what about the inactive ingredients and preservatives in those drugs? Is the very medication you have prescribed to help your patient actually harming their ocular surface?

Why Preservatives Are Important

Preservatives are generally beneficial and, in many cases, an absolute necessity in preventing microbial growth in water-based molecules that are delivered in a multidose bottle. The recent outbreak of *Pseudomonas aeruginosa* in multidose bottles that came into the United States without going through the FDA demonstrates this point, and, unfortunately, several people lost their sight and even their lives in this particular scenario.¹ However, we now have access to formulations available in both single-use vials and preservative-free multidose bottles that can spare the ocular surface. Such products contain non-water-based molecules where microbes cannot grow; therefore, no preservatives are needed in these formulations.

Adverse Effects

The most widely used preservative in topical ocular therapies is benzalkonium chloride (BAK), which has been in use since 1940 and is found in nearly all classes of topical eye drops. Ocular symptoms that can present with long-term exposure to BAK-preserved agents include instillation discomfort, burning/stinging, foreign body sensation, and itching. Signs associated with BAK-preserved topical drugs include superficial punctate keratitis, conjunctival hyperemia, staining, blepharitis, increased osmolarity, and reduced tear breakup time.² BAK toxicity has been estimated to occur at concentrations as low as 0.005%, although in eye drops it is often found in concentrations of 0.04% to 0.02%.³

Importance of Disease Chronicity

Chronicity of an ocular disease is top of mind for me in considering when to recommend a preservative-free eye drop. Dry eye disease (DED) and glaucoma are two chronic conditions we treat often, and we know that patients with glaucoma can struggle with compliance when they also have concurrent DED.⁴ These patients will typically need treatment for the rest of their lives, and the administration of topical therapies multiple times a day exposes their

ocular surface to desiccating stress compounded over time. Consider the cumulative effects of the treatments you're prescribing when reaching for a prescription or topical medication, and ask yourself: Is the patient going to need therapy every day? Is the medication dosed once daily or multiple times a day? Is the patient going to remain compliant with their therapy if their eyes feel bad due to toxicity over time?

EFFECTIVENESS OF PRESERVATIVE-FREE SOLUTIONS

We've widely accepted the newer thinking that patients should only use preservative-free formulations of lubricating drops around refractive and cataract surgery. Why have we adopted this mindset in some aspects of eye care but not others—especially given the fact that preservative-free prostaglandins have proven to be as effective as their preserved counterparts?⁵

Selective laser trabeculoplasty, an interventional glaucoma treatment, was demonstrated in the LiGHT study to be as effective at lowering IOP as first-line drop therapy.⁶ Heat compress and manual expression, interventional DED therapies, were proven to be superior in the SAHARA trial at reducing signs and symptoms of DED compared with a leading prescription

eye drop. Ocular surface-sparing therapies, such as varenicline 0.03 mg nasal spray (Tyrvaya, Oyster Point Pharma), the iTear 100 neurostimulator (Olympic Ophthalmics), and intense pulsed light therapy are additional treatment options that do not involve application of a drop to the ocular surface.

TIME TO MAKE A CHANGE

Dry eye is the number one reason why patients seek medical attention and the number one diagnosis for triage appointments.⁷ Doctors are becoming more intentional about screening for patients with DED during comprehensive eye examinations, but this statistic should make us as a community sit up and take notice. We should be looking at alternative ways to manage the ocular surface and help reduce the burden that preservatives can have in disease management.

As the adage goes, "Just because we've always done it this way doesn't mean we should keep doing it this way." Now that we know better, we can and should deliver better strategies that protect the ocular surface as best we can. ■

1. Centers for Disease Control & Prevention. Outbreak of extensively drug-resistant *Pseudomonas aeruginosa* associated with artificial tears. Accessed September 7, 2023. www.cdc.gov/hai/outbreaks/crpa-artificial-tears.html
2. Walsh K, Jones L. The use of preservatives in dry eye drops. *Clin Ophthalmol*. 2019;13:1409-1425.
3. Sarkar J, Chaudhary S, Namavari A, et al. Corneal neurotoxicity due to topical benzalkonium chloride. *Invest Ophthalmol Vis Sci*. 2012;53(7):1792-1802.
4. Bacharach J, Ahmed ILK, Sharpe ED, Korenfeld MS, Zhang S, Baudouin C. Preservative-free versus benzalkonium chloride-preserved latanoprost ophthalmic solution in patients with primary open-angle glaucoma or ocular hypertension: a phase 3 US clinical trial. *Clin Ophthalmol*. 2023;17:2575-2588.
5. Dubrulle P, Labbé A, Brasnau E, et al. Influence of treating ocular surface disease on intraocular pressure in glaucoma patients intolerant to their topical treatments: a report of 10 cases. *J Glaucoma*. 2018;27(12):1105-1111.
6. Gazzard G, Konstantakopoulou E, Garway-Heath D, et al. LiGHT trial study group. Laser in glaucoma and ocular hypertension (LiGHT) trial: six-year results of primary selective laser trabeculoplasty versus eye drops for the treatment of glaucoma and ocular hypertension. *Ophthalmology*. 2023;130(2):139-151.
7. Tang VD, Safi M, Mahavongtrakul A, et al. Ocular anterior segment pathology in the emergency department: a 5-year study. *Eye Contact Lens*. 2021;47(4):203-207.

AT A GLANCE

- ▶ The ocular surface is exposed to a barrage of desiccating stresses daily, such as air, certain cosmetic products, poor diet, lack of water, reduced blinks, and some medications—even eye drops.
- ▶ Formulations available in both single-use vials and preservative-free multidose bottles can spare the ocular surface.
- ▶ Preservative-free prostaglandins have been proven to be as effective as their preserved counterparts, and other therapies that do not involve use of an eye drop have been proven efficacious in treating dry eye and glaucoma.

SELINA R. MCGEE, OD, FAAO

- Founder, Chief Optometrist, Executive and Visionary, BeSpoke Vision, Edmond, Oklahoma
- Co-Chief Medical Editor, *Modern Optometry*
- drmcgee@bespokevision.org;
- Instagram @drselinamcgee
- Financial disclosure: None