



Over the past year and a half, one could not help but notice a shift at ocular society meetings in the discussion regarding multi-purpose solutions and contact lenses from asymptomatic 'corneal staining' to preservative-associated transient hyperfluorescence or PATH (see below).

In contrast to years past, especially from 2006 to 2009, where 'corneal staining' at two hours was a hot topic, there was almost no talk regarding the Andrasko grid.¹ This is due to new compelling research that showed fluorescein is able to enter healthy, dividing cells² and the signal seen with MPS solutions (PATH) is reversible and benign³⁻⁵ and occurs with all solutions, depending upon when viewed after lens insertion.^{1,6,7}

What is more interesting is that the preservative polyquaternium-1 (Polyquad/PQ-1), which is found in several MPSs that show low levels of PATH at two hours, disrupts corneal cell membrane models at 7-8ppm; levels near (3ppm in RevitaLens OcuTec; AMO) or below (10ppm in Opti-Free Express and RepleniSH; Alcon) that found in three marketed solutions.³ This is in contrast to polyhexamethylene biguanide (PHMB), a preservative found in several of the solutions showing high levels of PATH at two hours, which had no effect on the same corneal cell membrane models up to 100 times that found in marketed solutions.

The new science presented at several meetings during 2010^{4,5} and 2011³ explains why this phenomenon occurs with certain preservatives at certain time points after lens insertion and has no pathological sequelae. This is further supported by new, more rigorous studies in the literature that showed PATH is not associated with symptoms, such as reduced comfort,^{8,9} and neither corneal staining (as observed during continuous wear) nor PATH are associated with corneal infiltrates,¹⁰⁻¹² in contrast to previously published findings that have now been retracted.^{13,14}

Clinically relevant findings

A very relevant concern to eye care practitioners (ECPs), non-infectious corneal inflammatory events, such as contact lens-associated infiltrates/infiltrative keratitis, as an increase in the incidence has been noted by a large proportion of ECPs; especially those in large-volume practices, those that specialise in contact lenses, and those at referral practices.^{15,16} Reports of an

That's going to leave a stain...or is it?

As the debate moves from corneal staining to contact lens-associated infiltrative keratitis, **Marc Bloomenstein** suggests ways this may help in practice



A hygienic and effective cleaning regimen is essential

increase in the frequency of infiltrative keratitis (IK)/contact lens-associated infiltrative keratitis (CLAIK) associated with Opti-Free RepleniSH and silicone hydrogel (SiH) lenses were first observed in 2008 with an increasing number published¹⁷⁻²⁰ and presented at meetings²¹⁻²⁴ in the subsequent years with ever increasing frequency. What is of even greater concern is that Opti-Free RepleniSH²⁵ is more closely associated with symptomatic IK (unhappy, red irritated eyes that come into your practice or call you after-hours).¹⁷ Moreover, of the symptomatic cases of IK/CLAIK, RepleniSH MPS with SiHs, especially senofilcon A (Acuvue Oasys; Vistakon), the most popular contact lens, is significantly associated (both $p < 0.01$) with those of the greatest severity.²³

The data regarding which SiH lens material is associated with infiltrates is not as clear cut. Reports have implicated senofilcon A,^{18,19,21,23} lotrafilcon A (Night&Day; CIBA Vision),¹⁷ and lotrafilcon B (AirOptix; CIBA Vision)¹⁸ as well as no lens association was found with infiltrates though Opti-Free/Opti-Free RepleniSH remained an associated factor.^{22,24}

It's becoming harder to ignore this problem reported by so many clinicians and its impact on patients. This is especially true in the current

economic climate as the total costs per non-severe (most likely not infectious) and severe CIEs (most likely infectious) were estimated to be \$1,002.90 and \$1,496.00, respectively.²⁶

Bacterial bioburden, compliance and infiltrates

Recently published studies confirm that lens and lens case bioburden is associated with an increase in infiltrates.^{11,27,28}

New research showed that there was a statistically higher level of bioburden in contact lens cases with any contamination of Opti-Free RepleniSH users ($p=0.0001$) and both significantly more lens cases and level of bioburden within these cases with gram negative bacteria of Opti-Free RepleniSH users ($p=0.0001$), while cases of those using a PHMB-based MPS and hydrogen peroxide were similar.²⁹ In this same study, the cases of Opti-Free Express users showed the lowest contamination rate and bacterial bioburden level for any contamination and specifically for gram-negative bacteria ($p=0.0001$). These findings show high agreement with the Carnt *et al* study published in 2009,¹⁷ as well as the case series by Kislán, where the vast majority of patients were RepleniSH users, with only one case in an Opti-Free Express user.²³

The importance of hand washing or the lack thereof with regard to complications, including 'sterile' infiltrates³⁰ and microbial keratitis,³¹ comes up again and again. As clinicians, the majority of us (~92 per cent) recommend rubbing and rinsing contact lenses as part of the cleaning process.³² We do this for a reason, and should stop recommending MPS products that don't meet with our professional standard recommendation.

Applying research to improve patient outcomes

Until we have more information there are several practical tactics that can be incorporated into your practice to reduce the likelihood of your patients



experiencing an infiltrative event:

- Make specific recommendations regarding solutions and why, including:

- A solution that has a new lens case included with the purchase of a new bottle of solution. And encourage them to throw the old one out!

- A solution with rub and rinse regimen which aids in decreasing lens bioburden

- Recommend to new patients and switch current patients to lens care systems not associated with high rates of infiltrative keratitis events and educate patients that there have been a lot of cases of inflammatory problems with one of these lens care systems

- Give specific instructions on proper lens hygiene, including a demonstration on how to wash one's hands, lenses, and lens cases between each use

- Keep abreast of contact lens complications by attending scientific meetings and engaging in an ongoing dialogue with colleagues

- As practitioners we should be reporting these adverse events to the manufacturer as well as on the FDA's MedWatch website

- Most importantly, stay informed by taking the time to review the current literature in addition to research presented at meetings to make decisions based on strong scientific evidence rather than based on grids where the evidence is less than rigorous and the conclusions are erroneous and driven by a marketing machine under the guise of one or two consultants purporting independence from a manufacturer. ●

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- **Marc Bloomenstien** is director of optometric services at the Schwartz Laser Eye Center in Scottsdale, Arizona. He acknowledged no financial interest in the products or companies mentioned. DrBloomenstien@schwartzlaser.com