



Promoting Healthy Contact Lens Wear

Daily disposable lenses offer practitioners and patients an invaluable modality for optimal ocular health and convenience of wear.

By Gregory W. DeNaeyer, O.D.

The first commercially available soft contact lenses were on the market in 1971. Of course, these lenses were not disposable, and replacement was costly and time consuming. The contact lens paradigm radically shifted when daily disposable soft contact lenses were introduced in 1995, resulting in improved comfort and fewer complications. These lenses were also easier and less costly to replace. And, of course, they offered patients the convenience of not having to bother with solutions or lens care.

According to the International Contact Lens Prescribing report of 2008, 13% of contact lens patients were fit with daily disposable (DD) lenses in the United States from 2002 to 2008.¹ By contrast, during the same time, Denmark had a DD fitting percentage of 64% and Taiwan's percentage was 50%.¹ The general consensus explaining the relatively low trend in the U.S. is that practitioners think that DD lenses

are too expensive for the majority of their patients. These lenses are probably only prescribed if patients ask about them or as a last resort when finding a lens for "trouble" patients. But today, availability is becoming less of a barrier—contact lens companies are offering a wider range of powers (see "Available Daily Disposable Soft Contact Lenses," pg. 20). Toric and multifocal DD lenses are already available, and the first silicone hydrogel DD will be available in late 2009. These lenses offer patients many advantages, but let's focus on how eye care practitioners can use DD lenses to promote healthy, uncomplicated contact lens wear to high-need patients.

Allergies and Contact Lenses

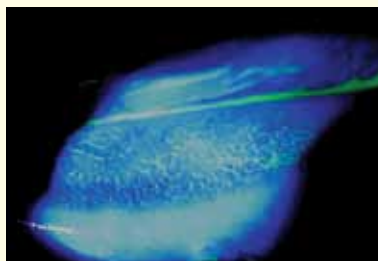
What role do allergies play in contact lens wear? It has been reported that 55% of the U.S. population tests positive for one or more allergens, and 50% of those people will have symptoms

of ocular allergies.² Recently, the Asthma and Allergy Foundation of America (AAFA) conducted a survey of 800 online participants; 33% stated that they were current contact lens wearers.³ Forty-five percent of the participants reported that eye-related allergy problems often prevented them from wearing contact lenses.² Finally, 12% of those respondents indicated that they discontinued contact lenses due to allergies.³

There are two types of allergens: seasonal and perennial. Seasonal allergens include pollen and are typically present during spring or fall, while perennial allergens, such as pet dander and mold, are present throughout the year. Patients with allergic conjunctivitis often complain of red, itchy and irritated eyes, and for these patients, slit lamp findings can include lid hyperemia, conjunctival injection or chemosis and a follicular reaction of the lower tarsal plates (*figure 1*). Those with dry eyes and subsequent reduced tear volume may have amplified

reactions because the antigens are more concentrated on the ocular surface. As the AAFA survey points out, contact lens wearers with allergic conjunctivitis have reduced wear time and sometimes have to stop lens wear altogether.³ It has been shown that soft contact lenses can become coated with a biofilm within minutes of insertion, and allergens are able to firmly attach to these biofilms and cause the lens to become an antigen depot.⁴ This subjects the conventional or frequent-replacement soft contact lens patient to high concentrations of allergens, as they build up over the wearing period. All these events can set patients up for contact lens wear failure if they have allergic conjunctivitis. Furthermore, films and deposits can persist even with proper cleaning and enzyme use.

An effective strategy to increase comfort and wear time is to have patients try DD contact lenses. Because these lenses are replaced daily, they are not exposed to the chronic build-up of antigenic material. A three-year prospective study demonstrated that patients who compared DD lenses to planned replacement lenses reported fewer symptoms of foreign body sensation, redness, cloudy vision and grittiness.⁴¹ They also reported better subjective vision, comfort and overall satisfaction. Clinically, they



1. Severe lower tarsal plate follicular reaction.

demonstrated fewer lens surface deposits, complications and tarsal abnormalities.⁴¹

Another study evaluated DD vs. habitual soft contact lenses wear among a group of allergy sufferers and showed that 67% of the patients reported improved comfort with DD lenses and had improved slit lamp findings from baseline data.⁵ But, the AAFA survey reported that 74% of patients never received any recommendation from their practitioners to try this modality.³

Contact lens-induced papillary conjunctivitis (CLPC), also known as giant papillary conjunctivitis (GPC) is not considered to be a typical allergy. It is an immunologic response to foreign substances that most commonly results from coated and deposited soft contact lenses.⁶ Additionally, the coated lens may cause mechanical irritation and the release of inflammatory mediators, which contributes to this type of conjunctivitis.⁷⁻⁹

The papillary reaction that develops as a result of CLPC on the upper tarsal plate can interfere with lens wear, making it nearly impossible. A retrospective study of 47 newly fit soft contact lens patients aimed to determine the incidence of CLPC for frequently replaced daily wear contact lenses and showed that the incidence of CLPC was 36% in patients who replaced their lenses at four weeks or longer—but only 4.5% in patients who replaced their lenses at less than four weeks.¹⁰ The study also showed that none of the patients wearing DD lenses or two-week replacement lenses developed CLPC.¹⁰ From this, we can conclude that more frequently replaced lenses will have less deposits and thus expose the patient to less antigens and mechanical trauma.^{6-9,11}

Another issue to consider is that patients can sometimes develop late-onset adverse ocular response to chemicals in contact lens solutions. Remember that these can take years of exposure to develop. For these patients, DD lenses are also a great option.

Compliance and Contact Lenses

Compliance with contact lens use and care is one of the most important aspects of preventing contact lens related problems. Noncompliant contact lens

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2. A dirty contact lens case that was presented during a routine visit.

behavior includes hygiene, solution use, appointment attendance, wearing times and replacement schedules.¹⁶ There are estimates that noncompliance in contact lens patients ranges from 40% to 99%.^{11-14,16} In fact, several studies report that patients who stated that they were compliant actually reported a wide variety of non-compliant behaviors.^{12,16} One study showed that the poorest level of compliance involved contact lens cases, which were the most frequently contaminated item.¹³ Data shows that poor storage case hygiene can put a patient at almost as much risk for microbial keratitis as extended wear (*figure 2*).¹⁵ Another group of researchers reported that 43% of patients who wore frequent replacement soft contact lenses used one pair of lenses at least one week longer than was prescribed.¹⁷ Interestingly, strategies such as consistent education using video, booklets, posters, checklists and a health care contract have been shown not to significantly affect compliance levels.¹⁸ Proper compliance with contact lenses requires following a prescribed series of steps. It only stands to reason that the more steps that are involved in this process, the more likely some will be skipped or forgotten. Patients who are noncom-

pliant—whether they realize it or not—are more likely to have their behavior reinforced if they are symptom-free. Targeting known noncompliant patients and fitting them with DD lenses is an easy and straightforward way to simplify the process of lens care. Educate these patients on the benefits and convenience that this modality offers. Most patients will be satisfied that there is an easier path to compliant lens wear. DD lenses eliminate the following noncompliant issues:

- Using non-prescribed contact lens solutions.
- Unwittingly using saline in lieu of multipurpose solution.
- Using dirty contact lens cases.
 - Topping off solution.
 - Not following the prescribed replacement schedule.
 - Case contamination.

Microbial Keratitis

Microbial keratitis (MK) is the most serious complication that can affect a contact lens wearer. MK is rare—affecting approximately five per 10,000 daily wear patients—but when severe, it can be sight threatening.¹⁹⁻²² MK is an infectious process and most cases are secondary to bacteria; *Pseudomonas* is the culprit in over half the cases.²³ Fungal and protozoan species are also



3. Note the infectious infiltrate in this microbial keratitis patient.

potential pathogens that can cause MK. Patients who present with MK experience pain, redness, photophobia and decreased vision, and their slit lamp findings include an area of focal infiltrate with an overlying ulceration (*figure 3*). In order for an infection of the cornea to occur, the offending organisms must first bind and break through the epithelium to reach the stroma. Lens-induced corneal hypoxia may predispose contact lens wearers to infection associated with compromised corneal epithelial integrity, impaired wound healing and increased bacterial binding.²⁵⁻²⁹

For 20 years, we have known that patients who wear hydrogel lenses on an extended-wear basis are at a five-fold increased risk for MK, as opposed to those patients who do not sleep in their contact lenses.¹⁹ So logically, it was hypothesized that the advent of silicone hydrogel lenses with hyper Dk would significantly reduce the risk of MK due to a reduction in hypoxia-related complications. But more recently, two companion studies have helped practitioners to understand the relative risk factors of MK for a variety of lens modalities and materials.^{24,30} What we know now from the study by Fiona Stapleton, Ph.D., MC.Optom., and colleagues is that there has been no significant reduction in risk for silicone hydrogel wearers on an extended-wear basis.^{24,30} It had also been hypothesized that the advent of DD lenses would reduce the overall risk of MK, as there is no need for hygiene and storage steps

Available Daily Disposable Soft Contact Lenses

Bausch & Lomb	SofLens Daily Disposable	hilafilcon B 59%	+6.50D to -9.00D
CIBA Vision	Focus Dailies Aqua Comfort Plus	nelfilcon A 69%	+6.00D to -10.00D
	Focus Dailies with "Aqua Release"	nelfilcon A 69%	+6.00D to -10.00D
	Focus Dailies Progressives	nelfilcon A 69%	+5.00D to -6.00D progressive add up
	Focus Dailies Toric	nelfilcon A 69%	+4.00D to -8.00D Cylinder powers: -0.75D, -1.50D Axis 90° and 180°
Vistakon	1-Day Acuvue	etafilcon A 58%	+6.00D to -12.00D
	1-Day Acuvue Moist	etafilcon A 58%	+6.00D to -12.00D
CooperVision	ProClear 1 Day	omafilcon A 60%	+6.00D to -10.00D
	ClearSight 1 Day	ocufilcon D 55%	+6.00D to -10.00D
	ClearSight 1 Day Toric	ocufilcon D 55%	plano to -7.00D Cylinder power: -0.75D, -1.25D Axis 180°, 160°, 90°, 20°
Marietta Vision	Day Star 1-Day	methafilcon A 55%	+4.00D to -8.00D
Optical Connection	Definition AC Everyday	methafilcon A 55%	+4.00D to -8.00D
Preferred Vision Group	Preferred Dailies	etafilcon A 58%	-1.00D to -12.00D
Unilens	C-Vue 1 Day ASV	methafilcon A 55%	+4.00D to -8.00D
Ocu-Ease/Optech	Elite Daily Disposable	methafilcon A 55%	+4.00D to -8.00D

that contribute to microbial contamination.³⁰⁻³² But, research conducted by John Dart, D.M., F.C.R.Ophth., found a surprisingly small increased risk for MK for DD lenses vs. planned replacement and a reduced risk of severe MK and vision loss with DD as compared to planned replacement.³⁰ In this study, no DD lens patients lost vision to a level of 20/40 or worse.

The results from the Stapleton study were similar, with no significant difference in risk of MK between DD and planned replacement lenses, and reduced risk of severe MK with DD.²⁴ No patients who wore DD lenses in the Stapleton study lost more than two lines of vision. So, why was the risk of mild/moderate MK not reduced with DD as has

been hypothesized? A closer look at the Dart study reveals some interesting factors to consider. The study showed that 30% of DD patient were wearing their lenses off-label by occasionally or regularly sleeping in their lenses, which puts the patient at the highest risk for MK.³⁰ The study also found that the brand of DD lenses made a significant impact on the overall risk of MK. For example, 1-Day Acuvue (Johnson & Johnson) had a lower overall risk of MK as compared to planned replacement.³⁰

Obviously, there are additional variables that may put patients at greater risk for MK. For instance, some lenses are more difficult to remove than others.³³ Difficult lens handling may lead to epithelial compromise, putting

the patient at greater risk.³⁰ The tendency to prescribe DD lenses for patients who are already at a higher risk due to hygiene or environmental issues could be another risk factor.³⁰ Or, severe cases may be avoided with DD wear because lens cases, which can be contaminated with gram-negative bacteria, are not utilized.²⁴ The causative organism has been shown to be the primary determinant of MK severity.²³ Although DD lenses have not reduced mild/moderate MK as compared to planned replacement lenses, they do reduce the risk of severe MK and vision loss, which are both important considerations.

Besides cosmesis, patients prefer contact lenses because glasses can interfere with athletic or leisure activities. But, as we know,

exposure to water can increase the risk of adverse events, such as MK. Water of all types—tap, swimming pools, rivers and oceans—contains microorganisms. A sampling of swimmers who wore soft contact lenses in a chlorinated pool showed that *Staphylococcus epidermidis* was the most common species identified in the water itself, while small amounts of *Staphylococcus aureus* and *Streptococcus salivarius* were found both in the water and on the lenses of swimmers.³⁴ And, as can be imagined, the diversity of organisms rises dramatically in the case of streams, rivers and oceans.

The protozoan *Acanthamoeba*—ubiquitously found in water of all types and soil—poses the most serious threat to soft contact lenses patients who are exposed. *Acanthamoeba* are free-living and exist as mobile trophozoites or dormant cysts.^{35,36} The active trophozoite form is able to bind to the cornea, especially to areas of abrasion, often associated with contact lens wear. They then produce a cytotoxic serine protease enzyme that destroys corneal integrity, producing a keratitis.³⁶ *Acanthamoeba* keratitis (AK), which has shown increased incidence in the last decade, usually runs a protracted course that is sight-threatening.³⁷

Treatments with antimicrobial agents for six to 12 months are not uncommon. Even after the active infection is no longer present, the cyst may still have the potential to reactivate months later. In cases where corneal transplantation is needed, surgery is delayed until the cyst has resolved. Multiple studies indicate that approximately 30% of all AK cases are associated with patients swimming in

their contact lenses.³⁷⁻³⁹ To date, *Acanthamoeba* is not included in product approval of disinfection products, but the increased incidence of AK has prompted the FDA to pursue a recertification of care systems that would include testing methodology for this particular protozoan.^{36,40}

For all the reasons stated above, it is critical that contact lens patients be educated and take the necessary steps to reduce their risk of *Acanthamoeba* if they are going to wear their soft contact lenses for water-related activities. Instruct patients to wear tight-fitting goggles or masks if they know that they will be submerged or splashed. If the patient's lenses are exposed to water, it seems only reasonable that the safest way to eliminate the risk would be to immediately throw the lenses out when the water activity is over. With this in mind, DD lenses would be the perfect replacement option for these patients, as they would not have to rely on a contact lens care system. Even patients who normally wear frequent-replacement soft lenses could have a set of dailies that they use exclusively for water activities.

Introducing Daily Disposable Wear to Your Patients

With all the benefits of DD wear, why do only 13% of U.S. patients take advantage of this modality? As mentioned earlier, the obvious answer is cost. Unless the patient brings up a specific type of lens or wearing schedule, the practitioner is the one who presents the choices when fitting or refitting patients. Most practitioners are reluctant to even bring up the topic of DD lenses out of fear that the patient will find the

increased price unacceptable. But, be careful not to prejudice what a patient is willing to pay for comfortable and safe glasses-free vision. Patients may respond well to your recommendation, and this is especially true for patients who are on the verge of dropping out of lens wear with discomfort as the culprit.

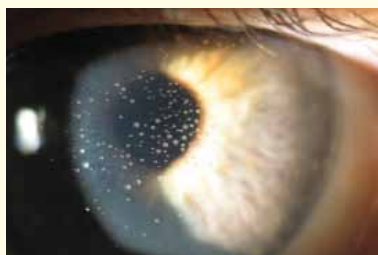
For instance, let's consider a contact lens patient who suffers from severe allergic conjunctivitis. As we know, planned-replacement soft lenses are likely to continually build up environmental allergens on the lens surface, exposing the patient to a greater concentration to antigens. Not to mention that the additional accumulation of protein and lipid deposits provide additional irritation. All of this leads to significantly reduced wearing time or causes the patient to drop out of lens wear all together. Presenting the DD lens modality as an option to this patient could be just what the doctor ordered.

In my practice, a significant percentage of patients who have LASIK consultations cite contact lens discontinuation due to the discomfort of seasonal or perennial allergic conjunctivitis. Yet, many contact lens patients are unaware that DD wear is an option for maintaining healthy and comfortable contact lens wear. The first step to a successful introduction is identifying those patients who would significantly benefit from the DD modality. Besides allergy sufferers, other candidates might include patients with a history of poor compliance, athletes and heavy depositors (*figure 4*). Once you've selected the candidates, the next step is to educate them about DD lenses and how they can immediately impact their soft contact

lens wear. Patients must understand exactly why this lens is more beneficial—otherwise, they won't pay more for something they perceive as providing little additional advantage. Discuss the advantages of this modality—increased comfort, increased wearing time, easier compliance, less risk of severe MK and vision loss. The final step is to let them try the lenses for one to two weeks. In my experience, allergy and CLPC patients immediately find DD lenses more comfortable and appreciate the DD advantages. And, noncompliant patients will enjoy the simplicity of not having to deal with any care regimen. Some may like to stay in their planned-replacement lenses, but use DD lenses for sports related activities or traveling. Again, a trial pack of lenses will best demonstrate the simplicity that DD lenses have to offer.

Health and Convenience

Daily disposable lenses can serve as the turning point that offers allergy sufferers a more comfortable way to wear contact lenses. For known noncompliant patients, DD wear eliminates the risk associated with dirty contact lens cases and topping off. For swimmers, they offer the advantage of a more convenient way to discard lenses, especially in the event of water exposure. While these lenses do not reduce the risk of mild to moderate MK, they greatly decrease the risk of severe MK and associated vision loss, which has always been the worst-case scenario for contact lens patients. The development of lens materials that incorporate an antimicrobial surface may further improve the safety profile of DD lenses. With increased parameter and material options, DD wear will continue to



4. This is a heavily deposited soft lens on a potential candidate for single-use contact lenses.

provide more patients with healthier contact lens options. **RCCL**

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Self-Assessment Examination: Promoting Healthy Contact Lens Wear

DIRECTIONS: To obtain 2 hours of continuing education credit, complete the exam by recording the best answer to each self-assessment question on the Examination Answer Sheet on Page 23. Mail the answer sheet to Optometric CE, P.O. Box 488, Canal Street Station, New York, NY 10013. A minimum score of 70 is required to obtain a certificate of completion. There is no fee for this course.

1. Daily disposables were first available in ____?
 - a. 1990.
 - b. 1995.
 - c. 2000.
 - d. 2003.
2. According to the 2008 International Prescribing Report, what percentage of patients in the U.S. were fit into daily disposable soft contact lenses?
 - a. 10%.
 - b. 13%.
 - c. 20%.
 - d. 30%.
3. According to a survey by the Asthma and Allergy Foundation of America, what percentage of respondents indicated they discontinued contact lens wear due to allergies?
 - a. 1%.
 - b. 12%.
 - c. 20%.
 - d. 40%.
4. Patients with allergic conjunctivitis often exhibit which of the following slit lamp findings?
 - a. Uveitis, meibomian cysts and chemosis.
 - b. Conjunctival injection and chemosis.
 - c. Chemosis and pterygia.
 - d. Lower tarsal plate follicular reaction, conjunctival injection and chemosis.
5. Within minutes of contact lens insertion, contact lenses can become coated with which of the following?
 - a. Lipids.
 - b. Proteins.
 - c. Biofilms.
 - d. Toxins.
6. GPC or CLPC is an immunological response most commonly secondary to which of the following?
 - a. Exposed sutures.
 - b. Contact lens deposits.
 - c. Ocular prosthetics.
 - d. Dry Eye Syndrome.
7. In a study by Donshik and Porazinski, what percentage of patients who wore daily disposables developed CLPC?
 - a. 0%.
 - b. 5%.
 - c. 0%.
 - d. 20%.
8. Which of the following is not associated with contact lens noncompliance?
 - a. Hygiene.
 - b. Wearing time.
 - c. Appointment attendance.
 - d. Contact lens drop out.
9. The Yung study showed that the poorest level of contact lens non-compliance involved which of the following?
 - a. Multipurpose solutions.
 - b. Contact lens cases.
 - c. Wearing time.
 - d. Replacement schedule.
10. Daily disposables target all of the following behaviors except _____.
 - a. Using saline solution for soft contact lens storage.
 - b. Dirty contact lens cases.
 - c. Wearing lenses on an extended wear basis.
 - d. Topping off multipurpose solutions.
11. The rate of MK for contact lens wearers is approximately:
 - a. 5/10,000.
 - b. 500/10,000.
 - c. 750/10,000.
 - d. 1/1,000,000.
12. Which of the following pathogens can cause MK?
 - a. Bacterial, fungal, protozoan.
 - b. Protozoan and bacterial
 - c. Prionic and viral.
 - d. Fungal.
13. Patients who sleep in their soft contact lenses increase their risk for MK by _____.
 - a. 5.
 - b. 7.
 - c. 15.
 - d. 20.
14. Daily disposables may be beneficial for allergy sufferers because _____.
 - a. They eliminate the use of contact lens cases.
 - b. They eliminate chronic build up of antigenic materials.
 - c. They are able to sleep in their lenses.
 - d. Daily disposables are coated with antihistamines.
15. According to studies by Drs. Dart and Stapleton, the risk for severe MK and secondary visual loss with daily disposables is _____.
 - a. Increased.
 - b. About the same as with other modalities.
 - c. Reduced significantly.
 - d. Increased significantly.

