

Soft Contact Lens Solutions:

Is Simple Really Better?

Senior Research Project

by

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ABSTRACT

Background: Many soft contact lens disinfecting systems claim simplicity and convenience. This study will show the actual time savings these systems provide, along with their estimated annual cost.

Methods: Five experienced soft contact lens wearers tested six disinfection systems: ReNu, Opti-Free, AOSEPT, UltraCare, Quick Care, and Pure Eyes. Complete, Opti-One, Opti-Free Express, Flex Care, and Hydrocare are considered equivalents in this study, and are also compared.

Results: The quickest systems tested are the multi-purpose solutions, providing a 28 to 78 percent time savings over the other systems. They are also significantly less expensive than most other systems.

Conclusions: Simplicity and convenience are important considerations in prescribing a soft contact lens disinfection system, but other factors must be included in determining the individual best system for each patient.

Key Words: soft contact lens disinfection solutions, time savings, annual cost, antimicrobial activity, compliance

In a world where speed and convenience are considered high standards, it comes as no surprise to the eyecare practitioner the successes of the disposable contact lens and multi-purpose solutions (MPS). Since the introduction of ReNu in 1987, no less than five other systems have joined the ranks of claiming speed, convenience, and efficacy in cleaning and disinfecting soft contact lenses. Several of them have had their efficacy in disinfecting evaluated, but no study has been done to determine the actual time saved by using them.

This study was designed to compare the amount of time needed to cycle a single lens using six disinfection systems. The word “cycle” is preferred instead of “clean,” because the lenses used had not been worn or artificially soiled. The systems tested were:

- ReNu
- Opti-Free
- AOSEPT
- UltraCare
- Quick Care
- Pure Eyes

Several systems were not tested because they are identical in the number of components and cleaning instructions. Subsequently, Complete, Opti-One, and Opti-Free Express are considered equivalents to ReNu in this study, as are Flex Care and Hydrocare considered equivalents to Opti-Free.

MPS systems use “soft” disinfectants -- ones that are not toxic to the eye -- to gain convenience. This may seem like an unnecessary risk, but with proper use, these systems are making soft contact lenses easier to care for. To aid the eyecare practitioner in dispensing the most appropriate disinfection system, this study will compare the time needed to care for soft lenses using the different systems, the cost for one year's use of each system, and consider some differences in antimicrobial efficacy.

METHODS

Five experienced soft contact lens wearers were recruited to cycle a soft contact lens three times using each of the six solution systems. All the participants had used a MPS system at one time, and most had used one of the hydrogen peroxide systems. When a participant had no prior experience with a system, a “dry run” was done to acquaint them with the instructions. To aid in eliminating a possible learning curve, the cycling order was randomized.

A -3.00D, 9.0BC Bausch and Lomb Medalist lens was used for each participant, as this lens design is packaged for conventional, frequent replacement, and disposable use. The

lenses were cycled according to the instructions packaged with each system. Each participant was given these instructions, and in areas where specifics were not included, was allowed to interpret them as they saw fit. In all aspects of the study, efforts were made to ensure consistency, so that the times recorded would accurately reflect the differences in the number and types of steps to cycle the lens using each system.

The timed portion began by the participant moving the bottle(s) and case of the system, one component at a time, to the countertop of a sink. A lens was placed in the palm of their non-dominant hand, and they proceeded with cycling the lens according to manufacturer's instructions. Technique and actual lens cleanliness were not evaluated in this study. The timed portion concluded when all instructions had been followed, the lens had been cased, and the bottle(s) and case were returned -- one component at a time -- to their starting positions.

Solution use was tracked so an estimate of the total volume needed for a full year could be determined. This information was used to calculate an approximate annual cost for each system.

RESULTS

As one might expect, the fewer components a system has, the less time it takes to use it. ReNu (equated with Complete, Opti-One, and Opti-Free Express), with a single bottle, took an average of 64 seconds to cycle a lens. UltraCare, with three bottles and a foil-packed tablet, took nearly twice as long, an average of 114 seconds (Figure 1). The other care systems fell in line between these, based on the number of components (Table 1). Keep in mind that these times were determined by cycling **one** lens.

Time Comparison of Means For Cycling One Lens

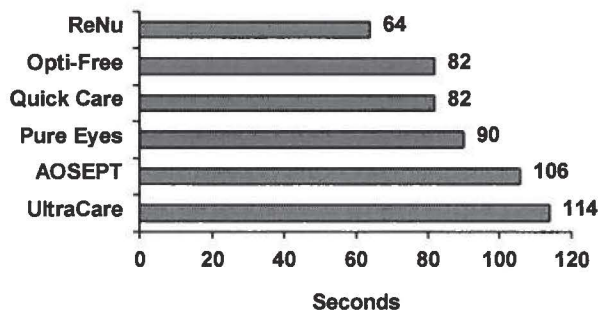


Figure 1

Comparison of All Lens Cycles (in seconds)

<u>System</u>	<u>Range</u>	<u>Mean</u>	<u>SD</u>	<u>Components</u>	<u>Time Increase</u>	<u>% Increase</u>
ReNu	35-92	64	21	2	Standard	Standard
Opti-Free	57-114	82	18	3	18	28%
Quick Care	57-133	82	21	3	18	28%
Pure Eyes	64-117	90	17	3	26	41%
AOSEPT	67-137	106	18	4	43	66%
UltraCare	90-133	114	12	5	50	78%

Table 1

The components of a system include solution bottles for cleaning, rinsing, and disinfection, as well as the case; enzyme systems and rewetting drops were not included in this number. In the AOSEPT system, the platinum disk is not considered a component, since it becomes a part of the case. For UltraCare, the neutralizing tablet is considered a component, because it must be added with each use.

Figure 2 shows the extra time needed to cycle a **pair** of lenses for a non-MPS system. The percentage value relates to the amount of extra time needed to cycle two lenses.

Increase In Total Cycling Time With MPS Systems As Standard

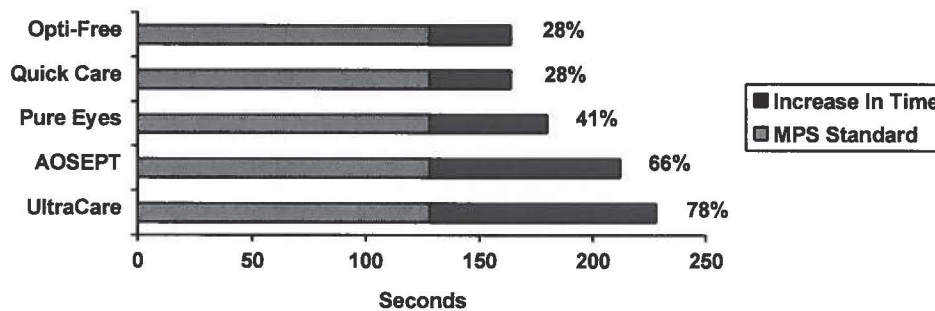


Figure 2

Because many of these systems are similar in the amount of time it takes to care for the lenses, cost may be a deciding factor in choosing which one to prescribe. Table 2 lists the

approximate annual cost for each system, including those considered to be equivalents to the systems tested. The second price listed includes the cost of weekly enzyming. Since MPS systems typically need less frequent enzyming, if at all, the overall cost may actually be less. Costs were determined from averaging the standard pricing found at three nationally-known discount retailers in Michigan, using the largest available quantity per unit. The systems are ranked from lowest to highest cost.

Ranking of Estimated Annual Cost

<u>System</u>	<u>Cost</u>	<u>Mean Time</u>	<u>Disinfectant</u>
ReNu	\$70 / 105	64	Polyaminopropyl biguanide (Dymed)
Opti-Free Express	\$81 / 120 *	64 **	Polyquaternium-1 (Polyquad)
Complete	\$81 / 134	64 **	Polyhexamethylene biguanide (TrisChem)
Pure Eyes	\$88 / 122 *	90	Hydrogen peroxide
Quick Care	\$94 / 120 *	82	Isopropanol and sodium chloride
AOSEPT	\$111 / 145	106	Hydrogen peroxide
Opti-One	\$117	64 **	Polyquaternium-1 (Polyquad)
Opti-Free	\$120 / 159	82	Polyquaternium-1 (Polyquad)
Flex Care	\$159 / 185	82 **	Chlorhexidine gluconate
Hydrocare	\$161 / 191 *	82 **	Thimerosal
UltraCare	\$193 / 227	114	Hydrogen peroxide

*Average based on fewer than three prices

**Equivalent times (not actually measured)

Table 2

A learning curve trend was noticed in only two systems. With four of the five participants, their second and third trials were both quicker than their first while using AOSEPT, with the difference between their individual fastest and slowest time ranging from 7 to 22

seconds. On the contrary, four of the five participants recorded slower times in a similar fashion while using ReNu, with a range of 9 to 11 seconds. These trends had no significant impact on the results, and no compensation was made.

DISCUSSION

When it comes to simplicity, the MPS systems are considered equal among themselves -- and better by at least 28 percent -- in saving time over the other systems that claim convenience. When compared to the systems with the most components, they are 66 percent faster than AOSEPT and 78 percent quicker to use than UltraCare. The MPS systems are also significantly less expensive to use, between 14 and 276 percent.

In terms of actual time saved for cycling a pair of lenses, the MPS systems save over half a minute from Quick Care, Opti-Free, Flex Care, and Hydrocare. They save about a full minute over Pure Eyes, nearly a minute and a half from AOSEPT, and close to one and three-quarter minutes over UltraCare. This may not seem like much time, but these minutes spent taking care of contact lenses are often the only thing between the patient and what they consider to be more important activities. **Any** time saved can be perceived as significant to your patient.

The systems naturally fall into three categories: one bottle MPS systems, systems claiming convenience with a separate cleaner, and peroxide systems with a separate cleaner. The following is a discussion of these categories.

Only one system is limited in its scope of use: Opti-One. The packaging explains that it is "not intended for use with lenses prescribed to be kept longer than two weeks." Subsequently, only ReNu, Complete, and Opti-Free Express can be considered its counterpart. For the two week or less disposable lens market, Opti-One is considered an equal in cycling time, but is the most expensive of the MPS systems. Therefore, it does not appear to have an obvious advantage over the other MPS systems.

Every MPS system claims superiority. There have been no lack of marketing campaigns to convince the eyecare practitioner that one is better than the other. However, no objective studies comparing all the systems have been done. Until then, ReNu, Opti-Free Express, and Complete must be considered equals except for price. ReNu is slightly less expensive, and becomes a better deal when an enzyme regimen is required.

The real differences are in those systems that still claim convenience, but use a separate cleaning solution. Opti-Free, Hydrocare, Flex Care, Quick Care, and Pure Eyes basically take the same amount of time, but differ greatly in type of disinfectant, care strategy, and cost. Pure Eyes and Quick Care are significantly less expensive than the other three systems.

Quick Care and Pure Eyes are both unique products. Quick Care relies on a 30 second rub in a hypertonic sodium chloride solution containing isopropanol for disinfecting; the finishing solution is only for rinsing and storage. It is also the only system that can clean and disinfect lenses in a matter of minutes, allowing your patients the option to store dirty lenses overnight so they can be cleaned and worn the next morning. Pure Eyes, an AOSEPT spin-off, does not use a separate cleaner like MiraFlow; instead, it uses a combination cleaner/rinse solution prior to an overnight soak in hydrogen peroxide. Both systems package a new lens case with the disinfectant, which lasts about a month. They are relatively equal in cycling time and price, but have obvious differences in their disinfectants and cleaning regimens.

As for comparing the other peroxide systems, AOSEPT is slightly quicker to cycle a pair of lenses, and 58 percent less expensive than UltraCare. The extra expense is due to the use of Lens Plus aerosol saline versus AOSEPT saline in a plastic bottle. The preservative free nature of aerosol saline can be necessary, but they tend to empty faster than the equivalent sized plastic bottle, and cost one-third more per container. For the many patients who are not preservative sensitive, using saline packaged in plastic bottles would make the cost of these two systems almost identical. It takes six hours for AOSEPT to neutralize the hydrogen peroxide, where UltraCare does it in two hours; this makes UltraCare the second fastest system for complete disinfection.

When it comes to dispensing a disinfection system, it can be tempting to give your patient a sample of your favorite system, or one based on replacement modality. Admittedly, a conventional wear lens usually requires a more thorough cleaning and disinfecting system than a two-week, or even two-month, disposable, but there are other factors that come into play in prescribing a lens care system: the age of the patient, personal hygiene, vocation, type of disinfectant needed, cost, tear composition, overall ocular health, and previous complications. This is in no way a complete list. It does, however, highlight the need to consider more than your best stocked sample when you reach for a disinfection system.

To be successful, all disinfection systems must meet minimum criterion. They must clean the lens of debris, disinfect the lens of microbial challenges, and return the lens to a tonicity compatible with the eye. But to measure success from the patient's point of view, which is the true measure of success, the system must also be compatible with their lifestyle. Most patients want convenience, and this desire has become the premise for the development of simplified lens care systems.

The trouble with this is that previous studies have shown peroxide systems like AOSEPT and UltraCare provide better antimicrobial activity over non-peroxide systems like ReNu and Opti-Free.^{1,2} The quandary lies in choosing what is more important for your patient: the strongest disinfectant, or a disinfection system that offers greater convenience. To help resolve this dilemma, a new study shows only a small decrease in disinfection activity for Opti-Free and Complete, when compared to AOSEPT and UltraCare.³ Of particular interest was the finding that chemical disinfectants were better at maintaining the microbial population during storage than the peroxide-neutralizer systems. For patients with variable

wearing schedules, chemical systems may provide greater protection against recontamination.

All of this is good news for the eyecare practitioner. It lets you choose the right disinfection system in light of the lens modality and the individual make-up of your patient needs. For a patient who barely has time to make their follow-up appointments, demonstrates no compromise to the eye, and is wearing a one month lens, ReNu, Complete or Opti-Free Express are excellent choices. (So is Opti-One, for two-week or less disposable modalities.) Taking about two minutes from eye to case, and with simple instructions, they often do a fine job. But if that same patient has a mild form of chronic blepharitis, for example, a system with a stronger disinfectant might be wise.

For the patient to fully appreciate the benefit of this change, you will need to re-educate them on the purpose and use of this new system. Otherwise, compliance may be compromised, as well as their ocular health. A study of 70 contact lens patients revealed that fully two-thirds did not comply with manufacturer's instructions for the daily cleaning of their lenses.⁴ Surprisingly, most of these patients were not aware of their error. Another study has shown that long-term wearers are the greatest culprits; they have either never been properly instructed, or have picked up bad habits.⁵ The need for patient education and specific follow-up questions on compliance cannot be understated.

Perhaps the most important advice you can share with your patients is the need for mechanical rubbing of their lenses, followed by a good rinse. Studies show that rubbing with a surfactant cleaner and rinsing with saline removes up to 95 percent of the potential pathogens from the lens.⁶ Another study compared protein deposition between lenses that were digitally cleaned for the manufacturers' recommended 20 seconds verses those for either 12 or 5 seconds. The lenses cleaned for a reduced time had a noticeable increase in protein accumulation.⁷

No lens care disinfectant was designed to be solely responsible for neutralizing every microbial challenge; however, your patients often believe the opposite. Successful lens care is a joint effort between the patient rubbing and rinsing the lens, and the disinfectant providing antimicrobial activity against the remaining pathogens. When patients know this, and act accordingly, lens care complications should be a rare event.

Another way of minimizing complications is to instruct your contact lens patients that not only is the lens disposable, but so is the storage case. A new study shows that 82 out of 101 lens cases were found to be contaminated from a population of asymptomatic daily wear cosmetic contact lens wearers.⁸ Some systems come with a new case in each package of the disinfectant, making replacement an automatic process. Either way, patients need to think of soft contact lenses and their storage cases in terms of planned replacement.

CONCLUSION

When it comes to soft contact lens disinfection systems, is simple really better? This study has shown that there are obvious time savings for some of the newer systems, and that many of them are less expensive to use. To base a decision on which system to prescribe solely by the strength of its disinfectant or replacement modality ignores the individuality of the patient's needs. To ensure success in fitting contact lenses, eyecare practitioners need to consider this individuality, and properly educate patients in the best methods of contact lens care.

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