Assessment of Contact Lens Care Products Antimicrobial Efficacy in the Presence of Lehfilcon A Contact Lenses

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Purpose

This study evaluates the antimicrobial efficacy of the "Contact Lens and Contact Lens Care system" of TOTAL30® (lehfilcon A), the new Alcon monthly replacement contact lens, a silicone hydrogel water gradient contact lens, almost ~ 100% water on the surface with OPTI-FREE Products (Express®, Replenish®, and Puremoist®) and CLEAR CARE® and CLEAR CARE Plus® microbiological test method ISO 18259 against bacteria, yeast, mold and *Acanthamoeba*.

Methods

Table 1. Products

Product	Biocide(s)
OPTI-FREE® PureMoist®	polyquaternium-1 0.001% (POLYQUAD®) myristamidopropyl dimethylamine 0.0006% (ALDOX®)
OPTI-FREE® Replenish®	polyquaternium-1 0.001% (POLYQUAD®) myristamidopropyl dimethylamine 0.0005% (ALDOX®)
OPTI-FREE® Express®	polyquaternium-1 0.001% (POLYQUAD®) myristamidopropyl dimethylamine 0.0005% (ALDOX®)
CLEAR CARE®	3% hydrogen peroxide
CLEAR CARE® Plus	3% hydrogen peroxide + wetting agent

Table 2. Microorganisms

ISO 18259 Microorganisms	Additional Microorganisms
S. aureus ATCC 6538	*F. chlamydosporum* MCC 5663
P. aeruginosa ATCC 9027	*F. roseum* MCC 5662
S. marcescens ATCC 13880	*Fusarium spp.* MCC 1620
C. albicans ATCC 10231	*A. castellani* ATCC 50370
F. keratoplasticum ATCC 30361	*A. polyphaga* ATCC 30461

Table 3. Methods

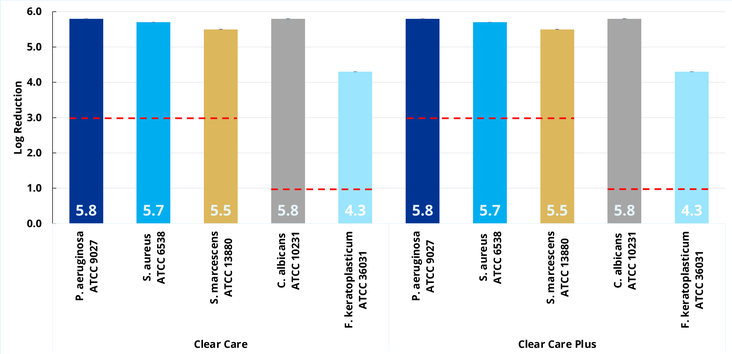
ISO 18259 Test Method
Lehfilcon A, pre-soaked for 18 hours in PBS, were inoculated in manufacturer's recommended lens cases at 10^5-10^6 CFU/lens. Appropriate volumes of MPDS were added to the lens cases. Test was conducted according to ISO 18259.
All MPDS were tested against the five ISO panel microorganisms plus two *Fusarium* isolates. H_2O_2 products were also tested against *Acanthamoeba* trophozoites and cysts at 10^4 cells/lens.
Test samples were evaluated for microbial loads at disinfection time (DT – 6 hours) using validated recovery methods. Appropriate incubation times and temperatures were observed.
Log reductions (LR) were calculated using the formula: LOG (initial CFU/mL) – LOG (final CFU/mL).

Conclusions

MPDS and H_2O_2 CLC products demonstrated antimicrobial efficacy against ISO panel microorganisms, clinical isolates of *Fusarium* and *Acanthamoeba* trophozoites and cysts in the presence of TOTAL30® (lehfilcon A) contact lenses and manufacturer's lens cases.

Results

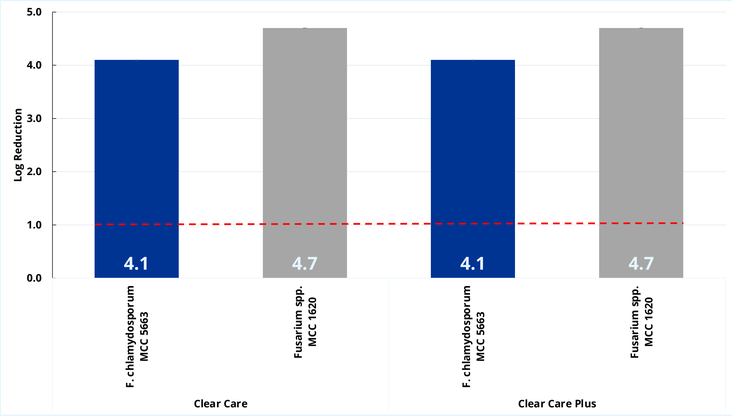
Figure 1. CLEAR CARE Products Vs. ISO Panel Microorganisms



Both CLEAR CARE products had total kill in the presence of lehfilcon A, which also met the primary criteria for ISO 14729 (≥3 log reduction for bacteria, ≥1 log reduction for yeast and mold) against all five ISO panel organisms.

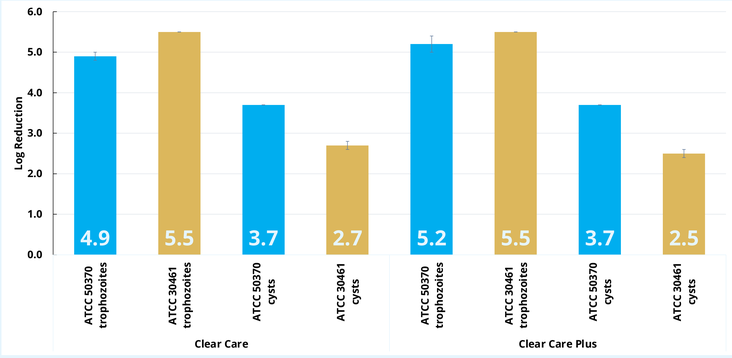
---- ISO 14729 Primary Criteria

Figure 3. CLEAR CARE Products Vs. *Fusarium* Clinical Isolates



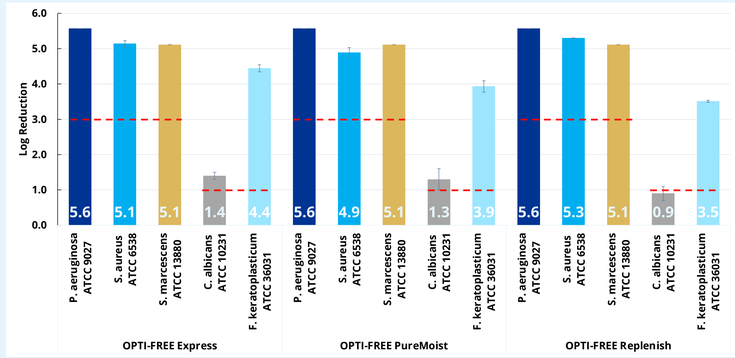
Both CLEAR CARE products had total kill in the presence of lehfilcon A, which also met the primary criteria for ISO 14729 (≥1 log reduction for mold) against two *Fusarium* clinical isolates.

Figure 5. CLEAR CARE Products Vs. *Acanthamoeba* Trophozoites and Cysts



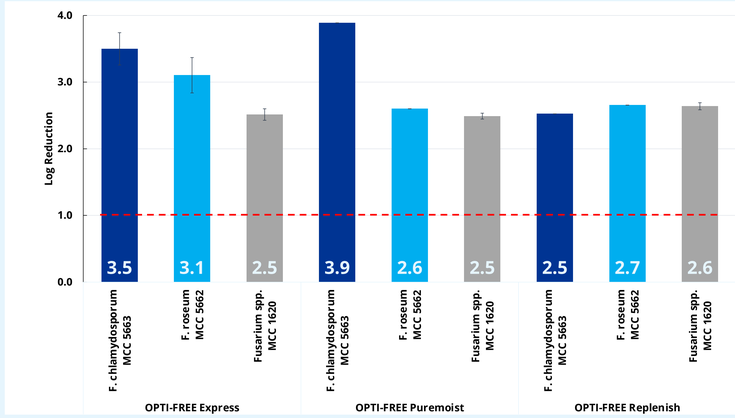
CLEAR CARE products had approximately total kill with Trophozoites for the 2 strains and log reduction of 2.5-3.7 for cysts in the presence of lehfilcon A.

Figure 2. OPTI-FREE Products Vs. ISO Panel Microorganisms



All OPTI-FREE products showed total kill against *P. aeruginosa* and *S. marcescens*, 4.9-5.3 LR for *S. aureus*, 0.9-1.4 LR for *C. albicans* and 3.5-4.4 LR for *F. keratoplasticum,* which met the primary criteria for ISO 14729 (≥3 log reduction for bacteria, ≥1 log reduction for yeast and mold) against all five ISO panel organisms in the presence of lehfilcon A (except Replenish vs. *C. albicans*).

Figure 4. OPTI-FREE Products Vs. *Fusarium* Clinical Isolates



All OPTI-FREE products showed 2.5-3.9 LR in the presence of lehfilcon A, which met the primary criteria for ISO 14729 (≥1 log reduction for mold) against three *Fusarium* clinical isolates.

References

1. ISO 18259:2014 "*Ophthalmic optics – Contact lens care products – Method to assess contact lens care products with contact lenses in a lens case, challenged with bacterial and fungal organisms*"
2. ISO 14729:2001 A1/2010 "*Ophthalmic optics – Contact lens care products – Microbiological requirements and test methods for products and regimens for hygienic management of contact lenses*"
3. Gabriel MM, McAnally C, Bartell J, Walters R, Clark L, Crary M, Shannon P. Biocidal Efficacy of a Hydrogen Peroxide Lens Care Solution Incorporating a Novel Wetting Agent. *Eye & Contact Lens* 2019; 45(3):64-170
4. Gabriel MM, McAnally C, Bartell J. Antimicrobial efficacy of multipurpose disinfecting solutions in the presence of contact lenses and lens cases. *Eye Contact Len.* 2018; 44(2):125–131
5. McAnally C, Walters R, Campolo A, Harris V, King J, Thomas M, Gabriel MM, Shannon P, Crary M. Antimicrobial Efficacy of Contact Lens Solutions Assessed by ISO Standards. *Microorganisms*. 2021; 9(10):2173