SHORT-TERM OVERNIGHT STUDY WITH SELENIUM ANTIBACTERIAL SILICONE HYDROGEL CONTACT LENSES

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INTRODUCTION
Selenium (Se) is a trace mineral essential for cellular function. Dietary selenium comes from nuts, cereal, meat, fish and eggs. Bacterial contamination of lenses during continuous wear is associated with inflammation and infection. Selenium covalently attached to a surface is a catalytically biocidal agent which can arrest local cellular growth by creating transient, localized, free radicals.¹

PURPOSE
Study aims were to evaluate the antibacterial efficacy of Se-coated silicone hydrogel lenses in vitro and ex vivo, and assess cytotoxicity and clinical safety of Se-coated lenses.

MATERIALS AND METHODS
Se-coated balaficon A lenses were challenged with Staphylococcus aureus 31 or Pseudomonas aeruginosa 6294. After 24 hours incubation, bacterial colonization numbers on lens surfaces were enumerated. Biofilm formation on selenium and control lenses were also examined under microscope after staining with fluorescein by using the LIVE/DEAD BacLight Bacterial Viability Kit. Cytotoxicity of Se lenses was examined by using standard cell growth inhibition assay. To detect difference of 0.5 ± 0.5 in bulbar/limbal redness and 10 ± 15 in comfort rating at 80% power, 20 subjects were required. 20 subjects completed a double masked, contralateral, randomised, controlled clinical trial by wearing Se-coated lens on one eye and standard balaficon A lens on alternate eye for 24 hours. Clinical assessments were performed during the course of the trial (3L, 6 hours, Prior to sleep and On waking). Grading scale for clinical variables was from “0” (Absent) to “4” (Severe) in 0.1 steps. Lenses were collected aseptically at trial conclusion and assessed for ex vivo antimicrobial activity.

RESULTS
No differences were observed for corneal (Fig 3) and conjunctival staining between both lenses. Biofilms formed by test strains on Se-lenses were markedly less than on control lens surfaces (Fig 2). Se lenses showed significant antimicrobial activity against S. aureus 31 in vitro, reducing colonization of S. aureus 31 by more than 3-log units (Fig 1A). Se lenses inhibited biofilm formation by P aeruginosa 6294 (Fig 2). Se lenses showed no significant cytotoxicity/cytokine growth inhibition. Se lenses behaved similarly to control lenses for bulbar (Figure 4A) and limbal redness (Figure 4B). Subjective responses and fitting performance between test and control lenses were similar.

CONCLUSION
The results of the study suggest that Se-coated lenses are able to inhibit bacterial colonization. The overall clinical performance of the Se-lenses was comparable to the commercially available lens, and the efficacy of Se-lenses is maintained after 24 hours CW. A larger scale, continuous wear, dispersing trial is required to further assess safety and efficacy of selenium lenses.

REFERENCES
¹ Mathews SM, Spoholz JL, Grimson MJ, Dubinzig RH, Gray T, Reid T. Prevention of Bacterial Colonization of Contact Lenses with Covalently Attached Selenium and Other Rabbit Cornea. Cornea 2006; 25(7): 806-814

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