Efficacy of Multi-Purpose Contact Lens Solutions on Passive Lysozyme Removal from Silicone Hydrogel and Conventional Hydrogel Contact Lenses

F. Zhang 1,2, M-A Glasier 1, H. Sheardown 2, L. Corsthorne 2, L. Jones 1,2
1. Centre for Contact Lens Research, School of Optometry, University of Waterloo, Ontario, Canada
2. Dept of Chemical Engineering, McMaster University, Hamilton, Ontario, Canada

Introduction

- Protein deposition from tear film components is a major contribution to hydrogel contact lens spoilation. These deposits adversely affect comfort, vision, and result in ocular complications such as giant papillary conjunctivitis.
- Lysozyme plays a dominant role in protein deposition on hydrogel contact lenses. However, silicone hydrogel (SH) lenses adsorb considerably less lysozyme than conventional hydrogel lenses.
- Current multi-purpose care regimens are typically used in a “no-rub” format, where lenses are placed in the regimen overnight, with no physical rubbing of the lenses being employed.
- The majority of available regimens were developed for conventional lens materials and have been formulated to optimize protein removal, frequently including components such as citric acid and Hydranate® (hydroxalkylphosphonate).
- To-date, very little data exists on the ability of current care regimens to passively remove lysozyme from SH materials.

Purpose

- To evaluate the ability of 6 “no-rub” multipurpose solutions to passively remove lysozyme from silicone hydrogel (SH) and conventional hydrogel (CH) contact lens materials, using a radiotracer technique.

Materials & Methods

- Regimens: Alcon OptiFree® Express® (OFX), AO Amo Complete® Moisture Plus™ (COM), B&L ReNu® MultiPlus® (RMP), CIBA Aquish™ (AQ), and CIBA ClearCare® (CC).

- Four SH materials (balafilcon, galyfilcon, lotrafilcon A and lotrafilcon B) and 4 CH materials (polymacon, omafilcon, alphafilcon and etafilcon).

- Artificial lysozyme preparation was prepared at the final concentration of 2.0 mg/ml in 10-mM phosphate buffered saline, pH 7.4.
- Artificial lysozyme solution was prepared at the final concentration of 2.0 mg/ml in 10-mM phosphate buffered saline, pH 7.4. 125I-Lysozyme was diluted by unlabeled lysozyme solution to a gamma counting rate of 10^6 CPM/ml.
- To measure the amount of lysozyme remaining on each lens, the saline was incubated, lenses were rinsed in PBS briefly before soaking statically for 8 hours in lens cases containing 3 ml or in polypropylene tubes with 15 ml of each care regimen, at room temperature. After passive cleaning, lenses were removed from the regimens without rinsing in the saline. Cleaned lenses and soaking regimens were measured separately for gamma radioactivity (Beckman Gamma 5500).
- The calculation of % cleaning efficacy is the ratio of gamma counting (lens plus regimen), multiplied by 100%.

- All data were reported as mean and standard deviation bars. One-way ANOVA and multiple comparison tests were run. A p value < 0.05 indicated a significant difference.

Results

- Using a radiotracer technique, we were able to directly measure the amount of lysozyme remaining on lenses after exposure to a variety of care regimens. For CH materials, etalphilcon was most influenced by the care regimen composition. For SH materials, galyfilcon was most easily cleaned, possibly due to its hydrophilic lens surface treatment (HydraClear™), which is PVP-based.

Conclusions

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