Impact of a Novel Contact Lens on Maintaining the Native State of a Tear Film Protein

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Introduction

The dynamics of protein interactions with the interface of contact lenses can be complex and can play a role in contact lens wear success. Tear proteins have beneficial properties that help maintain the balance of ocular surface homeostasis, evidenced by research of the structural changes of lysozyme relative to stabilizing the tear film[1,2] and to its lubricating properties.[3]

Contact lenses, by nature, alter the balance of ocular homeostasis. A novel contact lens, kalifilcon A daily disposable contact lenses, has integrated multiple moisturizers (Poloxamine 1107 and Poloxamer 181) infused into the lens material to help stabilize the tear film. Moisturizing components also help retain hydration and provide a smooth wettable surface.

This *in vitro* study investigates the ability of the kalifilcon A solution to stabilize the representative tear film protein lysozyme in its native state.

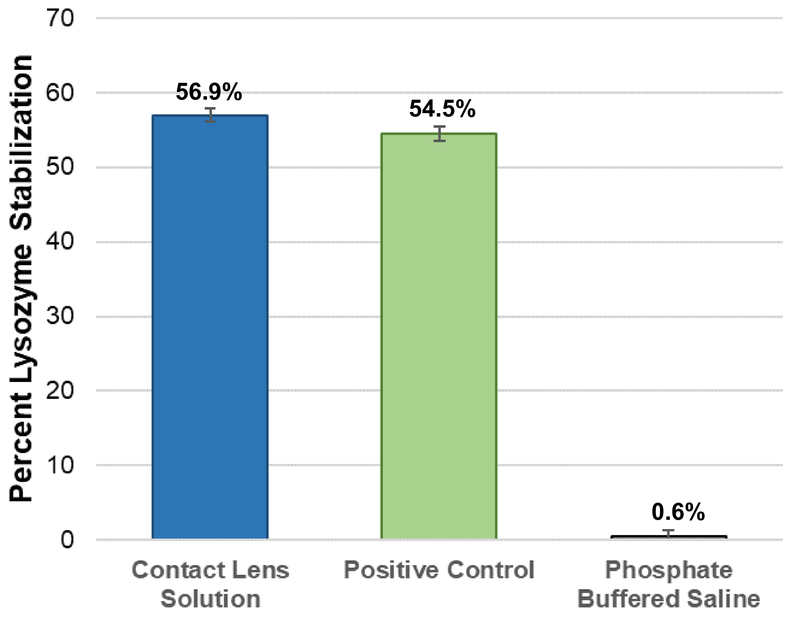
Methods

Lysozyme was dissolved in contact lens solution, negative control phosphate buffered saline (PBS) or positive control water-soluble phospholipid solution. The resulting solutions were then exposed to the protein denaturant sodium lauryl sulfate. Activity of lysozyme was evaluated by adding each test solution to a suspension of 0.03% *Micrococcus luteus*. Native lysozyme lyses *M. luteus* cells causing a decrease in suspension turbidity.

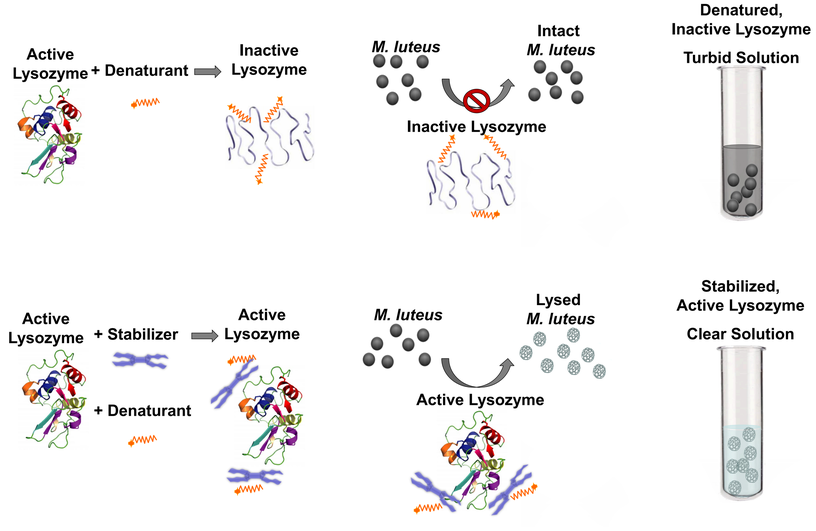
Percentage of lysozyme maintained in native form was determined by comparing turbidity of *M. luteus* suspension before and after exposure to test solutions.

A statistical analysis comparing percent lysozyme stabilization for the test solutions was performed using a two-sample t-Test.

Percent of Lysozyme Activity Stabilized by Test and Control Solutions



Lysozyme Stabilization Assay



Results

The percent stabilization of lysozyme was 56.9%, 54.5%, and 0.6% for the contact lens solution, positive control, and PBS, respectively.

Both contact lens and positive control solutions demonstrated statistically significant improvement in stabilizing lysozyme compared to PBS ($p<0.05$).

Conclusion

Proteins play an important role in helping maintain homeostasis through managing biological functions. Stabilizing tear film proteins can have a positive impact on maintaining ocular surface homeostasis. The representative protein lysozyme, in the presence of a novel contact lens solution containing multiple moisturizers, was significantly more stable when compared to a phosphate buffered saline.

The lysozyme activity assay provides mechanistic evidence that the novel kalifilcon A daily disposable contact lens solution has the ability to stabilize proteins under conditions that typically denature proteins.

References

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3. *Chang Y. Polymers (2020) Correlation between tribological properties and the quantified structural changes of lysozyme on poly (2-hdroxyethyl methacrylate) contact lenses. 12(8):1639*

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