Introduction

Dry eye is a common cause of people seeking medical attention for their eyes, and its multifactorial nature makes it difficult to diagnose and manage. 

- During sleep, the ocular surface becomes inflammatory to help maintain overall eye health. 
- However, it is possible that the inflammation may be dysregulated and linked to the development of dry eye disease.
- Neutrophils are released as an immune response and secrete matrix metalloproteinase-9 (MMP-9), which degrades the collagen of epithelial cells and further disrupts the tear film. 
- MMP-9 activity can indicate inflammation, damage, and other ocular abnormalities.
- The overall purpose was to strengthen our understanding of the pathogenesis of dry eye disease while validating a cost-effective and simple method for managing symptoms.

Human Active MMP-9 Fluorokine E ELISA assay

Enzyme-linked immunosorbent assay (ELISA) quantified MMP-9 concentration and activity in the tear supernatant samples.

- Relatively sensitive and measures both activation and concentration of enzymes
- 1. Protein Capture
- 2. Detection of antibody
- 3. Conjugate
- 4. Addition of Substrate
- BCA Rapid Gold assay

Quantifies total protein levels in human tear supernatants

Materials and Methods

Subject Randomization

- Subjects perform eye wash at beginning and end of month
- Subjects perform eye wash daily for a month

Clinical Trials

1. Subjects performed eye wash on both eyes immediately upon awakening
2. Brought tear samples to clinic on Visits 2, 3, and 4
3. Supernatant from eye wash was collected for protein analysis

Results

MMP-9 Concentration

- Normal Control
- Normal Treatment
- Dry Control
- Dry Treatment

MMP-9 Concentration Normalized to Total Protein

Baseline MMP-9 Levels

Discussion

Matrix metalloproteinase-9 (MMP-9) degrades the collagen of epithelial cells and further disrupts the tear film. MMP-9 activity can indicate inflammation, damage, and other ocular abnormalities.

- The data did not show a significant correlation between MMP-9 concentration and dry eye symptoms after the eye wash performed.
- The normal treatment group showed a decrease in MMP-9 levels.
- A significant difference was observed in the dry eye control group before and after treatment, more so than in the treatment group.
- Normalization to total protein vs. MMP-9 concentration alone projects slightly different results.

Conclusions

These findings determined that the eye wash treatment was not responsible for reducing MMP-9 levels, ultimately reducing dry eye symptoms.

- May indicate the need for a more standardized or supervised method of performing the eye wash
- Tear volume collected may be too dilute to allow sufficient data analysis
- More definitive conclusions could result from a similar study performed on a larger sample size
- Suggests a new and easily accessible treatment alternative for dry eye that could be more systematically explored in the long term
- Further stratification may reveal a relationship between certain subgroups and dry eye severity

Acknowledgements

Much thanks to Cameron Postnikoff for mentorship and laboratory assistance, Dr. Kelly Nichols for guidance and mentorship, and Bill Beumer for statistical assistance. This project is supported by the UAB Vision Science Research Core and Allergan, PLC.

References

6. VISION Core Grant P01 EY013039