

# Effect of Lipid Based Artificial Tear Use on Hyperosmolarity

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## Abstract

We assessed and compared the efficacy of three commercial lipid based artificial tears at treating meibomian gland dysfunction by using TearLab tear osmolarity measurements as our primary diagnostic indicator in addition to the Ocular Surface Disease Index (OSDI), the TearScience SPEED Dry Eye Questionnaire and Oculus Keratograph meibomian gland assessments.

## Introduction

Tear film is critical in maintaining ocular health, provides a refractive surface, and aids in repair. Disruption of this tear film plays a critical role in dry eye syndrome. Tear film disruption is caused by many different factors including dysfunction of the lids, lacrimal glands, meibomian glands, ocular surface cells, or neural network. Specifically, altered secretions of the lacrimal and meibomian glands can cause an increase in tear film osmolarity, leading to an inflammatory cascade. Inflammation then leads to damage in the epithelial surface of the eye and further disrupts the arrangement of the tear surface. Thus, many researchers view hyperosmolarity as the new gold standard in the diagnosis of dry eye disease.

In this study we explore the composition of the tear film as well as the various methods used to evaluate its integrity. We focus on improving tear osmolarity as a possible means to increase tear film quality and relieve dry eye symptoms. We hypothesized that use of lipid based artificial tears would decrease tear osmolarity over the course of the four week study.

## Methods

Participants were assigned one of three lipid based artificial tears (Systane Balance, Refresh Optive Advance, or OcuSoft Retaine MGD) for use four times a day over the course of four weeks. At the first visit, OSDI, the Dry Eye Questionnaire, meibomian gland assessment, and baseline tear osmolarities of both eyes were obtained. Subjects returned for a four-week follow-up visit to repeat all measurements.



**Figure 1.** TearLab Osmometer was used to measure tear osmolarity

## Results

We found no statistically significant difference between Systane Balance, Refresh Optive Advance, or OcuSoft Retaine MGD at decreasing tear osmolarity. All three lipid based tears showed an overall decrease in dry eye symptoms; this was further attributed to the placebo effect of using an eye drop. Meibomian gland structure stayed consistent throughout the one-month trial within all three study groups.

Visit	Baseline	Post tx – Retaine MGD	P-value
MGD grade	1.86 ± 0.86	1.86 ± 0.86	NS
Osmolarity	315.14 ± 11.47	307.07 ± 10.94	NS
Symptoms	8.14 ± 3.92	5.93 ± 3.36	NS
Visit	Baseline	Post tx – Refresh OA	P-value
MGD grade	1.29 ± 0.83	1.29 ± 0.83	NS
Osmolarity	310.57 ± 10.13	310.71 ± 11.29	NS
Symptoms	10.64 ± 2.59	6.43 ± 3.88	0.002
Visit	Baseline	Post tx – Systane Balance	P-value
MGD grade	1.73 ± 0.70	1.73 ± 0.70	NS
Osmolarity	315.93 ± 15.52	317.6 ± 13.32	NS
Symptoms	6.87 ± 4.73	3.73 ± 2.46	0.03

**Table 1.** Summary and comparison of statistical analysis across treatment groups

## Discussion

The data analysis was not able to identify any specific trends with any of the three treatments due to several factors. The sample size within each group is relatively small to detect any differences within or between groups. Subjects with more severe levels of meibomian gland dysfunction may require a longer duration and a more aggressive therapy regimen to detect improvements in osmolarity. The quality control values used during the research process include a wider range of acceptable values than TearLab's current quality control criterion; this could impact osmolarity values measured. Further research is warranted.

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## References

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