

MGD: New Technology for diagnosis and management

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disclosures

milton hom

last 24 months

allergan/abbvie
beusch health
novartis
sun pharma
kale pharma
tarsus pharma
hovione scientia
silk-tach
sydneis
topcon

last 24 months

eyenova bio
laboratoires Thea
aurinia pharma
eyevance pharma
surface pharma
nevakar, inc.
visus therapeutics
aperta biosciences
astareal, inc.
azura ophthalmics

last 24 months

aldeyra therapeutics
allysta
vyluma
nicor
ocuphire
Zeiss
versea Biologics
famy group
anneal Pharma
bruder health

Dry eye/MGD triggers are high temperature, high pollen counts and high humidity

True
False

Prevalence

"Overall, 86% of these qualified DED patients demonstrated signs of MGD."

Michael Lemp

TD

Lemp, Michael A., et al. "Distribution of aqueous-deficient and evaporative dry eye in a clinic-based patient cohort: An retrospective study." *Cornea* 31.8 (2012): 472-478.

Allergy

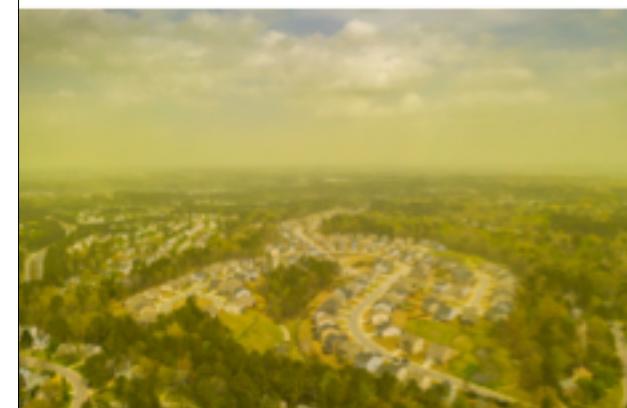
Allergy

"Meibomian gland dysfunction... was associated with...greater dry eye, and allergic symptoms"

Chao C, Tong L. Tear Lactoferrin and Features of Ocular Allergy in Different Severities of Meibomian Gland Dysfunction. *Optom Vis Sci*. 2018 Oct;95(10):930-936. doi: 10.1080/OPIX.0000000000001285. PMID: 30234832.

"pollen tsunami"
"pollen vortex"
"perfect storm for allergies."
"pollmageddon"

<https://www.vox.com/2019/4/8/18300342/pollen-season-2019-allergies-climate-change>



Durham, North Carolina April 8 2019

Pollen season getting longer

"Start taking...med[s]...around St. Patrick's Day"

"Now start around Valentine's Day"

Stanley Fineman, MD
Allergist, Atlanta

<https://www.nbcnews.com/health/allergies/nothing-sneeze-global-warming-triggers-earlier-pollen-n1257081>

Weather	Asthma	Dry eye/ MGD	Allergic conjunctivitis
Temperature	High (or very cold)	High	High
Pollen	High	High	High
Humidity	High (or very dry)	Low	High (dust mites)

Rathin J, Hom MM, Cicati L, Wallace CD. Humidity Levels and Temperature Effects on Dry Eye Symptom Scores. *Ocular Surface*. American Academy of Ophthalmology 2017 Congress.

Mariash CE, Aguirre R, Farbman A, Weiss RM. The role of pollen counts on the signs and symptoms of eyelid surface disease. *Systemic Reviews in Ophthalmology*; 2017 Oct; 6(4):e100.

Heddy N, Ji J, Hermans, and M. Arezza. "The effect of temperature on eyelid hyperemia, pollen size growth, and eyelid sensitivity in peach." *Plant Biology*; 11(3) (2009) 470-483.

Your allergy patients have
MGD

Lash serums

Lash serums



Lash serums



<https://www.buzzfeednews.com/article/stephaniemcnulty/rodan-and-fields-lash-boost>

Lash serums

212 responders

OTC Lash serums:
Lash Boost (Rodan and Fields) 77%
GrandeLash 16%
Revitalash 13%

Doll T, et. al. Over-the-Counter Eyelash Growth Serum Use: Self-Reported Perseverance and User Satisfaction. ARVO 2020

Lash serums

"43% of users discontinued use with the primary reason being 'side effects'"

Doll T, et. al. Over-the-Counter Eyelash Growth Serum Use: Self-Reported Perseverance and User Satisfaction. ARVO 2020

Lash serums

91% PGAs has MGD

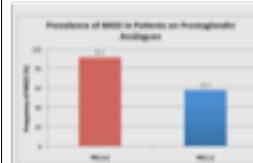


Figure 1. Prevalence of meibomian gland dysfunction in patients who were on PG analogue therapy versus those who were on non-PG medications.

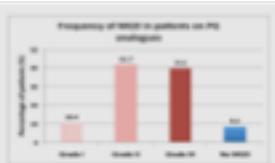


Figure 2. Frequency of meibomian gland dysfunction (MGD).

<https://www.eyedolatryblog.com/2017/04/is-your-lash-growth-serum-causing.html>

Your glaucoma patients have MGD

Diabetes

Diabetes

Diabetes

Your patients with diabetes have MGD

Metformin

"After metformin treatment...morphology of MG was well maintained... inflammation and oxidative stress of MG were alleviated after metformin intervention"



"HbA1c \geq 7% is likely to result in meibomian gland...dysfunctions in T2DM [diabetes] patients"

Fan F, Li X, Li K, Jia Z. To Find Out the Relationship Between Levels of Glycated Hemoglobin with Meibomian Gland Dysfunction in Patients with Type 2 Diabetes. *Ther Clin Risk Manag*. 2021 Aug 6;17:797-807. doi: 10.2147/TCRM.S324423. PMID: 34393486; PMCID: PMC8355560.

Eyecare workers

Eyecare workers

Eyecare workers

Eyecare workers

44 eyecare workers
SPEED
OSDI
Lipid layer thickness
MG dropout
Meibography

TQ
Chan AYK, Chuang JC, Wong VVY. Evaluation of Meibomian Gland Dysfunction Among Ophthalmic Healthcare Workers. *Clin Ophthalmol*. 2021 Mar 19;15:1201-1206. doi: 10.2147/OPTH.S299338. PMID: 33776416; PMCID: PMC7989054.

"Despite being more knowledgeable to MGD and more accessible to treatment, MGD is a highly prevalent condition among ophthalmic healthcare workers, with a 61.4% prevalence"

TQ
Chan AYK, Chuang JC, Wong VVY. Evaluation of Meibomian Gland Dysfunction Among Ophthalmic Healthcare Workers. *Clin Ophthalmol*. 2021 Mar 19;15:1201-1206. doi: 10.2147/OPTH.S299338. PMID: 33776416; PMCID: PMC7989054.

You have MGD

Chan AYK, Chuang JC, Wong VVY. Evaluation of Meibomian Gland Dysfunction Among Ophthalmic Healthcare Workers. *Clin Ophthalmol*. 2021 Mar 19;15:1201-1206. doi: 10.2147/OPTH.S299338. PMID: 33776416; PMCID: PMC7989054.

Depression

Depression

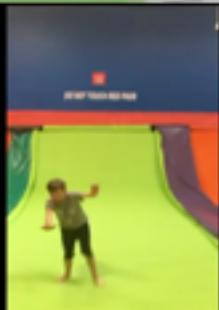
"Increased prevalence of depression has been found in patients with meibomian gland dysfunction (MGD)"

Wei Z, Liang J, Cao K, Wang L, Baudouin C, Labbé A, Liang Q. A multi-center study evaluating the correlation between meibomian gland dysfunction and depressive symptoms. Sci Rep. 2022 Jan 10;12(1):443. doi: 10.1038/s41598-021-04187-x. PMID: 35013413; PMCID: PMC8748887.

The COVID-19 pandemic has had a large and uneven impact on global mental health



COVID



<https://www.youtube.com/watch?v=bHvxiWTckVjk>

Depression

"Antidepressants may have an impact on the course of eye dryness"

Köper E, Köper A, Özsoy M, Durmus AE, Kiparlı İ. Dry Eye Related to Commonly Used New Antidepressants. J Clin Psychopharmacol. 2015 Aug;39(4):411-3. doi: 10.1089/jcp.0000000000000366. PMID: 26075491.
İşik-Ulucay S, Ulucay MD. Influence of Different Antidepressants on Ocular Surface in Patients With Major Depressive Disorder. J Clin Psychopharmacol. 2021 Jan/Feb; 01:41(1):49-52. doi: 10.1089/jcp.0000000000001325. PMID: 33347023.

Depression

"Ocular Surface Disease Index score of the depression group was significantly higher than the control group"

Deng J, Zhou F, Hsu W, Silver Z, Wong CY, Cheng O, Huang E, Zuo GK. The prevalence of depression, anxiety, and sleep disturbances in COVID-19 patients: a meta-analysis. Ann N Y Acad Sci. 2021 Feb;1489(1):90-111. doi: 10.1111/nyas.14508. Epub 2020 Oct 2. PMID: 33003688; PMCID: PMC7675607.

Depression

"The characteristics of depression in the MGD group included: crying spells, sleep disturbance and depressed appetite"

Wei Z, Liang J, Cao K, Wang L, Baudouin C, Labbé A, Liang Q. A multi-center study evaluating the correlation between meibomian gland dysfunction and depressive symptoms. Sci Rep. 2022 Jan 10;12(1):443. doi: 10.1038/s41598-021-04187-x. PMID: 35013413; PMCID: PMC8748887.

1. Remeron (mirtazapine)
2. Lexapro (escitalopram)
3. Effexor (venlafaxine)
4. Zoloft (sertraline)
5. Celexa (citalopram)
6. Wellbutrin (bupropion)
7. Paxil (paroxetine)
8. Savella (milnacipran)
9. Prozac (fluoxetine)
10. Cymbalta (duloxetine)
11. Luvox (fluvoxamine)
12. Vestra (reboxetine)

Treatments

Azithromycin drops

Efficacy of azithromycin 1% ophthalmic solution for treatment of ocular surface disease from posterior blepharitis View abstract	Multicenter open-labeled study evaluating the efficacy of azithromycin ophthalmic solution 1% on the signs and symptoms of subjects with Meibomian Gland Dysfunction View abstract
Efficacy of topical azithromycin ophthalmic solution 1% in the treatment of posterior blepharitis View abstract	Topical azithromycin therapy for meibomian gland dysfunction: clinical response and lipid alterations View abstract

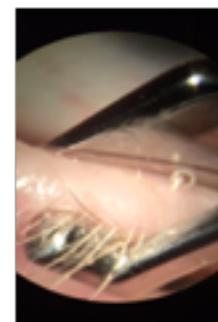
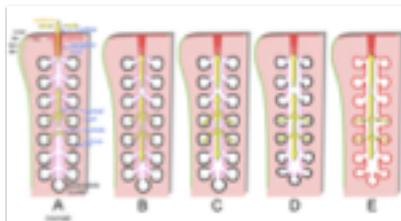
TQ

NOV-03

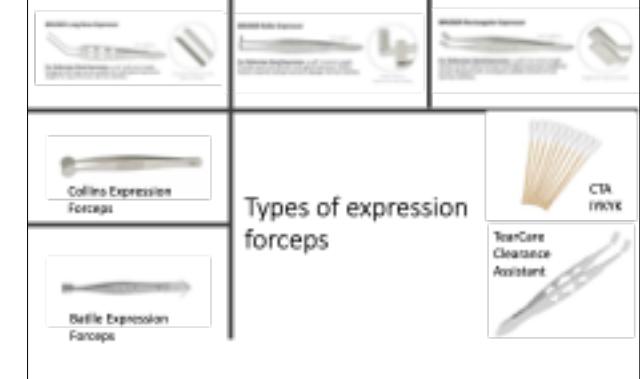
- Perfluorohexylcane
- Seeking approval as first drop to treat dry eye disease associated with Meibomian Gland Dysfunction
 - All other medications are open/label-free
- QID dosing
- GOBII and MOJAVE studies
 - Reported at ARVO 2022
 - Phase II
 - 549 / 620 subjects respectively
- Statistically significant improvement on Day 57 vs hypertonic saline
 - Total Cornea staining score
 - Primary Symptoms on VAS scale of dryness

Procedures

Remember the anatomy...



Hand Expression



Types of expression forceps

To Heat or not to Heat?

LipiFlow



Clinical studies

Long-Term (3 Year) Effects of a Single Thermal Pulsejet System Treatment on Meibomian Gland Function and Dry Eye Symptoms View abstract	Phase 3 View abstract
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TQ

MiBoFlo



TearCare



TearCare Pilot Study Conclusions^{1,2}

4 Month Pilot Study

- Published in Clinical Ophthalmology, April 2018
- The findings of this pilot study suggest that the TearCare System is a safe and effective treatment option for patients with DED, with the treatment effects persisting for at least 4 months.

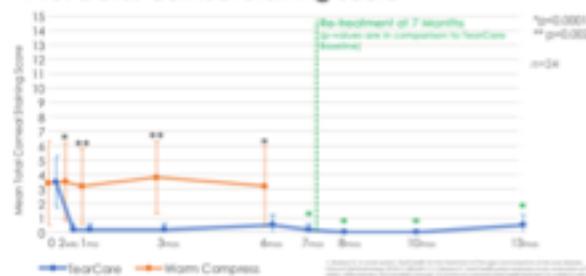


Extension Study: Evaluation Through 12 Months

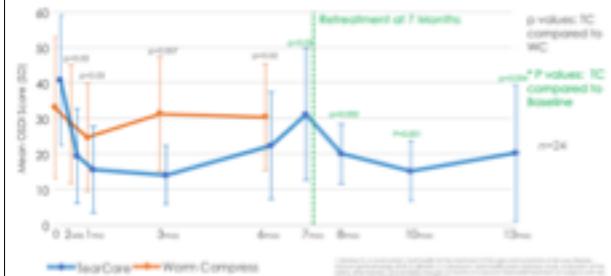
- Published in Clinical Ophthalmology, January 2019
- The findings of the extension study through 12 months suggest that a second TearCare treatment after 4 months provides additional improvement in the signs and symptoms of DED.



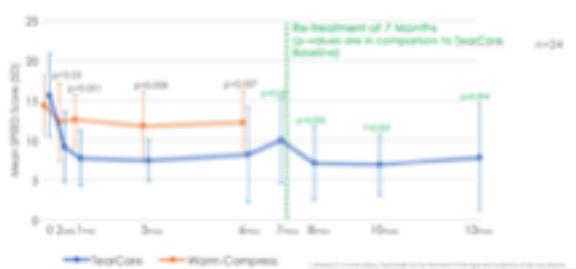
Pilot Data: Corneal Staining Score



Pilot Data: OSDI



Pilot Data: SPEED



Systane iLux²

- All-in-one imaging and treatment handheld device
- HD video and imaging as meibography
- Treatment is 8-12 minutes for both eyes
- Customizable heat and compression for targeting meibomian glands



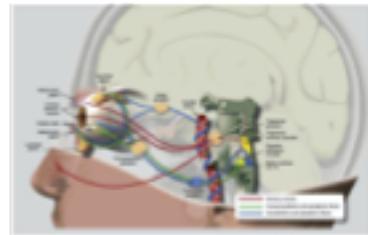
Systane iLux²

- Decrease in IDEEL symptom survey lasted for 12 months
- Increase in Meibomian Gland Score (0-45) that sustained for 12 months

iTear100



Lacrimal Functioning Unit



iTear100 Clinical Trial

Published in *Int J Clin Exp Ophthalmol*, 2019; Nov 1: 1-10.
Published online 2019 Nov 17. doi: <https://doi.org/10.1016/j.ijceo.2019.10.001>

- Exploratory end results showed increase in Meibomian Gland score pre- and post-iTear usage
- Showed improvements by Day 30
- The data notwithstanding, the effect of neuromodulation on meibomian secretion is exploratory and not conclusive, requiring further study.

Low Level Light Therapy



LLLT Therapy

- Photobiomodulation
 - Athermal, atraumatic cellular activation from light emitting diodes of specific wavelengths
 - Stimulates production of collagen and elastin
 - Results in repair to damaged cells and improvement in healthy cells
 - Decrease inflammation in lids/glands
 - 830nm

LLLT

- 15 minute procedure
 - Repeat 24-32 hours later
 - 3-4 sessions within 7-30 days
- Other studies show improvement in symptoms, corneal staining, other dry eye metrics.
- Improvements but not statistically significant differences in meibomian gland expressibility, structure, etc.

Published in *Journal of Clinical Ophthalmology*, 2019; 1(1): 1-10.
<https://doi.org/10.5236/jco.2019.111001>

Effect of low-level light therapy in patients with dry eye: a prospective, randomized, observer-masked trial
<https://doi.org/10.1016/j.jco.2019.01.001>

Photomed Laser Surg, 2015 Jun 1; 33(6): 41-46.
doi: <https://doi.org/10.1089/pls.2013.3030>

Intense Pulsed Light Treatment for Dry Eye Disease Due to Meibomian Gland Dysfunction: A 3-Year Retrospective Study

Photomed Laser Surg, 2017; <https://doi.org/10.1089/pls.2016.3030>

Intense Pulsed Light

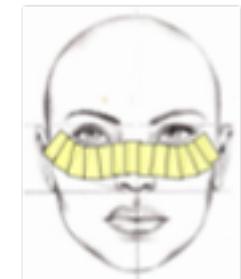
- Used in dermatology for treatment of rosacea for decades
- Photocarcinogenic light at different wavelengths absorbed by chromophores like melanin, hemoglobin and water
- First reported by Tayos in 2015 for ocular indication

IPL Mechanism of Action

- Unclear but few possibilities:
 - Abnormal blood vessel thrombosis
 - Meibum heating and liquefaction
 - Photomodulation
 - Demodex eradication
 - Secretion modulation of pro and anti-inflammatory molecules
 - Matrix metalloproteinase suppression

Treatment Pattern

- Thighs to Thighs
 - Typically single pass
 - Below lid margin and over the nose
- Patient and doctor wearing eye protection
- Usually 3-4 sessions spaced 3-5 weeks apart



Skin Types

- IPL for Types I – IV
- Not absorbed in V, VI



Nutritional Support

- HydroEye
- GLA



TQ

Dream

Omegas

"patients with dry eye disease...who... receive...3000 mg of n-3 fatty acids for 12 months did not have significantly better outcomes than...placebo"

Dry Eye Assessment and Management Study Research Group. "n-3 Fatty Acid Supplementation for the Treatment of Dry Eye Disease." *New England Journal of Medicine*. 379;18 (2018): 1681-1693.

Why not multiple procedures?

Studies showing stacking or multiple procedures

- IPL + LipiFlow
 - HS Chung, *Int Ophthalmology*, May 2022
- IPL + LLLT
 - K Stonecipher et al, *Clinical Ophthalmology*, June 2019
 - Severe MGD patients failed on prior treatments
 - 5 IPL pulses + LLLT x 15 minutes
 - Decrease in % of patients with <6 second TBUT
 - 70% of patients had 1 step or greater improvement in MGD

Castor oil

Ricinus communis plant



Sandford EC, Muntz A, Craig JP. Therapeutic potential of castor oil in managing blepharitis, meibomian gland dysfunction and dry eye. *Clin Exp Optom.* 2021 Apr;104(3):315-322. doi: 10.1111/ceo.13148. Epub 2021 Mar 10. PMID: 33037703.

Castor oil

"castor oil...has a prolonged residence time...increased tear film lipid layer thickness, stability, improved...staining and symptoms"

Sandford EC, Muntz A, Craig JP. Therapeutic potential of castor oil in managing blepharitis, meibomian gland dysfunction and dry eye. *Clin Exp Optom.* 2021 Apr;104(3):315-322. doi: 10.1111/ceo.13148. Epub 2021 Mar 10. PMID: 33037703.

