

Beauty and The Beastly Truth of Ocular Surface Disease

Speaker: Jennifer Lyerly, OD

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Dr. Jennifer Lyerly is a 2011 graduate of Southern College of Optometry. She founded **Eyedolatriy** in 2011, a website dedicated to patient friendly and doctor approved ocular health advice and industry news with over 100,000 page views a month. In addition to writing for Eyedolatriy, she has written for *Review of Optometry*, *Invision Magazine*, *Women in Optometry*, *Optometry Times* and *Review of Optometric Business Management*, and been a contributor for *O: The Oprah Magazine*. She was recognized as a leading innovator in Vision Monday's 50 Most Influential Women in Optical in 2015, and SCO's Young Alumni of the Year in 2017. In 2018 she was named as one of *EyeCare Business Magazine's* Game Changers. She currently serves on SCO's Board of Trustees.

Her article, "Is Your Lash Growth Serum Causing Lasting Damage?" has over 200k reads and was referenced by *Buzzfeed* in their report on the Rodan + Fields lash growth/ocular surface disease lawsuit filed in May 2018.



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Beauty & America: The Untapped Potential of Ocular Aesthetics

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What is the Price of Beauty?

Gender	2017 Avg Yearly Spend per Person
Women	\$3,756
Men	\$2,928

Women spend on average \$3,756 a year, just narrowly surpassing their male counterparts who spend a comparative \$2,928 a year.

AMAZON.COM TOP GROWTH PRODUCT GROUPS: 2017 ESTIMATED SALES

Rank	Product Group	YoY Growth	Total Estimated Sales
1	Luxury Beauty	47%	>\$400M
2	Pantry	38%	>\$500M
3	Grocery	33%	>\$1.5B
4	Furniture	33%	>\$1.5B

One Click Retail AN UNEMPLOYED www.oneclickretail.com

That's \$225,360 for women and \$175,000 for men in a lifetime!

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But these trusted resources don't always get it right



Tightlining or "invisible eyeliner"

This video has >1.25 Million Views



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What You Need to Know About the Cosmetics Industry

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Federal Food, Drug and Cosmetic Act, passed in 1938 is only legal regulation for cosmetic industry

- Per the FDA: “The Federal Food, Drug and Cosmetic Act does not require cosmetic products and ingredients to be approved by FDA before they go on the market. Companies and individuals who market cosmetics have a legal responsibility for the safety of their products and ingredients.”
- Federal Food, Drug and Cosmetic Act is focused mainly on regulating products that are falsely packaged
- labeling products as natural or organic **does not** qualify as misbranding
- **does not** require the FDA to recall potentially dangerous items or monitor the ingredients used in products.

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Claire's recalls makeup products that tested positive for asbestos

BY ASHLEY WELCH
MARCH 13, 2019 / 3:21 PM / CBS NEWS

Claire's has issued a voluntary recall of three makeup products that regulators said tested positive for asbestos. When the U.S. Food and Drug Administration announced the test results last week, Claire's disputed the findings but pulled the items from stores. Now it says any consumers who bought the products should stop using them.

To date, there have been no reports of any injuries or illness associated with the recalled products. The company said it is also removing any remaining talc-based products.

Last week, the FDA issued a warning to consumers not to use the products because it said Claire's refused to comply with its request for a recall, and the agency doesn't have the power to force one. At the time, Claire's said the FDA's test results mischaracterized fibers as asbestos. It said it tried to discuss the matter with the FDA, but the agency moved ahead with its warning.

The FDA conducted the tests after learning of reports of asbestos in products sold by retailers Claire's and Justice in 2017. Talc is commonly found in makeup and personal care products, including baby powder and eyeshadow, and can be contaminated with asbestos, the FDA says.

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Rise of the Organic Beauty Movement



- 2019 Grand View Research: the global [organic personal care market](#) is projected to reach \$25.11 billion by 2025, up from \$12.9 billion in 2017
- Consumers and the medical research community are pushing FDA to make changes to regulations
 - “Better cosmetic surveillance is needed given their ubiquity and lack of a premarket approval pathway. Unlike devices, pharmaceuticals, and dietary supplements, cosmetic manufacturers have no legal obligation to forward adverse events to the FDA.” *JAMA Internal Medicine* 2017

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Rise of the Organic Beauty Movement

On Cosmetics Safety, U.S. Trails More Than 40 Nations

By Alyssa Katzenelson, Stable Law Fellow and Scott Faber, Senior VP, Government Affairs



WEDNESDAY, MARCH 20, 2019

U.S. regulation of chemicals and contaminants in cosmetics is falling behind the rest of the world, according to an EWG analysis.

More than 40 nations – ranging from major industrialized economies like the United Kingdom and Germany to developing states like Cambodia and Vietnam – have enacted

regulations specifically targeting the safety and ingredients of cosmetics and personal care products. Some of these nations have restricted or completely banned more than 1,400 chemicals from cosmetic products. By contrast, the U.S. Food and Drug Administration has banned or restricted only nine chemicals for safety reasons.

More Than 40 Nations Have Stricter Cosmetic Safety Regulations Than the U.S.

- May 2017, California Democratic Sen. Dianne Feinstein and Maine Republican Sen. Susan Collins introduced the bipartisan [Personal Care Products Safety Act](#).
- In October 2017 Utah Republican Sen. Orrin Hatch introduced the competing [FDA Cosmetic Safety and Modernization Act](#).
- Both bills include mandatory reporting, registration of cosmetic facilities and ingredient review from the FDA.
- Feinstein-Collins bill would give FDA the authority to order mandatory recalls and conduct annual investigations on the safety of five cosmetic contaminants: **methylene glycol** (a form of **formaldehyde** and a recognized carcinogen), **propylparaben**, **lead acetate**, **diazolidinyl urea** and **quaternium-15**. Lead acetate already has been banned by the European Union.

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Common Cosmetic Preservatives

The problem: While the FDA dictates that “ingredients must be declared in descending order of predominance”, any ingredient less than 1% of total volume may be listed in any order.

Top Offenders:

1. BAK – Preservative
2. Formaldehyde – Preservative
3. Parabens – Preservative
4. Phenoxyethanol - Preservative

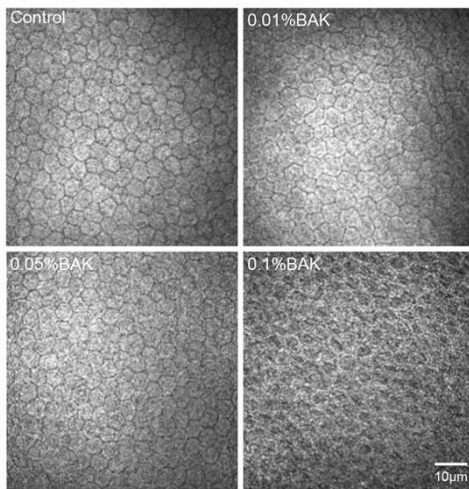
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Preservatives in Makeup Can Have a Big Impact on the Eye

- 2018 Study by Chen et al has shown that preservatives typically found in cosmetics could compromise the ocular surface
 - Studied impact of BAK and formaldehyde-releasing preservatives on morphology, survival, and proliferation and signaling ability of human meibomian gland cells, corneal epithelial cells and conjunctival epithelial cells
 - At even low levels of BAK (0.5 mg/ml or 50 µg/ml) BAK killed meibomian gland cells within 1 day after a 15 min exposure
 - concentrations of BAK at 1 mg/ml are approved for consumer use
 - Using an in vitro model, they reported that benzalkonium chloride (BAK)- and formaldehyde (FA)-releasing compounds could cause cell atrophy, poor adherence, and cell death, as well as decreased cell proliferation, even in concentrations lower than what is currently approved for consumer use.

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Benzalkonium Chloride (BAK)



Effects of BAK on rabbit corneal endothelial cell morphology. BAK at 0.01%, 0.05%, and 0.1% was applied twice daily to one eye of each of rabbits for seven days. Irregular cell morphology and blurry boundaries were apparent in 0.05% and 0.1% BAK treated groups. Zhang, et al. 2014

Found in: preserved eye drops, glaucoma medications, eyeliner, mascara, makeup remover, face washes

Why should we care?

Studies show BAK preservatives are toxic to the ocular surface. Detergent preservative destabilizes the lipid layer and damages epithelial and goblet cells.

- At 0.0025%, epithelial cells lose microvilli
- At 0.005%, epithelial cells wrinkle
- At 0.01%, epithelial cells peel and expose the underlying layers

41.6% of glaucoma patients using BAK preserved treatment have ocular surface disease

9,10,11,12

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Formaldehyde Releasing/Donating Preservatives

Johnson's No More Tears Baby Shampoo

OLD FORMULATION

Ingredients: Water, Cocamidopropyl Betaine, PEG-80 Sorbitan Laurate, Sodium Trideceth Sulfate, PEG-150 Distearate, Fragrance, Tetrasodium EDTA, Polyquaternium-10, Quaternium-15, Sodium Hydroxide, Citric Acid, Yellow 10, Orange 4.

REMOVED:
Quaternium-15 a formaldehyde-releasing preservative

NEW FORMULATION

Ingredients: Water, PEG-80 Sorbitan Laurate, Cocamidopropyl Betaine, Sodium Trideceth Sulfate, PEG-150 Distearate, Phenoxyethanol, Glycerin, Citric Acid, Fragrance, Sodium Benzoate, Tetrasodium EDTA, Polyquaternium-10, Ethylhexylglycerin, Sodium Hydroxide, Potassium Acrylates Copolymer, Yellow 6, Yellow 10.

ADDED:

- Potassium Acrylates Copolymer** helps maintain proper shampoo thickness
- Phenoxyethanol, Sodium Benzoate and Ethylhexylglycerin** components of the new preservative system
- Glycerin** helps with moisturization

AKA: quaternium-15, DMDM hydantoin, imidazolidinyl urea, diazolidinyl urea, polyoxymethylene urea, sodium hydroxymethylglycinate, bromopol, glyoxal

Found in: shampoo, face washes, makeup removing wipes

Why should we care?

Studies show concentrations > 0.2% are associated with:

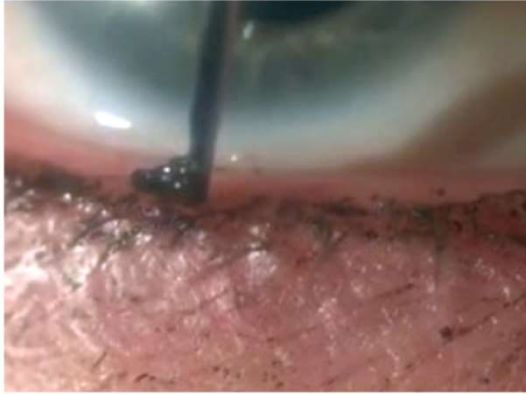
- Contact dermatitis + allergic reactions
- Skin and ocular surface irritation
- Nasopharyngeal and nasal cancers?

In the US, there are currently no regulations for quaternium-15 use in cosmetics. In Europe, it must be <0.2% concentration

5, 12, 14, 15, 16, 17

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Parabens



Parabens are commonly found in eyeliner and waterproof mascara

Examples: butylparaben, methylparaben and propylparaben

Found in: cosmetics, lotions, deodorant

Why should we care?

- Parabens can penetrate human skin tissue
- 2004 study showed traces of 5 different parabens in breast tissue of 95% of women
 - Could increase risk of breast cancer?
- Mimic estrogen in the body
 - Could increase risk of reproductive cancers?
- Associated with MGD
 - Decrease release of meibum oil from the glands

The International Workshop on Meibomian Gland Dysfunction: Report of the sub-committee on anatomy, physiology and pathophysiology of the meibomian gland. IOVS 2011

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Phenoxyethanol



Found in: mascara, eyeliner, eye shadow, concealer and foundation, moisturizers, sunscreen, soaps and makeup removers

Why should we care?

- Skin dermatitis, ocular irritation, stinging, burning
- At 1% concentration skin patch tests: can induce urticaria and eczema *Lee et al. 2007*
- Phenoxyethanol in the presence of other preservatives can increase risk of allergic reaction
- Limited to 1% in Japan and the EU
- Not suggested for use in baby products as per a warning issued by the FDA

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Makeup and the Eye

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Mascara



Purpose: darken, thicken and lengthen the appearance of eyelashes

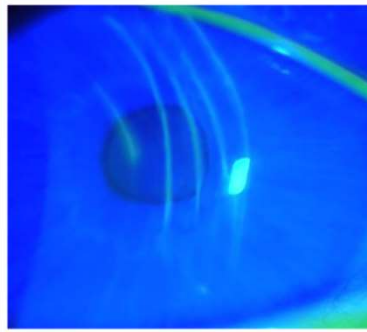
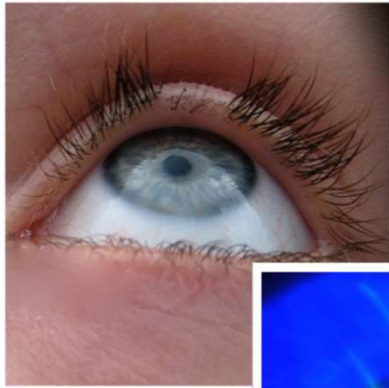
Ingredients: carbon black or iron oxide pigment to darken lashes; a polymer to form a film that coats lashes; a preservative; and thickening waxes or oils like lanolin, mineral oil, paraffin, petrolatum, castor oil, candelilla wax

Waterproof versions contain no water and are less likely to flake off, but also more difficult to remove



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Mascara



Research Shows Mascara is an Eye Irritant

2013 followed 130 college students over the course of 12 months of mascara wear.

- **30%** of daily mascara users experienced eyelash loss or fall out
- **60% of daily mascara users experienced ocular irritation** or discomfort (redness, itching, pain, etc)
- using water to clean off waterproof mascara did increase the risk of lash fall out (26.6% of participants using this combo had lash loss)

Kadri et al. Mascara induced milphosis, an etiological evaluation. Int Journal of Trichology. 2013.

Corneal trauma is a recognized potential complication from the use of mascara applicator wands

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What We Need to Tell Patients About Mascara



Case Report: After wearing mascara for 25 years and never removing it before bed, she developed an allergic-type reaction which caused follicular conjunctivitis and concretion-like deposits. She experienced foreign body sensation and recurrent SPK requiring surgical intervention of these deposits.

- Remove mascara nightly
 - Avoid Waterproof mascara
 - Use oil-based lid cleansers to remove mascara and eyeliner instead of soap and water
 - Avoid fiber-based mascaras which are more likely to flake and shed into the conjunctiva
 - Replace mascara every 3 months
 - 2008 Study: At end of 3 months microbial growth found in **36.4%** of the subject mascara tubes.
 - Most common: *Staphylococcus epidermidis*, *Streptococcus* species, or fungi
- Pack et al. Microbial contamination associated with mascara use. Optometry. 2008.*
- Examine labels on mascara
 - Avoid formaldehyde based preservatives

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What Products Can We Recommend?



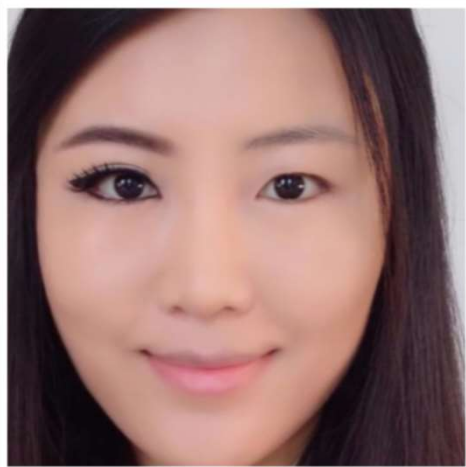
- There is no one mascara (or any makeup product) that is guaranteed to cause no issues
- Empower patients to read labels and look for offending ingredients
 - Patient resources: ewg.org, petitvour.com

Products that my patients have found less irritating:

- Lily Lolo Mascara
 - Fragrance, silicon and alcohol free
 - Free from harsh chemicals, lead, parabens and preservatives
 - Easy to remove (not waterproof)
- Zorah Biocosmetiques Length and Care Mascara
 - Enriched with argan oil
 - Organic cosmetic certified by Ecocert Greenlife according to Ecocert Standard available at: <http://cosmetiques.ecocert.com>

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Eyeliner



Purpose: make eyes appear larger, more noticeable

Ingredients: Thickeners -- such as waxes, natural gums, and clays -- help stabilize the formula so it will stick to your lids. Pigments include iron oxides to create blacks and browns, ultramarine for blue, chromium oxide for green, and titanium dioxide for white.

Ancient Egyptians used kohl (lead based!)



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Eyeliner



LIPIVIEW®

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TearScience®

In slit lamp, will appear like black or brown line across meibomian glands; can use meibography or anterior segment photos to educate!

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Eyeliner

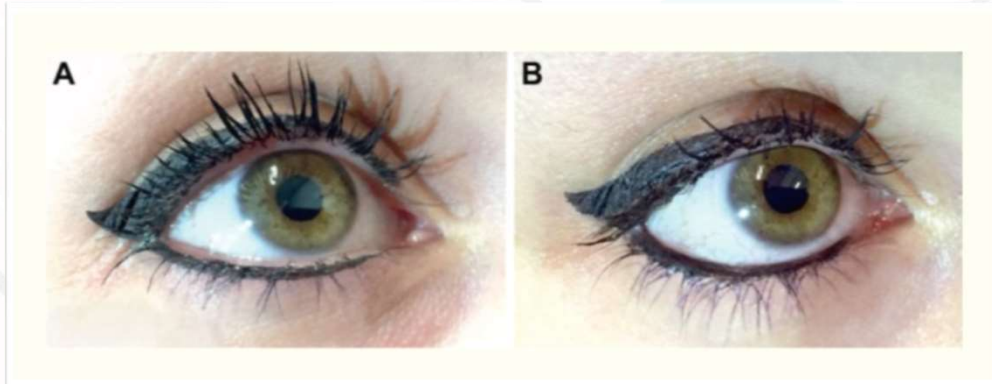


What Should We Tell Patients?

- Sharpen eyeliner pencils before application to remove the top layer of bacteria
- Avoid “tightlining” or “waterlining”
 - Blocks meibomian gland
 - Alters the chemical properties and viscosity of the meibum
 - **15-30% of makeup transfers into the tear film & disrupts the ocular surface**
 - Higher risk of introducing bacteria

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Eyeliner



- 2015 Study by Ng et al have shown that particle migration into the tear film is found shortly after eyeliner is applied inside the lash line
- Pencil eyeliner ("Glimmerstick" by Avon) was applied to the subject's upper and lower right eyelid either behind the lash line or along the periocular skin)
- Migration of the glitter particles occurred more readily with inner lash line application
- Maximum contamination occurred 5 to 10 min after eyeliner application

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Eyelid/Eyeliner Tattooing



1 Day Post-Eyelid Tattooing

- Presented with ecchymosis and anesthetic keratitis

What Happens?

- Pigmented ink granules are inserted via a needle under the upper layers of the skin
- Initial procedure takes 1-2 hours
- Takes 3-4 weeks for the color to fade to its permanent shade.

Ocular side effects (mechanical microtrauma):

- Reaction to the ink and preservatives
- Infection
- Increased corneal staining and erosion
- Damage to/loss of meibomian glands
- Reduced TBUT/tear film instability
- Granuloma or keloid formation

FDA website: "FDA is looking into the safety of tattoos and permanent makeup because of their growing popularity."

57, 58, 59, 6, 60, 61, 40, 27, 62

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Concealer



Purpose: reduce appearance of undereye circles

- A study of over 13,000 women by Clinique showed 53% of women say dark under eyes is their biggest cosmetic complaint.

Ingredients: Mineral Oil, Talc, Beeswax, Isopropyl Palmitate, Copernicia Cerifera (Carnauba) Wax, Sorbitan Tristearate, Allantoin, **Propylparaben**. May contain: Iron Oxides, Titanium Dioxide CI

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Concealer or Foundation in the Slit Lamp



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Concealer



But How Does It Get Into The Eye?

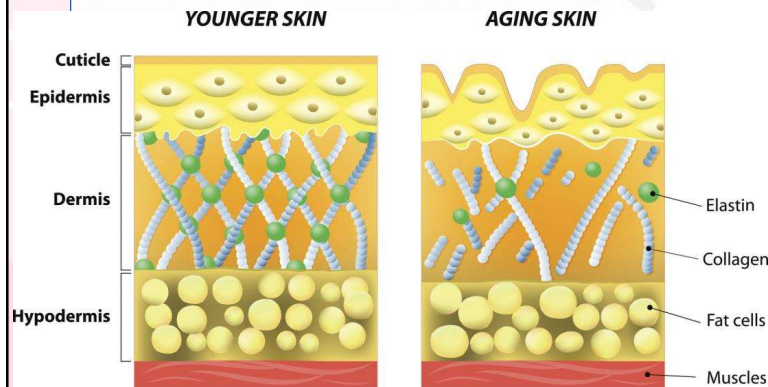
- tear film contamination can result from passive and inadvertent migration of periocular cosmetic products across the eyelid margin
- poor application techniques
- direct accidental ocular instillation
- eye rubbing

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But doc, what can I do about my dark under eye circles??

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What Causes Dark, Puffy Under Eye Circles?



Skin around the eyes is extremely thin, with weak moisture barriers and low natural elasticity

- **Aging** = reduced collagen and elastin that support link between surface and deeper dermis skin layers
 - **Lose 1% of skin collagen every year of life**
 - Less collagen and elastin = skin tissue sags from lack of support, causing wrinkle & drooping

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What Causes Dark, Puffy Under Eye Circles?

- Dark circles = side effect of the eyelid's thin skin.
 - Without a thick barrier, it's easier to see the matrix of blood vessels running underneath the skin, resulting in a dark purplish hue.
- Anything that dilates (or enlarges) the blood vessels under the eye will exacerbate the appearance of dark circles.
- **The most common culprits are:**
 - **Dehydration**
 - **Fatigue**
 - **Allergies**
 - **Hormone changes (estrogen levels especially influence changes in dark circle appearance)**
 - **Warm environments**
 - **Sleep causes dilation of the blood vessels too,**
 - This is why many people feel their circles are worse when they wake up
 - Sleep causes our body's sympathetic nervous system to wind down, causing blood vessels to dilate as our body enters "rest mode."

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What Can We Recommend for Patients with Under Eye Circle Complaints?



1. Sun Protection

- Sun damage ages skin faster (more collagen loss at younger age)

2. Stay Hydrated

- Salty foods, alcohol, tea, and sodas can all act as diuretics that increase dehydration
- Medications commonly prescribed for high blood pressure, diabetes, mood-stabilizers/anti-depressants, and allergy medications

3. Adjust your screen time:

- Good, natural lighting in the room where you work
- Working in the dark or in a dim room makes your body enter "rest" mode, so you'll not only feel more tired, but your blood vessels will dilate and your dark under eye circles will be more noticeable.
- Blue Light? Disrupting melatonin and body's natural sleep cycle hormones

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What Can We Recommend for Patients with Under Eye Circle Complaints?

4. A Little Morning Pick-Me-Up

- To constrict blood vessels and the fluid that has pooled in the under eye area overnight, we need to kick the sympathetic nervous system into gear
- Morning Exercise
- Caffeine
- Cool Compresses
 - Metallic applicators like that used in the LA MER Lifting Eye Serum begin to depuff eyes immediately with their cool temperature



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What Can We Recommend for Patients with Under Eye Circle Complaints?

5. Products with the Right Ingredients

- tetrapeptide-5 and heparin sulfate
 - reduce puffiness and contain hydrating agents to moisturize the skin
- *mild* retinols to provide collagen stimulation
 - BUT Retinols can irritate skin and cause dryness/flaking
- Caffeine based ingredients: coffee seed extract, tea extract, feverfew, and cacao extract



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What Can We Recommend for Patients with Under Eye Circle Complaints?

5. Products with the Right Ingredients

- Sample Product: **Algenist Complete Eye Renewal Balm**
- Ingredients: vitamin C, caffeine, cucumber, aloe, and green tea extracts
- No Parabens, Sulfates, or Phthalates
 - Does contain phenoxyethanol!
- Study of 100 women using product 2 x daily for 4 weeks:
 - 81% of subjects reported visibly decreased dark circles
 - 87% of subjects reported a decrease in puffiness
 - 91% of subjects reported visibly smoothed eye contours



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What Can We Recommend for Patients with Under Eye Circle Complaints?

6. At Home Aesthetics Treatments

- Jade Roller
 - helps improve lymphatic drainage
 - MUST BE CAREFUL TO USE THE RIGHT WAY
 - gently roll towards the nose; not away from it
- Cold cucumbers or warm green tea bags over the eyes for 5 minutes
 - cucumber juice and the cold temperature act as anti-inflammatory compresses
 - caffeine in the teabag will decrease fluid and improve circulation under the eyes



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What Can We Recommend for Patients with Under Eye Circle Complaints?

7. In Office Aesthetics Treatments

- Botox and Exilis Ultra stimulate collagen production
- Vbeam Prima laser
 - pulsed dye laser that constricts vessels and reduces vascularity and puffiness
- Pico Genesis FX
 - tightens the tissue, builds collagen, and reduce both pigment and vascularity



33yo WM after Botox and filler to under eye area

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Contact Lenses and Cosmetics

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Research Shows Cosmetics Can Have Significant Impact on Contact Lenses

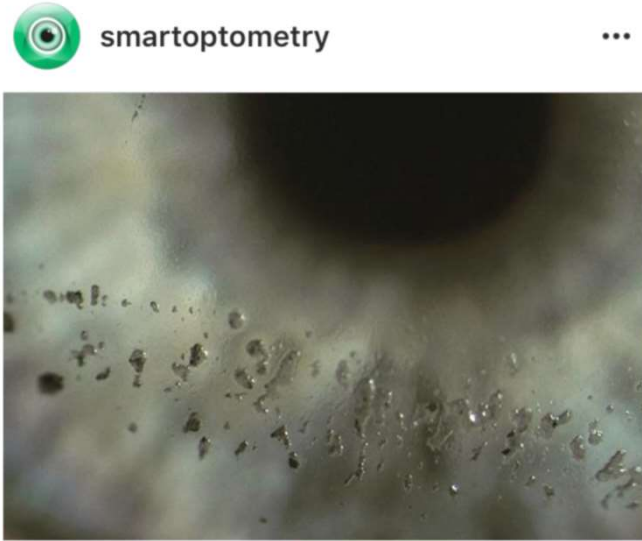
- Cosmetics can adhere to the lens surface, which could reduce surface wettability *Srinivasan et al 2015*
- Have the potential to change the lens dimension by flattening the base curve *Gonzalez-Cavada et al. 2009*
 - could affect lens fit and comfort



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How do Cosmetics Come in Contact with the Eye?

- During contact lens insertion or removal
- Direct contact while lenses are on eye (example – mascara wand hitting contact lens while applying mascara)
- Inadequate hand washing after applying creams or lotions
- Washing off makeup while wearing contact lenses



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Let's Talk About the Research

- *Leunsmann et al 2015* researchers tested seven different silicone hydrogel contact lenses with different common skincare and makeup products, including hand cream, makeup removers, and mascara.
 - Lenses were exposed to the product in vitro
 - dark-field microscopy was used to see how much the product visibly deposited on the contact lens both before and after cleaning with a hydrogen peroxide solution
 - Deposition was measured in "pixel brightness" with higher pixel brightness meaning more depositing
 - Researchers found that mascara was far and away the product that deposited the most on contact lenses.
 - While non-waterproof mascara deposits improved significantly after cleaning the contact lens with a hydrogen peroxide solution, waterproof mascara deposits remained relatively unchanged, even after a cleaning cycle!

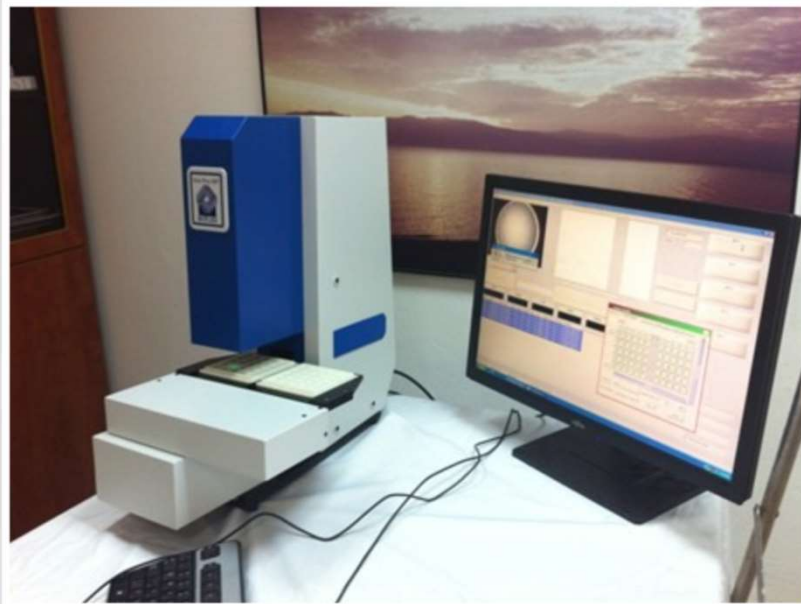
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Let's Talk About the Research

- In June 2019, a [new study](#) exploring this same topic was performed looking more specifically at the changes these skincare products can have on the physical size, shape, and optical properties of a contact lens
- 3 different brands of contact lenses were tested with exposure to mascara and eye makeup removers
- All lenses were newly opened from the package
- Each lens was only exposed to one product only
- A -3.00D lens was used for each contact lens to minimize differences between lenses outside of the product material itself

Leunsmann et al. "The Impact of Cosmetics on the Physical Dimension and Optical Performance of Contemporary Silicone Hydrogel Contact Lenses." *Eye and Contact Lens*. June 2019.

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Contest Plus
by Rotlex
was used to
measure
changes to
the contact
lens

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The Lenses



Material: Lotrifi-con B +E0BO
Center Thickness: 80
Base Curve: 8.6
Diameter: 14.2



Material: Senofilcon C
Center Thickness: 70
Base Curve: 8.4
Diameter: 14.0



Material: Samfilcon A
Center Thickness: 70
Base Curve: 8.5
Diameter: 14.2

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Let's Talk About the Research

The Results:

Statistically significant contact lens changes were found in diameter of the lenses, base curve, and power of the lenses in this study

The magnitude of change relative to the baseline measurements was compared with the [ISO standards for contact lenses](#), which suggests tolerance limits of:

- +/-0.20 mm for lens diameter
- +/-0.20 mm for base curve
- +/-0.25 D for lens power

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The Products: Makeup Removers



Novartis Lid-Care Towelettes



L'Oréal Gentle Makeup Remover Eyes & Lips



Neutrogena Oil-Free Eye Makeup Remover

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Let's Talk About the Research

What Problems Do Makeup Removers Cause? Research shows these products primarily affect the fit of the contact lens.

Diameter Changes: The makeup removers, specifically the liquid products (L'Oréal Gentle Makeup Remover and Neutrogena Oil-Free Makeup Remover), resulted in an increase in lens diameter and lens edge distortions.

- L'Oréal Gentle Makeup Remover caused diameter increases in senofilcon C (Acuvue Vita) and samfilcon A (Bausch and Lomb Ultra) of 0.26 mm
- Neutrogena Oil-Free Makeup Remover showed a mean increase of 0.35 mm for samfilcon A (Bausch and Lomb Ultra)
- Lotrafilcon B+EOBO (Air Optix Plus Hydraglyde) was less affected compared with senofilcon C and samfilcon A

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Let's Talk About the Research

What Problems Do Makeup Removers Cause? Research shows these products primarily affect the fit of the contact lens.

Base Curve Changes:

Liquid makeup removers resulted in an increase in contact lens base curve.

- L'Oreal Gentle Makeup Remover resulted in an increase in base curve for senofilcon C (Acuvue Vita) of 0.36 mm
- Neutrogena Oil-Free Makeup Remover resulted in an increase in base curve for samfilcon A (Bausch and Lomb Ultra) of 0.35 mm

Because most of these changes exceeded the tolerance of the ISO standard of ± 0.20 mm, it is possible that lens movement and centration of the contact lens on the eye could be affected

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The Products: Mascara



Maybelline Great Lash
Waterproof Mascara



Rimmel Wonder'Lash
Waterproof Mascara



L'Oreal Voluminous
Original Mascara

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Let's Talk About the Research

What Problems Do Mascaras Cause? These products primarily effect image quality and vision.

Deposition Changes: Mascara caused significant deposition on the contact lenses, and in some brands deposition did not improve even after a one hour soak in purified buffer solution (PBS).

- Maybelline Great Lash Waterproof Mascara deposited thickly on all lens types and did not slough off during the 1-hr PBS-soak
- Rimmel Wonder'Lash Waterproof Mascara and L'Oreal Luminous Original Mascara did not deposit as thickly and sloughed off more readily after cleansing

Optical Image Quality: This was measured using the Contest Plus II (Rotlex, Israel) lens analyzer. All contact lens brands were adversely affected by mascara

- samfilcon A (Bausch and Lomb Ultra) was affected similarly by all brands
- senofilcon C (Acuvue Vita) and lotrafilcon B+EBOB (Air Optix Plus Hydraglyde) were most affected by Maybelline Great Lash Waterproof Mascara

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Let's Talk About the Research

What Problems Do Mascaras Cause? These products primarily effect image quality and vision.

Base Curve Changes:

- Of the mascaras tested, only Maybelline Great Lash Waterproof Mascara caused a statistically significant change in base curve
- The application of Maybelline Great Lash Waterproof Mascara caused a steepening in base curve for all lens types of 0.24 mm for senofilcon C (Acuvue Vita) and samfilcon A (Bausch and Lomb Ultra) and 0.19 mm for lotrafilcon B+EBOB (Air Optix Plus Hydraglyde)

Lens Power Changes:

- Maybelline Great Lash Waterproof Mascara caused an apparent decrease in power of -1.18 D for senofilcon C (Acuvue Vita)

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Let's Talk About the Research

Take Home

During the normal course of wear, contact lenses can be exposed to numerous facial and cosmetic products that can significantly impact the comfort and visual performance of the lens. Properly cleaning your contact lenses may help recover some of the parameter changes caused by different cosmetics to some degree. However, particularly mascara may still affect image quality and liquid eye makeup removers may affect lens fit. If you are struggling with contact lens performance, changing to a daily disposable contact lens and limiting exposure of the lens to cosmetic products may greatly increase lens comfort, vision, and wearing time.

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Common Cosmetic Procedures & Effect on the Eyes

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Eyelash Extensions



What Happens?

- Synthetic, silk, or mink lashes are glued to individual natural lashes.
- Application can take up to 2-3 hours. Refills are required 1-2x/month.
- Remove CL and makeup prior to application, ok to reinsert CLs after application.

For the first 24-48 hours, patients should avoid:

- Touching lashes
- Makeup
- Getting lashes wet
- Facial treatments

29, 30, 31, 32

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Eyelash Extensions



Lyerly

The Importance of Proper Care

2012 study of 107 women with false lashes over 3 years:

- 64 cases of keratoconjunctivitis
- 42 cases of allergic dermatitis and/or blepharitis
- 3 cases of corneal erosion

Things to Avoid:

- Oil-based or waterproof makeup
- Eyelash curlers
- Rubbing eyes or playing with lashes
- Excessive moisture or steam
- Leaving make-up on overnight – **Patients should clean lashes twice per day**
- Cotton swabs to remove makeup

33, 34, 22, 35, 29, 30, 31, 36, 37, 38

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Eyelash Extensions



The Dry Eye Factor

Eyelashes are meant to protect the eyes from debris and wind

- Optimal eyelash length is 1/3 of the eye width
- Long lashes divert air flow towards the ocular surface, increasing evaporation and dry eye symptoms
- Weight of the eyelashes create an incomplete blink

Glue and Adhesive

Acrylates (Cyanoacrylate or Methylacrylate)

- Can cause contact dermatitis and conjunctivitis
- If there's a reaction, return to the salon for a professional removal
- Recommendations: Ask for a patch test at each new salon.

6, 39, 35, 40, 41, 34, 30, 42, 5, 31, 43

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Life of an Eyelash

HAIR GROWTH CYCLE

1. Anagen

(growth phase)

Nourishment of hair follicle via blood supply enables hair growth.



2. Catagen

(transition phase)

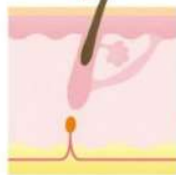
Hair follicle detaches from nourishing blood supply.



3. Telogen

(resting phase)

Without nourishment, the hair dies and falls out.



44, 45, 46

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What You Need to Know About Eyelashes

- Humans have between 225-300 eyelashes per eye
 - 150-200 upper eyelid and 75-100 lower eyelid
- Anagen/Growth Phase – 30-45 days
 - Eyelash Growth Serums increases duration of Anagen/Growth Phase. This leads to longer lashes and more lashes in the “active” state at a time
 - Hair follicle is nourished by the blood supply and eyelash grows
 - Approximately 40% of the upper lashes and 15% of the lower lashes are in Anagen Phase at any time
- Catagen/Transition Phase – 14-21 days
 - Eyelash detaches from the blood supply and hair follicle desiccates. Eyelash is still present at its maximum length
- Telogen/Resting Phase – 4-9 months
 - the hair follicle completely desiccates (so it can replenish and return to Anagen), eyelash remains in place until Exogen/Lash Loss occurs.

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Latisse: 0.03% Bimatoprost

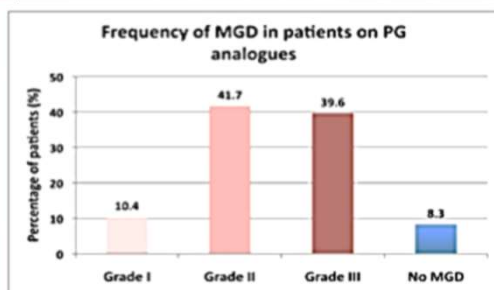


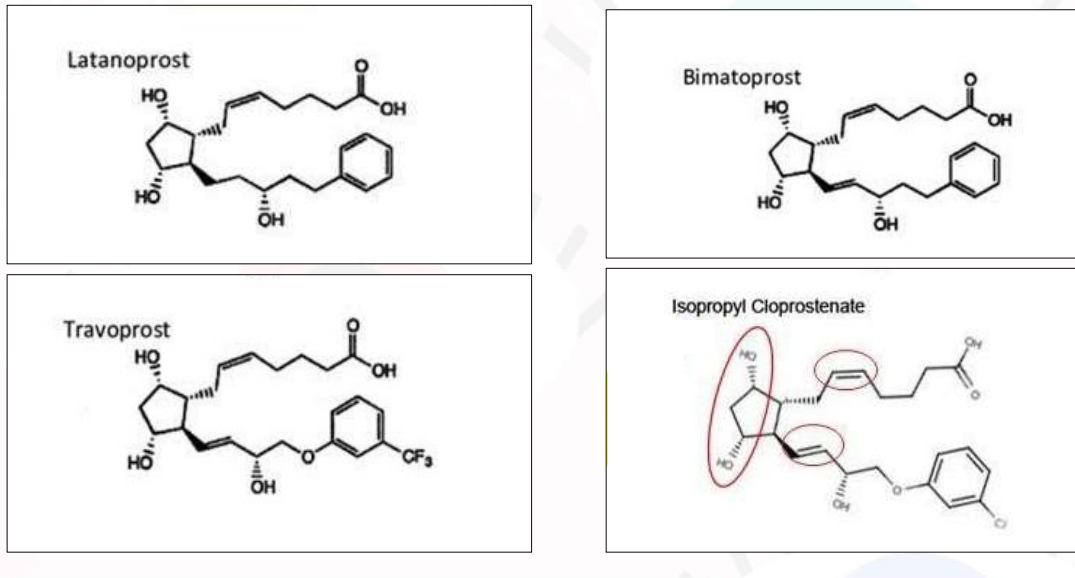
Figure 2. Depiction of percentage of patients who were diagnosed with different grades of meibomian gland dysfunction (MGD).

Preservative: BAK

- **4% of Latisse users experience itching, redness, and watering**
- Other less common side effects:
 - Allergic reaction causing lid chemosis
 - Darkening of eyelid skin and iris
 - Shrink layers of orbital fat in eyelid causing sunken eye appearance
- **Nearly 50%** of all prostaglandin analog glaucoma drop users have diagnosis of dry eye
- **91.7% of patients treated with prostaglandin analogue drops for glaucoma had meibomian gland disease**, versus only 57.7% of patients being treated for glaucoma on a different category of medication

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Isopropyl Cloprostenate: a synthetic prostaglandin analog



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Isopropyl Cloprostenate: a synthetic prostaglandin analog

By JONATHAN BERR MONEYWATCH May 4, 2018, 5:30 AM

Rodan + Fields hit with suit over eyelash enhancer

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Skincare product company Rodan + Fields faces a federal class action lawsuit accusing it of violating state consumer protection laws and engaging in fraudulent and unfair marketing of its Lash Boost eye serum. Rodan + Fields says its \$150 Lash Boost gives users "the appearance of lush, longer-looking lashes." But the suit claims the multilevel marketing company failed to disclose the side effects of a key ingredient in Lash Boost.

The ingredient in question is a chemical called isopropyl cloprostenate, which is a type of medication called a prostaglandin analog. This one is used to treat eye conditions such as glaucoma. Rodan + Fields omitted information to Lash Boost buyers about the side effects of prostaglandin analogs that are well-known to eye doctors, according to the [April 13 court filing](#) in a U.S. District Court in Oakland, California.

FDA issued a warning to OTC lash serum makers back in 2011 about the potential dangers of including a synthetic version of a prescription product (isopropyl cloprostenate) with known FDA-studied side effect profile in their formulations

- **List of OTC lash growth products that contain isopropyl cloprostenate:**

- Xlash Eyelash Enhancer
- Neulash
- NeuveauBrow
- RevitaLash
- Nutraluxe MD Lash
- M2 Lashes Eyelash activating serum
- Peter Thomas Roth Lashes to Die For
- Platinum
- Rodan + Fields Lash Boost

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What You Need To Know about Lash Growth Serums:

Are there any alternatives?



- ZORIA by OCuSOFT:
- **How it Works:** "polypeptide technology to naturally enhance and support each of the three phases of the eyelash growth cycle"
- Ingredients: water, sony amino acid, magnesium ascorbic phosphate, sodium chloride, **disodium EDTA**, myristoyl pentapeptide-17, cocoyl-oligopeptide-1, calcium chloride, **polyaminopropyl biguanide**, hydroxyethylcellulose, **phenoxyethanol**, caprylyl glycol, **polyhexamethylene biguanide HCl**, adenosine triphosphate, camellia sinensis (green tee) extract, tocopheryl acetate, glycerine.
- Take Home: There is no such thing as a completely "safe" lash growth product; all may cause redness, irritation, and ocular surface disease side effects depending on the patient.

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Does Castor Oil Help Lash Growth?

- There have been no scientific studies that prove castor oil helps eyelash hair grow
- There is evidence that ricinoleic acid, a chemical compound that makes up almost 90 percent of castor oil, might help reverse hair loss.
- A study found that the protein prostaglandin D₂ (PGD2) is present in high levels on men who have male pattern baldness, and is one of the factors that kept the subjects of the study from growing their hair back.
- Studies show ricinoleic acid may help inhibit PGD2 and potentially help scalp hair grow back.

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LashLift or Lash Perming



What Happens?

- Protective pads are glued to the top and bottom surface of the eyelid
- Silicone curler glued to the top eyelid, eyelashes are positioned over the curler and glued in place
- A chemical perming solution applied (ammonium thioglycolate)
- Results last 2-3 months

What Should We Educate

- Lash Lift providers have extensive FAQs warning about the dangers of the process to the surface of the eye.
- **Aestheticians warn that Lash Lift should NOT be performed if a person has a history of eye allergies, eye infections, styes, sensitive eyes, watery eyes, or chronic dry eye.**

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Eyelash Tinting



What Happens?

- Eyelashes are dyed to a darker color
- Dyes include Para-phenylenediamine (PPD), which can cause conjunctivitis or dermatitis
- Results last 2-3 months

What Should We Educate?

FDA: "Do not dye or tint your eyelashes. FDA has not approved any products for permanent dyeing or tinting of your eyelashes or eyebrows."

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Isotretinoin Also known as: Accutane



25yo WF that reported Accutane use for 3 years with complaints of foreign body sensation and photophobia

Found in: acne treatment

Study of 14,682 adolescents and young adults on oral isotretinoin x 2 years *Neudorfer M et al Ocular Adverse Effects of Systemic Treatment With Isotretinoin. Arch Dermatol. 2012.*

- **13.8%** had ocular adverse events: blepharoconjunctivitis, keratoconjunctivitis sicca, abnormal meibomian gland secretion, corneal opacities, photophobia, hordeolum/chalazion, contact lens intolerance, refractive changes
- *ARVO Poster 2016 Conclusion:*
 - Isotretinoin has been documented to cause structural changes in meibomian gland architecture visible via meibography
 - Baseline meibography on patients taking Isotretinoin may be helpful to monitor possible atrophy

“What is interesting is that I’ve seen significant dry eyes in patients who were not currently on Accutane but had taken it years prior,” Dr. Paul Karpecki *Review of Optometry 2013*

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Retin-A Also known as: tretinoin, retinol, retinyl palmate



Reddit forum post: “Is this normal for someone on tretinoin and benzoyl peroxide? I’ve been on it for 6 days and it made my skin extremely dry and aged me 40 years.”

Found in: topical wrinkle creams
Side Effects documented at length. *Caffery, et al. Ocular Side effects of Isotretinoin therapy. J Am Optom Assoc. 1988 Mar;59(3):221-4:*

- Dry eye syndrome and blepharoconjunctivitis in 20-50% of users
- Cheilitis, dryness, peeling, itching, redness of the skin; eczematous dermatitis
- dry eye; irritation of the eye
- Blurry vision, photophobia
- Contact lens intolerance

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Botox



The most common complication of botulinum injections to the glabellar complex is **ptosis of the upper eyelid** caused by diffusion of the toxin through the orbital septum where it affects the levator palpebrae muscle.

What Happens?

- Botulinum toxin is injected to paralyze muscle and smooth lines. Periorbital targets include the corrugator muscle (between the eyebrows), orbicularis oculi (around the eyebrow region including “crows feet”)

Botox is on the Rise: 7.2 million injections in 2017

- Rate of Botox in men is on the rise (up 337% since 2000)

What Should We Educate?

Weakening orbicularis affects blink dynamics and meibum delivery

- Lagophthalmos and Ectropion
- SPK
- Foreign body sensation
- Photophobia
- Diplopia
- Epiphora

63, 64, 6, 65

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Botox

Could it improve patient reported symptoms of dry eye?

Take Home: Ocular pain doesn't always come from the ocular surface. “We have to acknowledge that for a subset of dry-eye patients, the primary problem is nerve sensitization. This proof-of-concept study suggests that strategies used to treat nerve pain may be effective when clinicians suspect that neuropathic mechanisms underlie dryness and photophobia.”

-Anat Galor, MD, MSPH

2018 Study of 90 patients being treated with Botox injections for chronic migraine

- asked to recall their ocular symptoms before and after receiving Botox injections and to rate their symptom severity on a scale of 0 to 10
- 72.5% of patients reporting improvement in photophobia
- 29.3% reporting improvement in dry eye symptoms

Why would dry eye symptoms get better if studies have shown it could exacerbate this same condition?

- researchers believe that calcitonin gene-related peptide (CGRP) may be central to study results. One of the proposed mechanisms in migraine is excessive CGRP release, which leads to neurogenic inflammation, recruitment of inflammatory cells to the site, and an inflammatory environment that does further damage to nerves
- sensations of dryness and photophobia are also transmitted via trigeminal activation

Diel RJ et al. Ophthalmology. 2018;125(1):139-140.

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In Your Chair: What Should We Educate Our Patients To Avoid or Change Today?

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Makeup Removers

and the
nough to clean
Non-comedogenic
Dermatologist recom
Directions For Use Without Water: Apply a liberal amount of cleanser to the skin and rub gently. Rinse.
Directions For Use With Water: Apply cleanser to the skin and rub gently. Rinse.
INGREDIENTS: WATER, CETYL ALCOHOL, PROPYLENE GLYCOL, SODIUM LAURYL SULFATE, STEARYL ALCOHOL, METHYLPARABEN, PROPYLPARABEN, BUTYLPARABEN



Makeup removers are full of harsh chemicals, even those often marketed as “safe” or “dermatology approved”. Educate patients:

- **Check the labels and avoid these harsh preservatives**
 - BAK, parabens, formaldehyde releasing preservatives
 - Phenoxyethanol – “strong eye irritant” at concentrations >2% per International Journal of Toxicology

A Closer Look:

- **Cetaphil Gentle Skin Cleanser**
 - **Ingredients:** water, cetyl alcohol, propylene glycol, sodium lauryl sulfate, stearyl alcohol, methylparaben, propylparaben, butylparaben.
- **Ocusoft Lid Cleanser**
 - **Ingredients:** Water, Peg-80 Sorbitan Laurate, Sodium Trideceth Sulfate, Peg-150 Distearate, Disodium Lauroamphodiacetate, Cocamidopropyl Hydroxysultaine, Sodium Laureth-13 Carboxylate, Sodium Chloride, Peg-15 Copolyamine, Quaternium-15

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What We Should tell Patients about Makeup Cleansers



It's essential to remove makeup nightly

Ocular Surface Friendly Eye-Makeup Removers and Eyelid Cleansers:

- Mychelle Argan Oil
- Micellar Water and Micellar Wipes
- We Love Eyes Tea Tree Oil Cleansing Oil
- Hypochlorous Acid (Avenova, Ocusoft Hypochlor, Heyedrate)

The above recommendations are from Dr. Laura Periman and the Ocular Surface Docs Facebook Group

Petitvour.com for more resources

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Patient Education From the Chair

Use photography or videos to show them ocular surface disease offenders

Anterior segment photography or meibomian gland imaging can be used to educate:

- Avoid waterline application or "tightlining"
- Mascara debris in tear film or conj
- Foundation debris in tear film
- Collarettes or lash debris/blepharitis

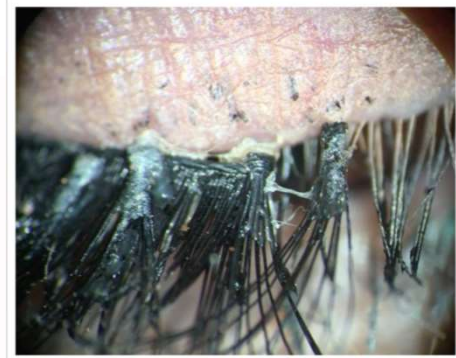


Image from Dr. Leigh Plowman

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Questions?

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Eyedolatry@gmail.com or jelyerly@gmail.com

Great Communities: OSDocs on Facebook

Great Resources:

Dry Eye Divas Dr. Laura Periman, Dr. Leslie

O'Dell, Amy Gallant Sullivan

Dr. Kathy Mastrota

Petitvour.com

EWG.org Environmental Working Group for
ingredient safety investigations

<https://www.opthalmologymanagement.com/issues/2016/august-2016/when-beauty-doesn-8217;t-bl>

When beauty doesn't blink

We look at exacerbators of ocular surface disease that lurk on product labels in cosmetics bags.

By Laura M. Periman, MD and Leslie E. O'Dell, OD August 1, 2016



DRY EYE DISEASE SPECIAL SERIES: COSMETICS

When beauty doesn't blink

We look at exacerbators of ocular surface disease that lurk on product labels in cosmetics bags.

By Laura M. Periman, MD and Leslie E. O'Dell, OD

Prescription medications that we recommend for our dry eye disease (DED) patients have been proven safe and efficacious through rigorous clinical trial studies. But the products and cosmetics that our patients use in and around their eyes — which have the potential to exacerbate or contribute to the disease¹ — are not required to meet that standard. The assumption is that cosmetics do not have a toxic local or systemic effect. Do we know if this is true?

The Federal Food, Drug and Cosmetic Act of 1938 was enacted after 100 babies died because