

Contact Lens Care and Compliance

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Financial Disclosures

- I am the Manager for Consultation and Customer Service for Bausch + Lomb Specialty Vision Products

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Evolution of SCL Lens Care circa 1971

- Heat disinfection with components:
 - Daily cleaner
 - Saline rinse (homemade! with salt tablets and distilled water)
- Steam disinfection
- Weekly enzyme cleaners

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Problems with Heat Disinfection

- Caused denatured protein that increased incidence of GPC
- Only 90% of units worked; electrical failure
- In the morning, patients would rinse lens with homemade saline; which would defeat the purpose of the heat disinfection

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Evolution of SCL Lens Care chemical systems

- Chemical disinfection:
 - Daily cleaners
 - Saline rinse
 - Overnight chemical disinfection
 - Thimerosal, Chlorhexidine
 - Morning saline rinse
 - Weekly cleaners

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Evolution of SCL Lens Care chemical multipurpose solutions

- All-In-One Multipurpose solutions:
 - Clean, rinse and disinfect in ONE step
- Patients were told they no longer needed to “rub and rinse” their lenses

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Rub vs. No Rub

- The No Rub label was approved by replacing rubbing with extra rinsing
- Either *rub it off* or *hose it off*
- Silicone Hydrogel lenses need to be digitally cleaned to prevent
 - Lipid build up (decreases wettability and blurs vision)
 - Denatured protein build up (increases inflammation)
- 2010: FDA recommended the removal of “no rub” from contact lens solution labels



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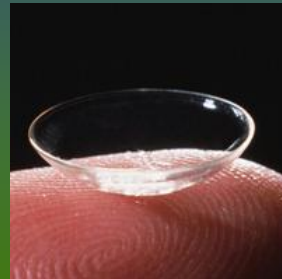
Label: No Rub Message: No Care

- This “no care” concept has led to dangerous complacency among patients and practitioners as regards to disinfection, comfort and lens functionality

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2010: Soft Lens Dropouts

- Unfortunately, a significant number of contact lens wearing patients were lost each year due to *dryness perceived discomfort*
 - 2010 survey found that the mean dropout rates among contact lens wearers was reported at 15.9% in the United States
 - This represents a loss of 1 in 6 contact lens wearers



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New Formulations

- Industry responded by introducing new product formulations to address lens drying concerns
- Lubricants/humectants/osmotics were added to lens care products to reduce lens dehydration
- Lens materials were developed with less water content to help with dehydration
 - Introduction of Silicone Hydrogel lenses

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Silicone Hydrogel properties/characteristics

- Si-Hy lens chemistry makes them behave differently
 - Very high oxygen permeable
 - Increased lens modulus or stiffness
 - Lower water content = Less lens dehydration
 - Low levels of total protein uptake, but higher binding of denatured proteins
 - Higher levels of lipid uptake
 - Increased GPC



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Looking for the Silver Bullet

- The key to preservative/disinfection use is to have sufficient concentrations for antimicrobial efficacy, yet low enough to prevent toxicity
- Toxicities are dose related events
- All preservatives are toxic if used in excess concentrations

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MPS Formula Ingredients

- The preservative combinations are not the only components of a solution. The chemical combinations of buffers, chelants, surfactants, electrolytes, and lubricants all work together to create the final contact lens solution.

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Ophthalmic Preservatives

- **BAK (Benzalkonium Chloride)**
 - Added to glaucoma drops to help drug penetration
 - Toxic to corneal epithelial and endothelial cells, increases conjunctival allergic response and decreases lipid layer
- **Polyquad (Polyquaternium-1)**
 - Detergent derived from BAK
 - Good coverage against bacteria, fungi, yeasts and molds
 - Been shown to cause superficial epithelial damage
 - Related to decreasing aqueous tear production
- **PHMB (Polyhexamethylene Biguanide)**
 - High kill rate against Acanthamoeba and bacteria
 - Non-irritating to corneal cells
 - Low efficacy against fungus

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Ophthalmic Preservatives

- **Aldox (myristamidopropyl dimethylamine)**
 - Good coverage against fungi and Acanthamoeba cysts and trophs
- **EDTA (Edetate Disodium)**
 - Chelating agent
 - Enhances the antimicrobial activity of disinfectants
 - Decreases deposit formation

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Infection Outbreak

- While industry was trying to create new formulations for better disinfection with less toxicity, new products created world-wide infection outbreaks

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Fungal Keratitis

- Cases of fungal keratitis associated with *ReNu with Moisture Loc* were reported in sub tropics of South Asia and later in the USA and other countries



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Outbreak of *Fusarium* Keratitis 2006

- Chang et al. (USA)
 - Case-control
 - 164 confirmed cases
 - 154 associated with *ReNu with Moisture Loc*
- Khor et al. (Singapore)
 - 68 cases
 - Associated with poor contact lens hygiene and *ReNu with Moisture Loc*

Chang et al., JAMA 23:2006
Khor et al., JAMA 295: 2006

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Acanthamoeba Keratitis 2007

- Abbott Medical Optics (AMO)
(formerly Advanced Medical Optics)
 - recalled *Complete Moisture Plus* on May 26, 2007
 - This action followed reports and data from CDC regarding a sevenfold increase of *Acanthamoeba* keratitis
 - Solution was not contaminated but was found ineffective in preventing *Acanthamoeba* keratitis



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Acanthamoeba Keratitis

- First reported in 1973
- According to CDC, estimated 85% of U.S. *Acanthamoeba* keratitis cases affect contact lens wearers

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Incidence of Microbial Keratitis per 10,000 Contact Lens Wearers

- DW RGP1.2
- Daily Disposable 2.0
- DW SCL 1.9
- EW SCL 19.5
- DW Si-H11.9
- EW Si-H25.4

- Permanent Vision Loss (> 2 Lines): 0.6

Stapleton F, Keay L, Edwards K, Naduvilath T, Dart JK, Franzco GB, Holden B.
Ophthalmology. 2008 Jun 4

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Current MPS Formulations



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How Do Products Differ?

- Chemistry
 - Disinfectant performance
 - Cleaning performance
 - Bio-compatibility – Lens is a “delivery device” for MPS to the eye
- Physical properties
 - Viscosity
 - Wetting properties on lens and eye
- Clinical Performance

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Optifree puremoist (Alcon)

- Hydraglyde Moisture Matrix specifically created to use with silicone hydrogel lenses to increase lens wettability
 - Reduces hydrophobic surface
 - Reduces lipid deposits
- Dual disinfection
 - Polyquad and Aldox
 - Increased concentration of Aldox as compared to Replenish
 - Citrate as cleaning agent/buffer
- EDTA



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BioTrue (Bausch & Lomb)

- Dual disinfection system
 - PHMB and Polyquad
- Matches pH of tears
- Hyaluronan is primary lubricant
 - Naturally found in tears



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Renu Advanced Formula (Bausch & Lomb)

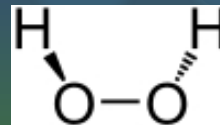
- Hydranate (hydroxyalkylphosphonate)
 - Removes protein deposits
- Preserved with DYMED (polyaminopropyl biguanide)
- EDTA



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Hydrogen Peroxide Mode of Action

- $\text{H}_2\text{O}_2 \Rightarrow \text{H}_2\text{O} + \text{O}_2$
 - Produces free radical superoxide; which is toxic to microbes
 - Damages DNA
- Strong oxidant
- Not affected by organic matter
- Removes proteins and lipids from lens surfaces



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Hydrogen Peroxide Disinfection Systems



- Catalase enzyme neutralized (Oxysept)
 - Full 3% strength for >20 min; delayed neutralization using tablet
- Catalytic disc neutralized (ClearCare)
 - Decreasing peroxide concentration
 - Age of disc determines if neutralization occurs in a few minutes or several hours
 - Triple Action is original formula
 - HydraGlyde helps with wettability to help decrease lens dehydration



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Peroxides

- Very effective and preservative-free
- For daily use; not for occasional CL wearers
- Caution patients not to store “spare lenses” in neutralized peroxide
- Most common problem is toxicity from non/insufficiently neutralized H_2O_2

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Gas Permeable Care Systems



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Boston Original/Advance Formula 3 step cleaning process

- Uses daily cleaner, conditioning solution and liquid enzyme
 - Daily cleaner
 - surfactant cleaner; can not be used with all GP lens materials/surface treatments as it will scratch the lenses
 - Used every night and rinsed with saline
 - Conditioning/storing solution
 - A sterile, aqueous buffered, solution containing a cellulose derivative polymer and polyvinyl alcohol as wetting and cushioning agents
 - Liquid enzyme
 - Used weekly to remove protein/lipid buildup



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Boston Simplus Multipurpose

- For cleaning, removing protein, rinsing, disinfecting, conditioning, storing
- Recommended that no evening rub required; just rub and rinse in the morning prior to lens insertion
- No weekly protein remover needed



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Unique PH Multipurpose

- For cleaning, removing protein, rinsing, disinfecting, conditioning, storing
- Recommended that no evening rub required; just rub and rinse in the morning prior to lens insertion
- No weekly protein remover needed



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Tangible Clean Multipurpose

- For cleaning, removing protein, rinsing, disinfecting, conditioning, storing
- Recommended that no evening rub required; just rub and rinse in the morning prior to lens insertion
- No weekly protein remover needed



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ClearCare Hydrogen Peroxide System

- Approved by FDA for use with Soft lenses and Gas Permeable lenses
- Preservative-Free benefits
- For added lens wettability, have patients rub and insert Gas Permeable lens with Boston Conditioner or artificial tear



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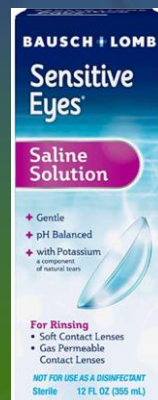
Saline



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Sensitive Eyes Saline Bausch & Lomb

- Not Preservative Free
- Buffered isotonic solution that contains potassium and is pH balanced
- Used to rinse cleaner off of lenses and to insert lenses
- Contains boric acid, sodium borate and sodium chloride



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Preservative Free Saline

- Bottles must be discarded within 30 days of being opened
- Sodium Chloride Vials
- Single use dosage; 3mL; 5mL; 15mL



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Generics/Private Label

- Private label products are not really generic
- “Generic” denotes same formulation
- Private label products are older generation MPS formulas sold under private label trade names
- The formulation may change yet the private label brand name/box/bottle remain the same
- Must caution patient's that they aren't always buying the same product each time

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Recommendations

○ Lens Care

- Wash Hands
- Compliant lens replacement
- Do not store opened “spare lenses”
- Rub and rinse daily
- Use fresh solutions daily
- Do NOT top-off solution



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Recommendations

○ Case care

- Empty/rinse daily
- Clean case with mild detergent and HOT water or H_2O_2
- Air dry daily
- Replace every 3 months



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Artificial Tears

- Based on disease severity and dosing, is the optimum artificial tear for this patient preserved or not preserved?
- Does the patient have more of an aqueous deficiency, mixed disease or an evaporative form of dry eye?
- How severe is it?

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Preservative Free Options



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Lipids

- The guar in Systane provides an excellent matrix for the aqueous component of the tear.
- Refresh Optive Advance as well as Soothe from Bausch + Lomb provide a lipid substitute to better stabilize the tear film.
- Another valuable additive to over-the-counter tears is hyaluronic acid, which can be found in Blink tears from Abbott
- Caution using these products with contact lenses in place due to coating the lens surface with oil



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Osmolarity

- Some tears have lower osmolarity
- Some studies show that lower osmolarity tears may have a better effect on the ocular surface.
- There are some tears that have ingredients that are called osmoprotectants.
- They are taken up by cells, and they blunt the response of the epithelial cells on the surface of the eye to high osmolarity in the tears.
- Optive tears have osmoprotectants

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Viscosity



- Patients with mild dry eye may prefer a watery drop, while those with more severe dry eye may prefer a thicker drop that stays on the cornea longer
- Regular tears or gel drops
- Introduce gel at bedtime to help with severe ocular surface dryness
 - Genteal Gel
 - Systane Gel
 - Refresh PM
 - Soothe PM
 - Ointments may leave residual oil in tear film that may effect contact lens wear

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2017: Soft Lens Dropouts

- Improved technology is decreasing contact lens dropouts but there are still contact lens patients that are lost due to *contact lens discomfort*
 - Recent study found that the retention rate for new soft lens wearers during the first 12 months of wear was 77.6% (531 total participants)
 - Of the **22.4% dropouts** (119/531)
 - **41% due to problems with vision**
 - (48/531) 9% total participants
 - **36 % due to discomfort**
 - (42/531) 8% total participants
 - **25% due to handling problems**
 - (29/531) 5.4% total participants
 - This represents a loss of **1 in 12** contact lens wearer

Retention Rates in New Contact Lens Wearers Sulley, Anna, B.Sc., M.C.Optom Et. al

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