

SOMETIMES THE SOLUTION IS THE SOLUTION

Phyllis L. Rakow, COMT, NCLE-AC, FCLSA(H)

PURPOSE OF LENS CARE SOLUTIONS (2 minutes)

- Remove surface contaminants
- Maintain healthy eyes
- Maintain comfort
- Maintain good VA

EXAMPLES OF NON-COMPLIANCE (3 minutes)

- Not changing solution nightly
- Topping off solution
- Immersing container tip in old, contaminated solution
- Not rinsing case daily
- Not replacing case regularly
- Using expired solutions
- Contamination of care solution bottles
- Not replacing opened containers after 30 days
- Storing lenses in saline instead of disinfectant
- Mixing incompatible care products

ISSUES IN SOLUTION DEVELOPMENT (2 minutes)

- Safety vs. microbial growth
- Efficacy in cleaning & disinfection
- Safety vs. toxic or hypersensitive reactions
- Complexity
 - Minimize confusion
 - Foster compliance

PRESERVATIVES ((2 minutes)

- Reduce bacterial & fungal loads from normal use
- Most do not bind to lens surfaces as readily as older preservatives
- Most are not absorbed into lens matrix
- Most are effective up to 30 days
- Most not effective vs. acanthamoeba

SOFT LENS PRESERVATIVES (3 minutes)

- Thimerosal (no longer used)
- Sorbate

- PAPB (polyaminopropyl biguanide)
- PHMB (polyhexamethylene biguanide)
- Polyhexanide
- Alexidine (no longer used)
- Hydrogen peroxide
- Polyquad

ADVERSE REACTIONS (2 minutes)

- Poor lens care habits
- Sensitive patients
 - Allergic & toxic responses to preservatives
 - May need preservative-free regimen

CONTEMPORARY SOLUTION ISSUES (4 minutes)

- Compatibility with new lens polymers
- Minimizing dry eye complaints
- Fungal contamination
- Acanthamoeba
- Patient compliance
- Adverse reactions
- Sensitivity
- Infection
- Use of generics

PATIENT SYMPTOMS (2 minutes)

- Dryness
- Burning
- Itching
- Cloudy lenses
- Fuzzy vision
- Lens awareness

OBJECTIVE SIGNS (2 minutes)

- Toxic keratopathy
- Limbal engorgement
- Superior limbic keratitis
- Corneal infiltrates
- Solution-related pseudo-dendrite
- Tarsal plate changes
- Corneal staining

SOLUTION TYPES (2 minutes)

- Saline solutions
- Cleaners
 - Surfactant
 - Enzymatic
- Chemical disinfecting products
- MPS
- In-eye contact solutions (rewetting)

FDA CLASSIFICATION (3 minutes)

- Group I Low-water-content Non-ionic
- Group II High-water-content Non-ionic
- Group III Low-water-content Ionic
- Group IV High-water-content ionic
- Need new group for silicone hydrogel

SILICONE HYDROGELS (10 minutes)

SILICONE-HYDROGEL DIFFERENCES

- Very high O₂ Permeability
- Low protein uptake
- High lipid uptake
- Reduced in vitro wettability
- Less dehydration
- Stiffer material

INTRODUCTION OF SILICONE HYDROGELS

- Anecdotal reports of corneal staining
- Question of interaction between certain lenses and lens care products?
- PHMB reactions in silicone hydrogels & FDA Group 2 lenses
- SPK
- Severity of staining increases over a 4-week period
- Most prominent about 2 hours after insertion
- Severity of staining then abates to lesser degree at 6 hours
- Patients often asymptomatic

GENERIC SOLUTIONS

- Many older formulations of national branded products
- May not be as effective as new products

- May cause more sensitivities
- ? Compatibility with silicone hydrogels
- Formulations may change without notice as contracts run out
- No sensitivity to old formulation
- Sensitive to new formulation

THIMEROSAL

- Gray discoloration of lenses and case
- High rate of sensitivity
- Reactions mimic infection, allergy, hypoxia

SORBATE

- Yellow discoloration of ionic lenses
- ? efficacy
- Still some sensitivities

PAPB (DYMED)

- Long chain molecule
- Does not penetrate lens matrix
- No lens discoloration
- Still some sensitivities
- Related to chlorhexidine
- No cross-sensitivity observed

ALEXIDINE

- Was used in B&L ReNu with Moistureloc
- Removed from market after outbreak of Fungal keratitis (*fusarium solani*)

POLYQUAD

- Quaternary ammonium compound
- Long chain molecule
- Does not penetrate lens matrix

NON-PRESERVED SOLUTIONS

- Squeeze bottles

- Aerosols

COMPLICATIONS OF LENS CONTAMINATION (3 MINUTES)

- GPC
- SLK
- Infiltrative keratitis
- Acanthamoeba keratitis
- Decreased comfort & VA

SOLUTION TYPES (13 MINUTES)

- Saline solutions
- Cleaners
- Chemical disinfecting products
- Multipurpose solutions
- In-eye contact solutions (rewetting solutions)

SALINE SOLUTIONS

- Isotonic salt solutions
- Rinsing
- Storage for heat-disinfected lenses
- Preserved
- Non-preserved
- Tested for microorganism stasis capability

NON-PRESERVED SQUEEZE BOTTLES

- Limited shelf life after opening
- Not good for P/T or EW
- Possible contamination of tip

HYDROGEN PEROXIDE DISINFECTION

- Bleaches as it disinfects
- Has cleaning action
 - Lenses shrink and swell during disinfection
 - Deposits are sloughed off surface
 - Safe on all lens types

ONE STEP PEROXIDE SYSTEMS

- AO-Sept, ClearCare, & Sauflon One Step (No-rub formula)
 - 3% H₂O₂ diluted in saline
 - No timing required between steps (but neutralization takes 6 hours)
 - Less chance of accidental corneal burn than with 2-step systems
 - Cannot substitute any other peroxide
 - Must remember to change case as directed
 - Not good for long-term storage (7 day maximum)
- Oxysept UltraCare
 - 3% H₂O₂ diluted in water
 - Timed-release neutralizing tablet
 - Neutralizer contains catalase and salt
 - Color indicator confirms neutralization tablet was added
 - Lenses disinfected & neutralized in only 6 hours
 - Possible confusion between neutralizing & enzymatic tablets
 - Not good for long-term storage

PROBLEMS OF HYDROGEN PEROXIDE

- Confusion about different directions for each system
- Incompatibility of different neutralizers
- Substitution of generic peroxide
 - Stability
 - Lens discoloration

MULTIPURPOSE SOLUTIONS

- Single bottle for cleaning, disinfection, & storage
- Passive cleaning
- Contain low level of surfactant to loosen surface debris
- Sensitive patients may have slight stinging or dryness
- Heavy depositors may need separate surfactant
- Regimen may include:
 - Digital rubbing
 - Rinsing
- “Stand-Alone” solutions
 - No rubbing
 - Critical rinsing step

CURRENT MULTIPURPOSE PRODUCTS

- B&L ReNu Original and ReNu Multiplus Disinfecting Solution
- Alcon Opti-Free Express and Opti-Free Replenish (effective vs. acanthamoeba & fungi)
- Ciba Aquify

- AMO Complete Easy Rub
- Sauflon Lite
- Private label multipurpose solutions
 - ? compatibility with new materials
 - ? current formulation
 - Contracts with manufacturers expire
 - New bottles of product could have different formulation from previous batch
 - Patients could have problems with corneal or lens integrity
- Advantages & disadvantages of above systems
 - ? efficacy, especially vs. viruses & fungi
 - Easy-to-follow directions
 - ? better compliance
 - Better than H₂O₂ for long-term storage (provide continuous disinfection)
 - Will patients just top off solution instead of changing nightly?
 - To rub or not to rub?
 - Conventional lenses vs. disposables
 - Silicone hydrogel vs. hydrogel
 - Ionic vs. non-ionic materials
 - Complete Moisture Plus and acanthamoeba

TYPES OF SURFACTANT CLEANERS

- Non-abrasive
- Abrasive
- Alcohol

PROTEIN REMOVAL

- Problems of accumulated protein
 - Decreased comfort
 - Decreased wear time
 - Decreased vision
 - Corneal staining
 - Papillary hypertrophy

ENZYMATIC CLEANERS

- Break down (digest) proteins, muco-proteins, lipoproteins
- Keep pores open so maximum oxygen can reach eyes
- Prevent lens shrinking and tightening
- Allow lens to hydrate fully
- Minimize incidence of GPC

TYPES OF ENZYMATIC CLEANERS

- Subtilisin (genetically engineered bacteria)
 - Used in laundry detergents
 - Can be dissolved in H₂O₂ (Ultrazyme only)

DAILY PROTEIN REMOVER

- Alcon Supra-Clens (pancreatin)
- Inherent protein removal qualities of multipurpose solutions

REWETTING DROPS

- Enhance lens wettability
- Maintain lens comfort
- Reduce friction between lens, cornea, & lids
 - Decrease irritation
 - Decrease adverse responses
- 30 ml limit (risk of contamination)
- Instruct patients on proper use
- Contents:
 - Saline
 - Common Wetting agents
 - Carboxymethyl cellulose (CMC)
 - Povidone
 - Hydroxypropyl methylcellulose
 - Polyethylene glycol
 - Dextran
 - Sodium Hyaluronate
 - Cleaning Components

CARE OF EW SILICONE HYDROGELS (5 MINUTES)

- Approved MPS or H₂O
- To rub or not to rub?
- MPS – Yes!
- H₂O₂ – No!
- Lubricate on awakening
- Keep moist during day
- Lubricate before sleep
- Extended wear means extended care
- When in doubt, take it out!
- Don't deviate from recommended care system
- No generics!

- Keep case clean & replace frequently
- Never top-off solution

COMBATING DRYNESS (5 MINUTES)

- Rewetting Drops
- Use of sorbate-preserved lubricants may cause red streaks on face
- Use rewetting drops from same manufacturer as care system whenever possible
 - EG: OptiFree Replenish MPS with OptiFree Replenish Rewetting Drops
- Disappearing preservatives
 - Aquify
 - blinkCONTACTS
 - Refresh Tears
 - Refresh Contacts
- PHMB sensitivity
 - CMC in Refresh products rapidly binds PHMB
 - Reduces its toxicity
 - Protects against disinfectant-related ocular insult
 - Place drop on lens or in eye before insertion

SOLUTION REACTIONS & INTERACTIONS (5 minutes)

LENS DISCOLORATION

- Always start with new CLs when changing care systems
- Precipitates may cloud lenses if patient changes care systems with old lenses
- Lenses may discolor when switching from MPS to H₂O₂

REACTIONS INVOLVING HYDROGEN PEROXIDE CARE SYSTEMS

- Use of generic H₂O₂
- Generic vs. Soft lens H₂O₂
- H₂O corneal burn
- Problems related to catalase neutralizers
- Irreversible bubbles may form between the layers of “sandwich technology” opaque colored lenses

PROBLEMS RELATED TO CATALASE NEUTRALIZERS

- Changes in sag depth may occur in Pure Vision lenses
- If the Oxysept UltraCare neutralizer is used in a case with a disc, it will gum up the disc

FUNGAL KERATITIS (3 minutes)

- Fusarium organism
- Initially in Asia
- ? Climate
- ? Hygiene
- ? Patient compliance
- ? Viscosity
- Initial presentation
 - Pain
 - Photophobia
 - Injection
 - Discharge
 - Tearing
- More painful than peripheral ulcer
- Hx of trauma – particularly vegetative matter
- Hx of prior corneal surgery
- Hx of ocular surface disorder
- May develop slowly or rapidly
- Suspect if no response to antibiotics

ACANTHAMOEBA KERATITIS (3 minutes)

- Parasite
- Ubiquitous in water
- Especially common in water with limescale
- Devastating corneal infection
- 138 cases of culture positive acanthamoeba since January '05
- 56% used Complete Moisture Plus
- Does increasing lubricant concentration compromise antimicrobial efficacy?
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- Does increasing lubricant concentration compromise antimicrobial efficacy?

PREVENTING FUNGAL KERATITIS AND ACANTHAMOEBA KERATITIS (2 minutes)

- Wash hands before handling CLs
- Rub & rinse lenses before disinfection
- Rinse case nightly
- Use fresh solution nightly
- Never top-off !!!
- Change solution daily even if not wearing CLs
- No tap water
- Keep case open & dry when not in use

- Replace cases monthly
- Make sure lenses are stored in disinfecting solution **NOT** saline
- Never use expired solutions
- Don't stretch life of lenses
- No swimming or hot tubs while wearing CLs
- Only OptiFree Express and OptiFree Replenish contain a fungicide & amoebicide
 - Effective vs. trophozoites & cysts

RGP SOLUTIONS (15 minutes)

CLEANING SOLUTIONS

- Remove accumulated secretions & contaminants from lenses
 - Physical cleaning
 - Involves use of abrasive particles suspended in surfactant solution
 - Abrasive action of particles physically disrupts deposits
 - Breaks deposits down into small particles coated with surfactant
 - Particles are rinsed away
 - Chemical cleaning
 - Uses a group of surfactants to neutralize attraction between deposits & lens surfaces
 - Breaks bonds chemically rather than physically
 - Removes deposits without vigorous rubbing
 - Eliminates scratches caused by abrasive cleaners

WETTING SOLUTIONS

- Convert hydrophobic surface of CLs to temporarily hydrophilic surface
- Help keep lenses clean during insertion
- Help keep lens on fingertip during insertion
- Act as mechanical buffer (cushion) between lens and cornea

SOAKING SOLUTIONS

- Serve as antimicrobial storage media
- Prevent dehydration and warpage of lenses

RGP CONDITIONING SOLUTIONS

- Create thin hydrophilic layer on lens surface
 - Increase comfort on insertion

- Allow tear film to form stable layer on lens surface
- Reduce dry spots
- Maintain base curve stability
- Meet antimicrobial requirements for *disinfection*
 - o Require rubbing or separate cleaner

COMBINATION SOLUTIONS

- Cleaning/Soaking
- Wetting/Soaking
- All-in-One

ENZYMATIC CLEANERS

- Remove bound protein from lens surfaces

RGP PRESERVATIVES & DISINFECTANTS

- Chlorhexidine (ChG)
- Polyaminopropyl biguanide (PAPB)
- Benzalkonium Chloride (BAK)
- Benzyl Alcohol

RGP CLEANERS

- Abrasive
 - Boston Cleaner (Original formula)
- Mildly Abrasive
 - Boston Advance Cleaner
- Non-Abrasive
 - Lobob Extra Strength Cleaner

CLEANING/SOAKING SOLUTIONS

- Optimum by Lobob (Benzyl Alcohol)
- MeniCare GP CDS (Benzyl Alcohol)
 - Destruction of biofilms
 - Maintenance of hydration
 - Base curve stability
 - Rub lenses with CDS
 - Store in fresh solution nightly
 - Rinse with sterile aerosol saline in AM
 - Never insert in eye directly from CDS

WETTING/SOAKING SOLUTIONS

- Boston Conditioning Solution (Original Formula)(ChG)
- Boston Advance Comfort Formula (PAPB & ChG)

WETTING/REWETTING SOLUTIONS

- Lobob Gas Permeable Wetting/Rewetting (Benzyl Alcohol)
- MeniCare Wetting & Rewetting Drops
- Boston Rewetting Drops (ChG)
- Allergan Refresh Tears/Contacts (Disappearing Preservative)
- AMO blinkContacts
- Ciba Aquify Long Lasting Comfort Drops

ALL-IN-ONE SOLUTIONS

- Boston Simplus (ChG & PAPB)
 - No evening rub regimen
 - Lenses must be digitally cleaned & rinsed before insertion in AM!
- OptiFree GP (Polyquad)

SPECIAL NEEDS LENSES (10 minutes)

PLASMA TREATED MATERIALS

- Electrical charge is applied to chamber containing CLs & O₂
- CL surface is chemically oxidized
- Surface becomes more hydrophilic
- Wetting angle is reduced
- Patient comfort is increased
- New wearers adapt more readily
- Lenses cannot be cleaned with abrasive cleaners

ENZYMATIC CLEANERS

- Boston One Step Liquid Enzymatic Cleaner (subtilisin)

PIGGYBACK CARE

- Clean GP lenses each night with GP cleaner & rinse with saline
- Store GP lenses in soft lens MPS or in MPS or in H₂O₂
- Rub, rinse & store soft lenses separately in MPS or in H₂O₂ systems
- In morning, rinse soft & GP lenses & insert in eyes
- If using H₂O₂, use soft lens rewetting drops to wet GP prior to insertion
- Never use GP rewetting drops with piggyback systems

RGP CLEANING & HANDLING RULES (2 MINUTES)

- Use only solutions formulated for RGPs
- Re-educate former PMMA wearers
- NEVER USE SALIVA TO WET LENSES!
- Clean nightly, immediately after removal
- Clean in palm of hand
- Cleaning between fingers may cause warpage, cracking, eversion
- Do not rinse in hot water

DIAGNOSTIC GP LENS CLEANING & STORAGE (2 MINUTES)

- Clean well after each use
- Disinfect with hydrogen peroxide for 10 minutes
- Wet vs. dry storage
- Must redisinfect lenses stored wet every 30 days
- Use dry storage for infrequently used trials
- Clean, rinse, & rewet prior to reuse

SOLUTION INCOMPATIBILITIES (5 MINUTES)

- Patient Symptoms
 - Dryness
 - Burning
 - Itching
 - Cloudy lenses
 - Fuzzy vision
 - Lens awareness
- Objective Signs
 - Conjunctival injection
 - SPK
 - Mild epithelial edema
 - Hydrophobic surface spotting
 - Lens deposits

GP SOLUTION PROBLEMS (5MINUTES)

- Toxic reaction to GP cleaner instilled in eye
- GP solution sensitivity
- NEVER use abrasives on:
 - Menicon-Z
 - Onsi-56
 - Hydro-2
 - Plasma-treated lenses
- Lens surfaces will be permanently damaged

- Use of borate-buffered RGP solutions in conjunction with those containing polyvinyl alcohol may result in the formation of a sticky gel on the lenses.
- RGP lenses must not be cleaned repeatedly with Miraflow.
 - Repeated use of Miraflow will cause parameter changes, brittleness, and cracking.
- Do not soak lenses that contain styrene (Soft-Perm) in solutions that contain chlorhexidine. Surface clouding will result.

AVOID SOLUTION-RELATED PROBLEMS BY:

- Educating staff
- Instructing patients thoroughly
- Telling patients to check with office before buying new products
- Emphasizing importance of
- Immediate care for solution-related emergencies
- Regular contact lens check-ups