

# CONTACT LENS CARE AND COMPLIANCE

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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
    - SALINE SOLUTION HEATED TO 70-80 DEGREES FOR 10-20 MINUTES
  - 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 PERFECT SOLUTION

- 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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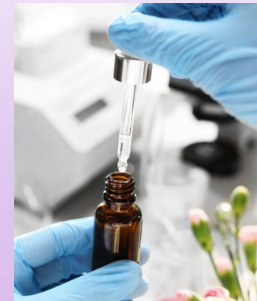
## OPHTHALMIC PRESERVATIVES

### • **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



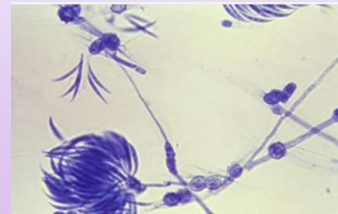
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## OUTBREAK OF *FUSARIUM* KERATITIS 2006

- 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

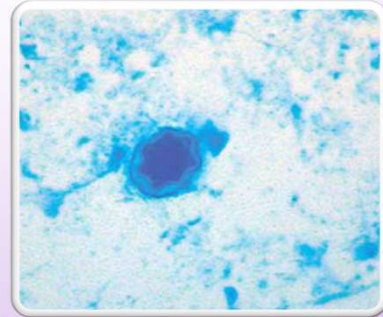
- ABBOTT MEDICAL OPTICS (AMO) (FORMERLY ADVANCED MEDICAL OPTICS)
  - RECALLED *COMPLETE MOISTURE PLUS* ON MAY 26, 2007
  - THIS ACTION FOLLOWED REPORTS AND DATA FROM CDC REGARDING A SEVENFOLD INCREASE OF *ACANTHAMOEBA* KERATITIS
  - SOLUTION WAS NOT CONTAMINATED BUT WAS FOUND INEFFECTIVE IN PREVENTING *ACANTHAMOEBA* KERATITIS



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## ACANTHAMOEBA KERATITIS 2007

- 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 RGP           | 1.2  |
| • DAILY DISPOSABLE | 2.0  |
| • DW SCL           | 1.9  |
| • EW SCL           | 19.5 |
| • DW SI-H          | 11.9 |
| • EW SI-H          | 25.4 |

- 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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## 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

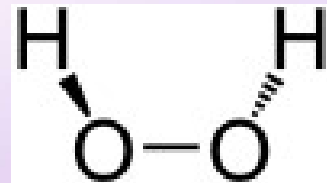


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## HYDROGEN PEROXIDE MODE OF ACTION

- $\text{H}_2\text{O}_2 \Rightarrow \text{H}_2\text{O} + \text{O}_2$ 
  - 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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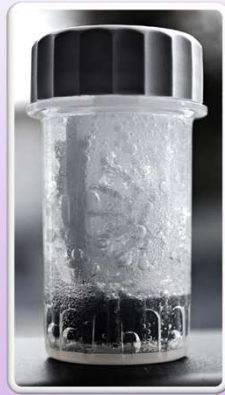
## HYDROGEN PEROXIDE DISINFECTION SYSTEMS



- 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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## HYDROGEN PEROXIDE DISINFECTION SYSTEMS



- 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<sub>2</sub>O<sub>2</sub>

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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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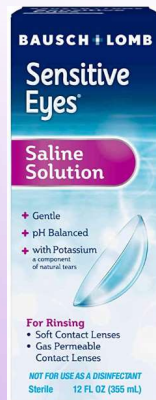
## CLEARCARE HYDROGEN PEROXIDE SYSTEM

- 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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## GENERIC/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<sub>2</sub>O<sub>2</sub>
  - AIR DRY DAILY
  - WIPE OUT WITH TISSUE OR CLEAN TOWEL
  - REPLACE EVERY 3 MONTHS



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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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