49th ECLSO
European Contact Lens and Ocular Surface Congress
EUROPEAN CONGRESS ON MYOPIA CONTROL
2 - 3 September 2022
Novotel Tour Eiffel
Paris - France
EUROPEAN CONTACT LENS SOCIETY OF OPHTHALMOLOGISTS

Contact Lenses for Beginners

What do we understand from soft lens care and post-fitting follow-up ?

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03-09-2022

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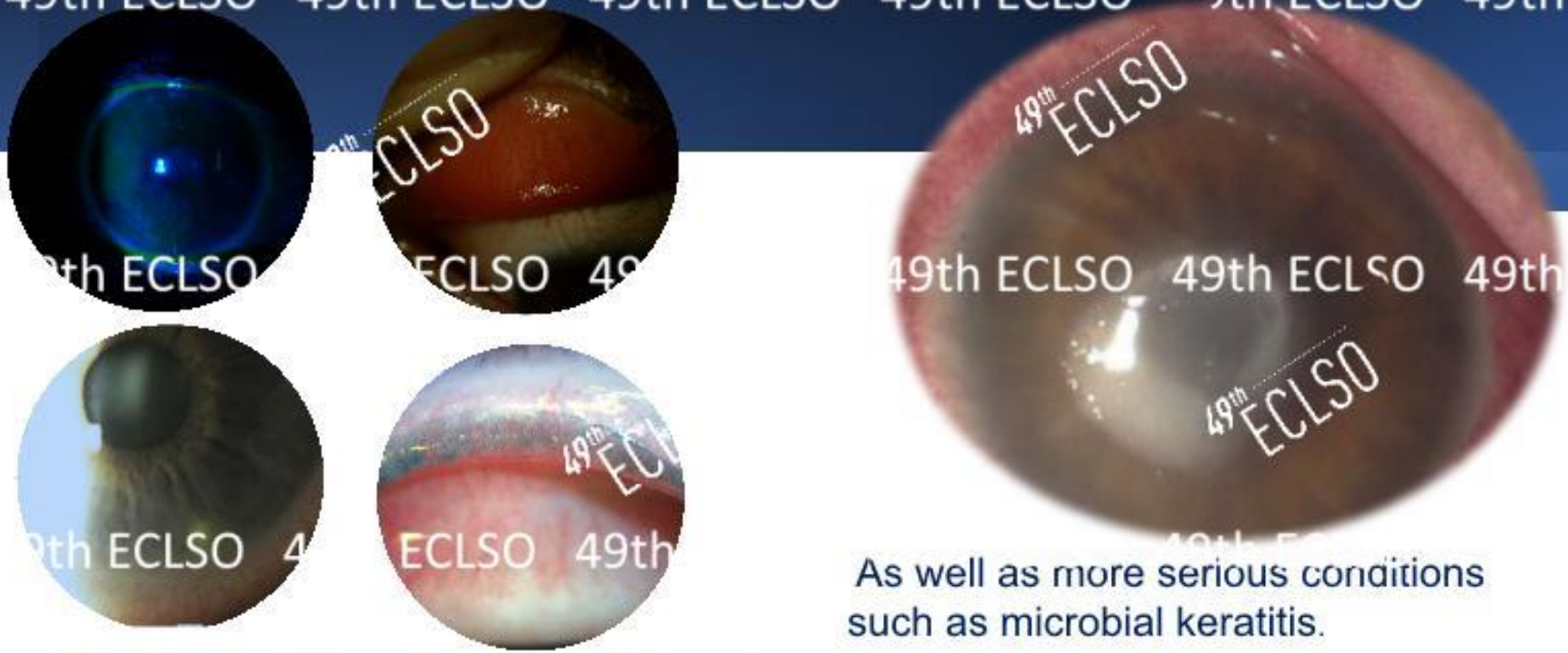
☑ *I do not have any potential conflict of interest*

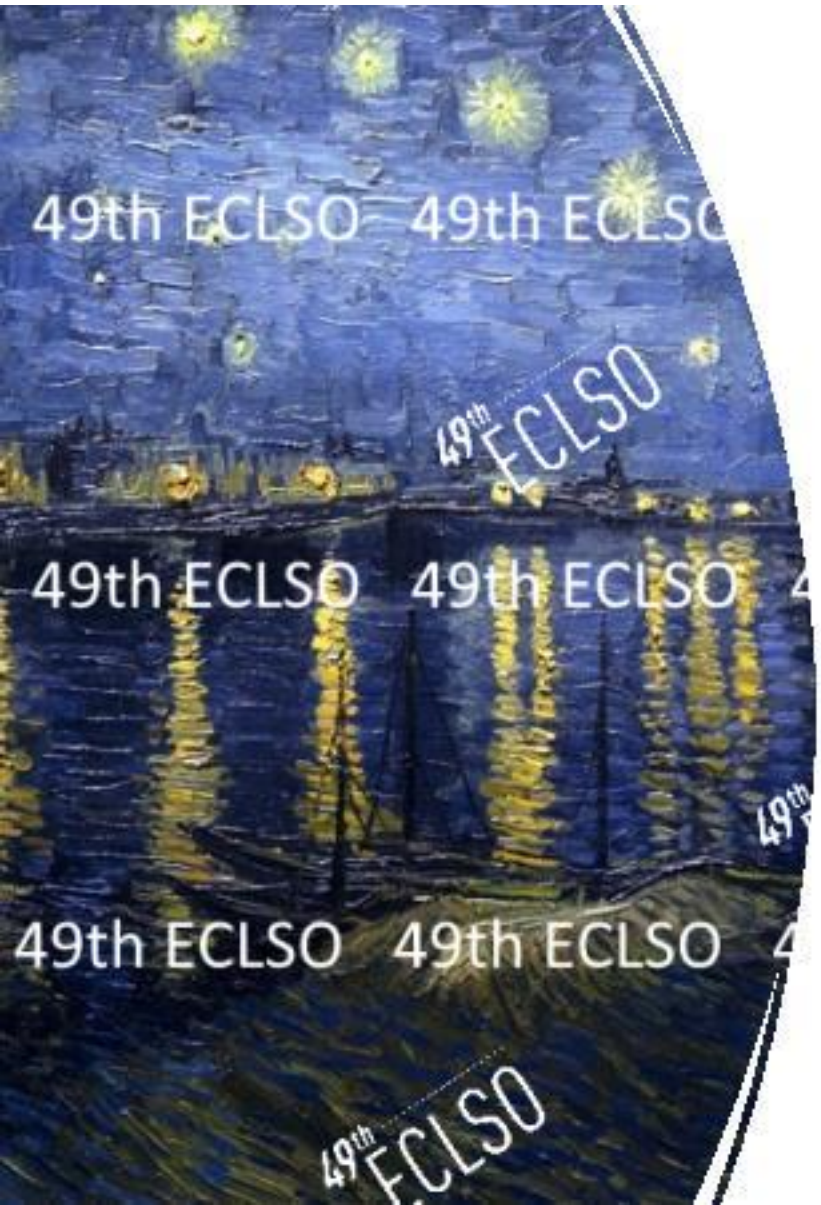
Contact lenses are exposed to many factors throughout the day that come from the ocular tissues and the environment.

Although contact lens use is generally considered safe, complications associated with the use of CL can occur



As well as more serious conditions such as microbial keratitis.

- Such as dryness, allergy, inflammation and discomfort...



Contact Lens Care

The main function of contact lens care products is to disinfect, clean, and increase the comfort of contact lenses, while they should be easy to use and compatible with ocular tissues.

Lens Care Systems

PHYSICAL SYSTEMS

Thermal Disinfection

Ultraviolet Radiation

Microwave Irradiation

Rarely used today.

CHEMICAL SYSTEMS

Multipurpose Solutions

Hidrogen peroxide

Multipurpose solutions (MPS)

All-in-one lens care systems
Only one solution is needed to clean, rinse, disinfect, condition and store the lenses.....

ANTIMICROBIAL AGENTS

WETTING AND LUBRICATING AGENTS

SURFACTANTS

OSMOLARITY AGENTS

CHELATING AGENTS

BUFFERS

DISINFECTION

The most important step !!!

- All contact lens care systems contain antimicrobial agents to reduce microbial contamination introduced during lens wear, removal, cleaning and storage

Contact lens Disinfection **≠ Sterilisation**

Disinfection : vegetative or living microorganisms are completely killed or inactivated.

Sterilisation : all organisms (including spores) are killed and, as such, there is no possibility for microbial growth

	PHMB (Poliheksametilen biguanide / Poliaminopropil biguanide)= DYMED	• **Effective against bacteria, less effective against fungi** and ineffective against *Acarthamoeba* • biotrue, Renu multiplus, MeniCare Plus, Sauflon All in One Light, SOLO-care Aqua, COMPLETE® Easy Rub®*, Boston Simplus® Multi-Action, Whölk perfect, Renu Advanced
	ALDOX -Amidoamine (Myristamidopropyl dimethylamine)	**Effective against fungi and *Acanthamoeba*** OPTI-FREE Express, OPTI-FREE RepleniSH
+	**Alexidine dihydrochloride**	**Effective against bacteria, fungi and *Acanthamoeba*** Bisbiguanid. RevitaLens Abbott(Johnson), Renu Advanced
+	**PQ-1 (Polyquaternium-1)**	• **Wide spectrum antibakterial ve antiviral aktivitity,** no effect against some fungi or amoeba • Biotrue, OPTI-FREE® Express®*, and RepleniSH®*, COMPLETE® RevitaLens Abbott(Johnson), Renu Advanced

New generation solutions are preserved with a double-triple disinfectant systems to increase the efficiacy.....

Bradley CS. Common Ophthalmic Preservatives in Soft Contact Lens Care Products: Benefits, Complications, and a Comparison to Non-Preserved Solutions. Clin Optom. 2021

A balance must be struck between efficacy and toxicity.

Efficacy

Standards for the microbiological requirements and test methods for evaluating the disinfection efficacy of CL solutions are set by the ISO (14729:2001)

STAND ALONE TEST

Antimicrobial efficacy is higher

NO-RUB

REGIMEN TEST

If the solution cannot meet stand-alone criterion

Recommended regimen outlined in the package insert (with rubbing and rinsing steps) are used

Contact lens

Lens case

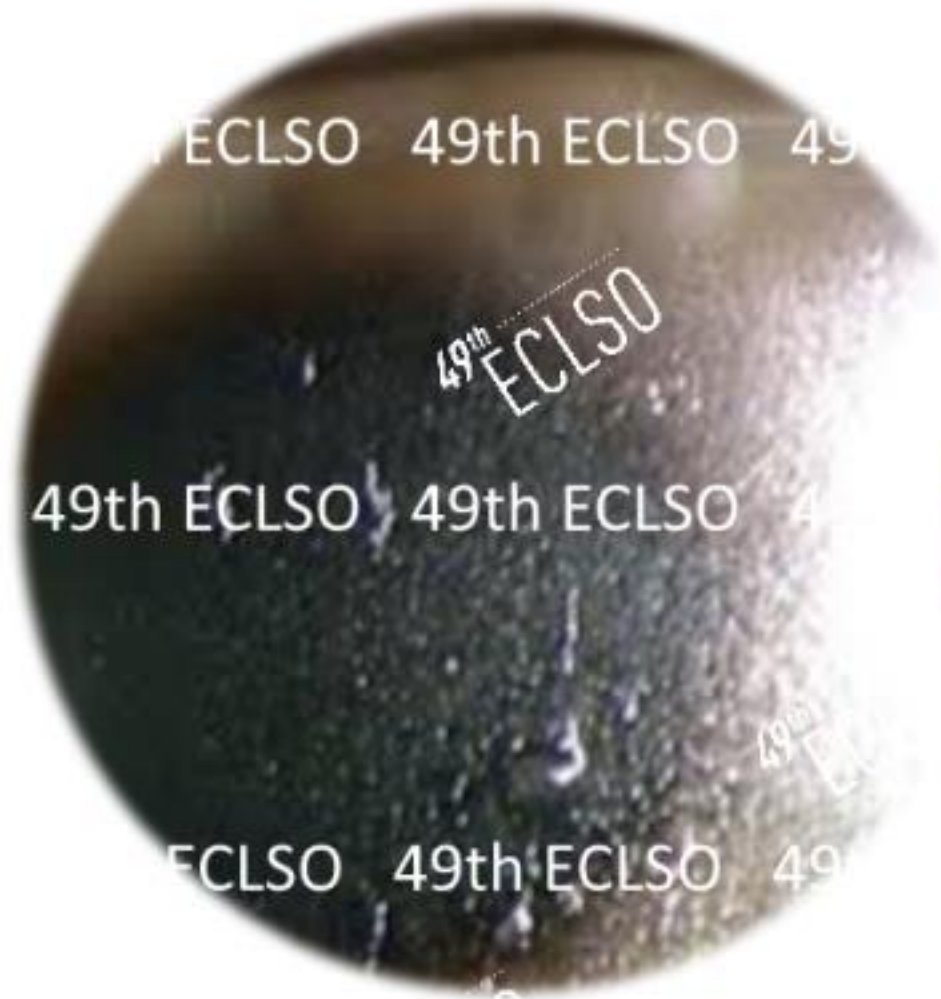
Revised ISO standards (18259:2014) : assess lens care products with different classes of contact lenses in a lens case, simulating real life conditions in the presence of organic soil.

ISO website. Ophthalmic optics—Contact lenses and contact lens care products—Fundamental requirements. www.iso.org/iso/iso_catalogue/ catalogue_ics/ catalogue csnumber=31778.

ISO 14729
Mikroorganisms tested

American Type Culture Collection (ATCC) :

Gram -	Gram -	Gram +	yeast	mold
				
Pseudomonas aeruginosa	*Serratia marcescens*	*Staphylococcus aureus*	*Candida albicans*	*Fusarium solani*
3 log (%99.9)	3 log (%99.9)	3 log (%99.9)	1 log (%90)	1 log (%90)



CLEANING

Cleaning debris adhering to the lens increases patient comfort and contributes to disinfection.

CLEANING

Lipid Deposits

Surfactants :

Poloxamine and Poloxamers

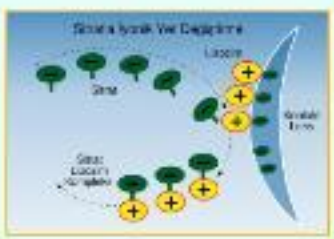
✓ Detergents or cleaners,
Remove loose debris and deposits (including microorganisms), by forming micelles which are more easily removed during the rinsing procedure

✓ Enhance wetting of hydrophobic lenses

Protein Deposits

Citrate :

A sequestering agent that aids in the passive removal of protein



Hydroxyalkylphosphonate -- Hidranat:

Forms a complex with calcium, which breaks the links between the deposits - lens and protein

Sulfobetaine :

A detergent used in protein purification- separation, and solubilization

Biocompatibility

Osmolarity agents

NaCl

To make the solution isotonic with the tears.

Buffers

Borate, Phosphate, Citrate

- Keep the pH of the solution close to natural tears

Chelating Agents

EDTA

Prevent calcium-bound proteins from being deposited on the lens surface.

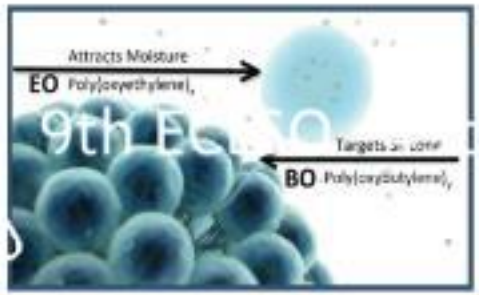
A variety of active ingredients are added to modern care systems to increase the compatibility of solutions with the pH, osmolarity, viscosity and surface tension of healthy tears

Wetting and Lubricating Agents

Hydroxypropyl Methyl Cellulose
Propylene Glycol
Poloxamine
Glycerine
Co-polymers
Dekspantenol (provitamin B5)
Sorbitol

Hyaluronan

a polysaccharide found in all tissues and body fluids and plays a role in lubrication and water homeostasis,



HydraGlyde Moisture Matrix

a block copolymer (poly[oxyethylene]-poly[oxybutylene]) surrounding the lens with a long-lasting envelope of moisture.

Super Moist Dew Technology

Hyaluronic acid derivative which coats the lens

Steps of Proper Contact Lens Care

1

Wash your hands with soap and water and dry before touching your contact lenses.

2

Rub and rinse your lenses when you remove them

Place at least 3 drops of **solution** on each side of lens surface and rub for 15-20 seconds with your fingers.

Thoroughly rinse each side of the lens with fresh solution.

3

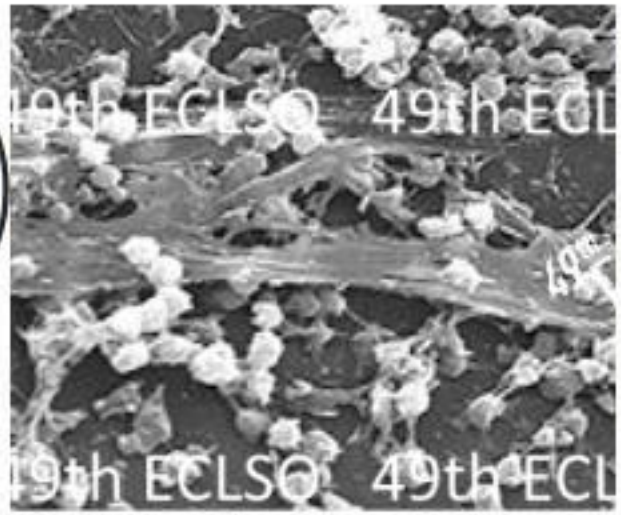
Place cleaned contact lenses in the lens case and fill with fresh solution.

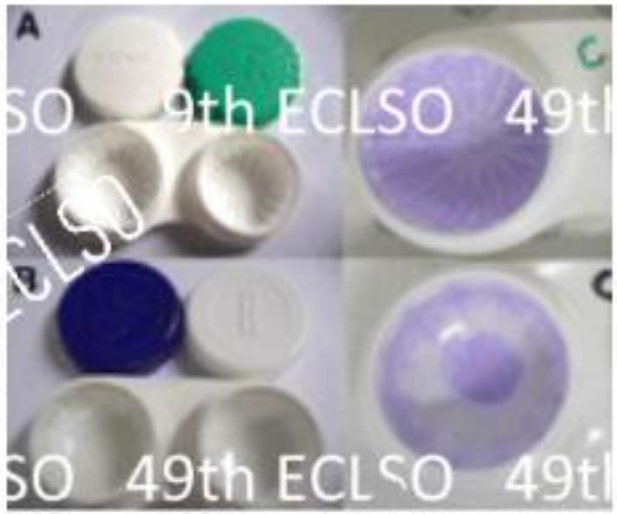
Soak lenses overnight or at least 6 hours.

Always use fresh solution –Never "top-off" or re-use solution.

TODNET Turkish Ophthalmological Society Contact Lens Care Education Video
https://www.todnet.org/html/todnet.asp?a=kon21

CONTAMINATION OF CONTACT LENS CASES





- Contact lens cases are a recognized potential source of pathogens associated with corneal ulcers.
- Contact lens storage cases can be easily contaminated to form biofilms of resistant bacteria, fungi and Acanthamoeba !

Lens Case Care

Rub and rinse your contact lens case with fresh solution after every use tissue wipe the well and store them open and upside down in a dry, clean place on a clean facial tissue

Replace contact lens cases (every one to three months)

Rebecca Voelker. Risky Contact Lens Use. JAMA. 2017; 318(12)

TODNET Turkish Ophthalmological Society Contact Lens Care Education Video
https://www.todnet.org/tr/todnet.asp?a=kon2|

Water and contact lenses do not mix !!!

Water exposure during CL wear is associated with complications ranging from sterile corneal infiltrative events to sight-threatening infections.

Avoid any water exposure while:

X Handling CLs with wet hands,

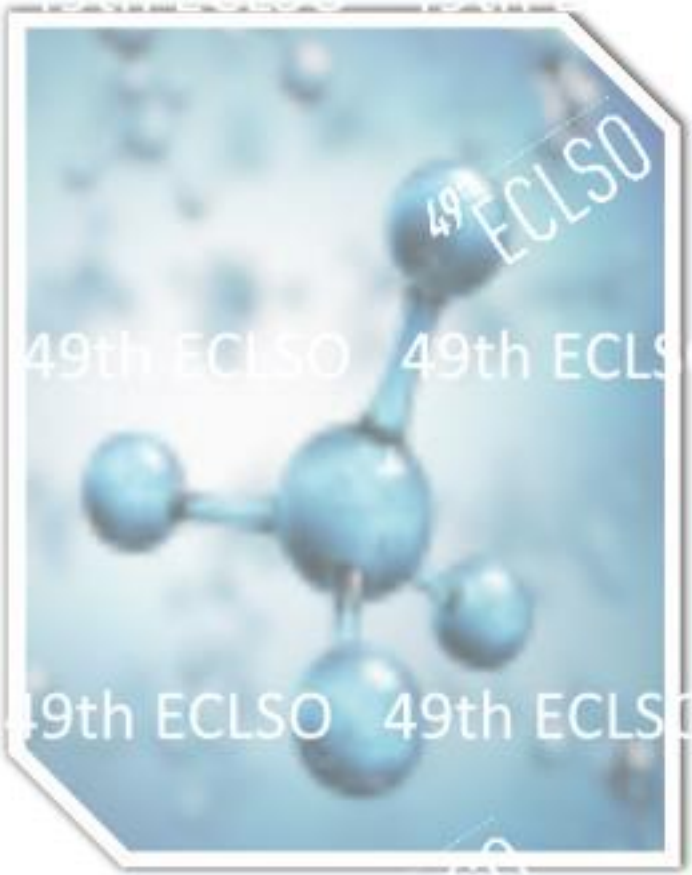
X Rinsing CLs or storage cases in tap water,

X Showering while wearing CLs

X Swimming with CLs without wearing goggles.

Arshad M, Carnt N, Tan J, Ekkeshis I, Stapleton F. Water Exposure and the Risk of Contact Lens-Related Disease. Cornea. 2019

Lens Care Systems



PHYSICAL SYSTEMS

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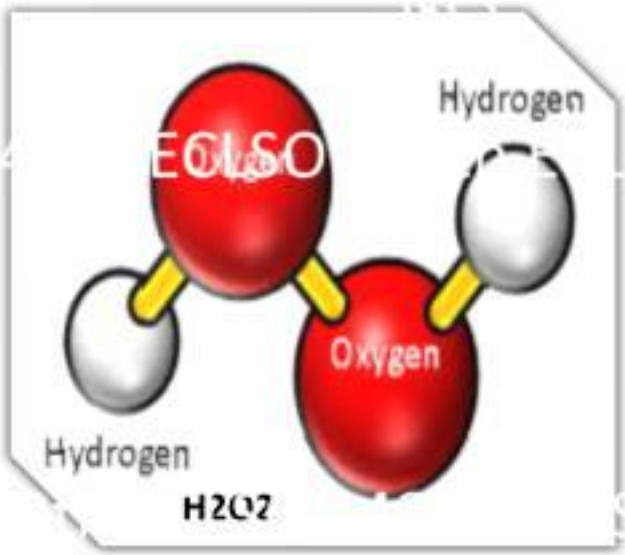
CHEMICAL SYSTEMS

Multipurpose Solutions

Hidrogen peroxide

Hydrogen Peroxide



it has strong biocidal action - effective against bacterial biofilms, acanthomeba trophozoites and cysts

Hydrogen peroxide provides fast and effective disinfection

Pass into the lens matrix, oxidize microorganisms

it has an oxidizing-49 cleansing effect on the lens surface

Preservative-free

Suitable for those who are allergic or sensitive to the preservatives found in multipurpose solutions.

Can be used with all soft and hard lenses.

*Keir N, Woods CA, Dumbleton K, Jones L. Clinical performance of different care systems with silicone hydrogel contact lenses. Cont Lens Anterior Eye. 2010

**Hughes R, et al Comparison of Hydrogen Peroxide Contact Lens Disinfection Systems and Solutions against *Acanthamoeba polyphaga*. Antimicrobial Agents And Chemotherapy. July 2001

Hydrogen peroxide !!!

https://www.fda.gov/consumers/consumer-updates/contact-lens-solutions-hydrogen-peroxide-avoid-injury-follow-all-instructions

- Hydrogen peroxide has a toxic effect when instilled directly into the eye or onto contact lenses : Severe burning, pain and irritation occur.
- A red warning and red tip remind that solutions containing hydrogen peroxide require special handling. İt is not suitable for rinsing

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- Hydrogen peroxide is neutralized into water and oxygen, making it safe to put lenses into eyes.

Neutralization process

- **Two-step** : Disinfection + subsequent neutralization with tablets (more effective method) (Oxysept ®)
- **One-step** : Neutralize the peroxide during the disinfection phase as the lens cases have a built-in neutralizer (Aosept® Plus(Wöhlk Peroxid, Aosept® Plus)

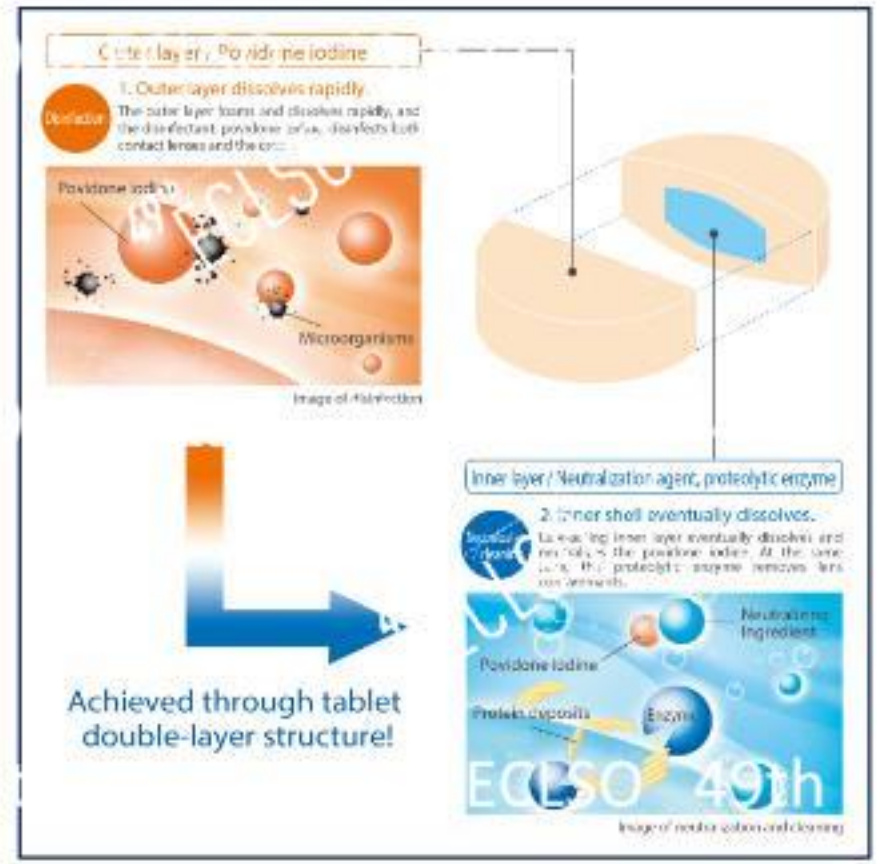
Hydrogen peroxide system disinfection-neutralization process

- Contact lens case with a neutralization disk that comes with hydrogen peroxide contact lens solution should be used. The lenses must remain in the solution for at least 6 hours to complete neutralization.....

Lens Care Systems Containing Povidone Iodine

Povidone-iodine is a strong and fast disinfectant, effective against bacteria, fungi and viruses as well as acanthomeba cysts

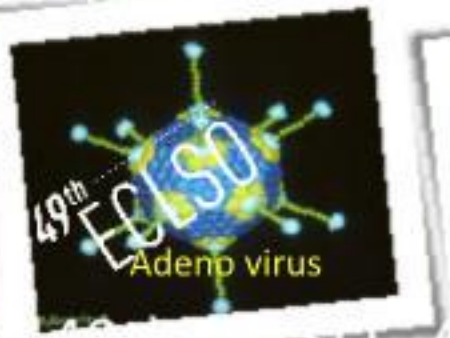
- System consists of a dissolving or rinsing solution and double action tablet
- Povidone iodine in the outer layer of the tablet dissolves rapidly / neutralizer and proteolytic enzyme in the inner layer dissolve lately (orange color is cleared)
- Disinfection, cleaning and neutralisation are carried out in 4 hours (*Cleadew Soft, Cleadew GP-SL)*

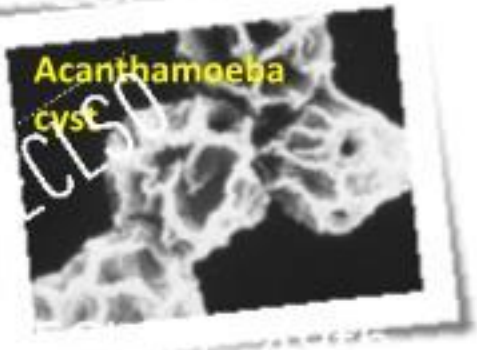


Itoi, M., Yoshimoto, K., Yamasaki, K.. (2015). *Disinfectant efficacy of soft contact lens care system containing povidone iodine. Contact Lens and Anterior Eye,*

Microorganisms differ in their resistance to disinfection.

Lipid-enveloped viruses and vegetative bacteria can be killed relatively easily during disinfection,





Non-enveloped viruses, Fungi, mycobacteria, bacterial spores, cysts and prions show resistance to disinfection

Williams L, Stapleton F, Carnt N. Microbiology, Lens Care and Maintenance. In: Contact Lenses.

Fedorko DP,et al. Optimized Protocol for Testing Multipurpose Contact Lens Solution Efficacy Against Acanthamoeba. Eye Contact Lens. 2018

Rub and Rinse

Enhance the disinfection

Mechanical cleaning of contact lenses by rubbing and rinsing reduces the load of microorganisms remaining on the lens surface and removes protein deposits.

Contact lenses should be cleaned by rubbing and rinsing, even if the solution used is a "NO-RUB" type.

Zhu H, et al. Importance of rub and rinse in use of multipurpose contact lens solution. Cotem Vis Sci. 2011

https://www.politico.com/news/magazine/2020/03/19/coronavirus-effect-economy-life-society-analysis-covid-

SARS Cov-2

The COVID 19 pandemic has increased the importance of the antiviral effect of contact lens solutions.

Human coronavirus contamination can be easily removed from CL surfaces .

- CL care products containing hydrogen peroxide and povidone-iodine efficiently remove virus contamination from CL surfaces

- While MPS based on non-oxidative system reduce infectious viral particles below the limit of quantification only when additional rub and rinse steps are included.

Nogueira CL,et al. The impact of a rub and rinse regimen on removal of human coronaviruses from contemporary contact lens materials. Cont Lens Anterior Eye. 2022

Solution Toxicity And Hypersensitivity

- Contact lenses take up and release biocides and other components in the eye
- Contact lens care products may cause allergic and toxic reactions and can alter corneal staining and comfort response during wear.
- The interactions of the solutions with contact lenses depends on lens type i.e. material water content, charge, relative hydrophobicity, surface treatment and surface porosity

Solution-induced corneal staining *is* a transient and reversible condition associated with the use of reusable hydrogel and SiHy contact lenses and certain care regimens

Prevention and Advice

- Switching to a hydrogen peroxide-based care regimen.
- Switching to daily disposable contact lenses and changing the care system

Stapleton F, Bakkar M, Carnt N, Chalmers R, Vijay AK, Marasini S, Ng A, Tan J, Wagner H, Woods C, Wolffsohn JS. CLEAR - Contact lens complications. Cont Lens Anterior Eye. 2021

COMPLIANCE

Non compliance to the CL care is very frequent:

- Young male full-time contact lens users,
- Rubbing and rinsing,
- Handwashing,
- Correct lens replacement
- Case cleaning.

COVID-19 pandemic improved compliance with handwashing but still soft reusable lens wearers show a statistically significant lower compliance with lens wear and care compared to daily disposable lens wearers

Morgan PB, Efron N, Toshida H, Nichols JJ. An international analysis of contact lens compliance. Cont Lens Anterior Eye. 2011
Vianya-Estopa M, et al. Soft contact lens wearers' compliance during the COVID-19 pandemic. Cont Lens Anterior Eye. 2021.

Contact lens wearers are traditionally advised to have eye examinations during the initial weeks and every 6 to 12 months

Benefits:

- ✓ Education of the patient
- ✓ Monitorization of ocular health and biocompatibility with the contact lenses and the care systems
- ✓ Ensure that lenses are being handled and worn in accordance with instructions
- ✓ Improve Compliance
- ✓ Optimize visual correction outcomes
- ✓ Early detection of Contact lens complications (such as dry eye, infiltrative keratitis, giant papillary conjunctivitis)

Modern lenses: Optimal interval between routine aftercare visits ?


CLINICAL AND EXPERIMENTAL
OPTOMETRY
INVITED REVIEW
Rethinking contact lens aftercare

The first aftercare visit should always take place within one to two weeks of lens dispensing

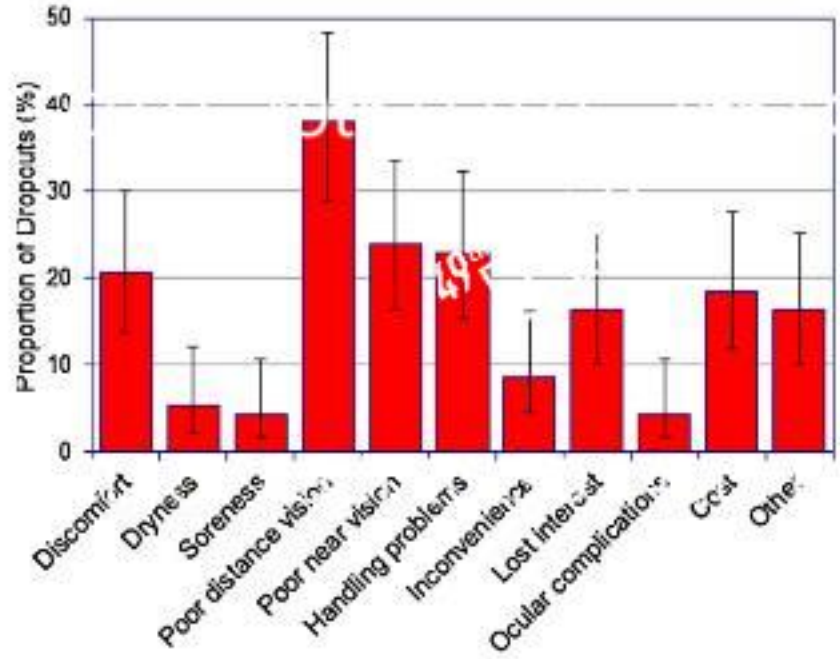
	After 1–2 weeks	Every 6 months	Every 12 months	Every 24 months	Rationale
Based on lens replacement frequency, lens type and wearing modality					
Soft daily disposable	✓*			✓	Lower risk of keratitis
Soft daily reusable	✓		✓		Adverse surface reaction and compliance issues
Soft extended wear	✓	✓			Higher risk of keratitis
Rigid daily wear	✓		✓		Lower risk of keratitis but higher risk of eyelid ptosis, three and nine o'clock staining and corneal deformation
Rigid extended wear	✓	✓			Higher risk of keratitis, eyelid ptosis, three and nine o'clock staining, corneal deformation and overnight lens mucus adhesion
Based on predicted rate of refractive change					
Youth myopia (5–15 years)	✓				Myopia advances –0.50 D annually
Presbyopia	✓		✓		Progressive accommodation loss

*After taking delivery of lenses for the first time, those new to lens wear (neophytes) should be seen again within the first two months.

More frequent aftercare visits are required for:

Children, Over 45 years Orthokeratology, Therapeutic applications, High ametropia, Corneal pathology such as keratoconus, corneal dystrophy or post-keratoplasty, post-refractive surgery and Non-compliant patients

Those new to lens wear should be seen within the first two months of lens dispensing....
They should be suppported for handling and vision maximized



•During the first year of CL wear, the overall drop-out rate for new CL wearers is 26 % with many lapsing during the first 2 months*.

•Visual problems, handling and comfort are the most common reasons for discontinuing in new lens wearers...

*Sulley A, Young G, Hunt C. Factors in the success of new contact lens wearers. Cont Lens Anterior Eye. 2017 Feb;40(1):15-24.

Communication, education and ongoing aftercare are the key factors to increase success with contact lens wearers....

Some people may find it more difficult to learn to use CL.

Since the time of the ophthalmologist is limited assistant personnel can provide this training, Brochures, Videos, websites and Applications may be helpful for ongoing education on lens handling and care ...

https://www.buzzfeed.com/annaborges/teach-me-how-to-contact

Thank You....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