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John R. Roggenkamp

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**A Practical Office Procedure for the Reduction of the Potential
Transmission of AIDS in the Contact Lens Practice**

By

James B. Connelly, B.S.

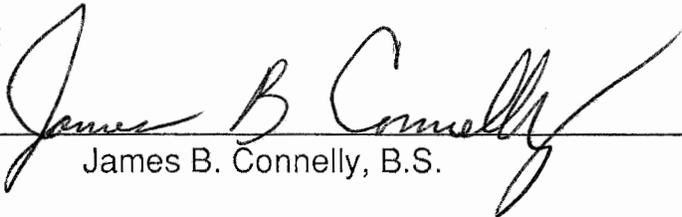
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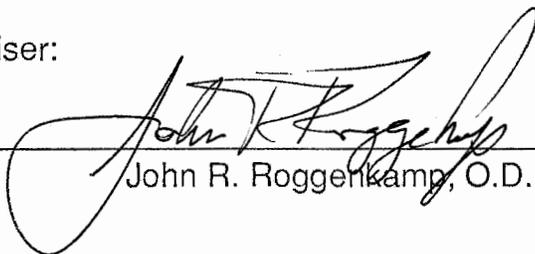
John R. Roggenkamp, O.D.

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A Practical Office Procedure for the Reduction of the Potential Transmission of AIDS in the Contact Lens Practice

Abstract

This paper presents a proposed standardized protocol for the efficient and economical large scale cleaning and disinfection of both soft and rigid contact lenses. In recent years, there has been an increased concern about the possibility of transmitting pathogenic agents via contact lenses. This protocol is primarily concerned with the risks associated with the acquired immunodeficiency syndrome (AIDS) virus in the general population. The AIDS virus represents a significant risk that must be addressed because of the consequences of contracting the virus and its isolation from the tears of human immunodeficiency virus (HIV) positive individuals.

Introduction

In 1981 a new socially transmitted pathogenic organism was identified and found to be propagating throughout the world. HIV, or the AIDS virus, has been called the plague of the 1980's and is likely to be a significant problem in the future. The virus exists in the body tissues and

fluids of an infected person and is transmitted by the exchange of body fluids to another individual. The virus affects the infected person's immune system and renders the victim incapable of protecting his/her self from various opportunistic organisms, which ultimately result in the death of the infected individual. At this time there is no cure for AIDS.

HIV was first isolated in semen and blood in 1984 and later that year in saliva.^{1,2} The existence of this new virus in these fluids ushered in a new era in the way health care professionals viewed the concept of pathogen transmission. Almost all aspects of institutional medical practices had to be reviewed and modified to ensure that no transmission of body fluids could occur.

In 1985, HIV was isolated from the tears of an individual afflicted with AIDS.³ This fact suggests a significant health risk for those health care practitioners dealing with the fitting and care of contact lens patients. Practitioners may not be the only ones at risk from virus laden tears. A patient fit with a diagnostic contact lens may be at risk if the diagnostic lens was used on a previous patient who carried the AIDS virus in his/her tears and the lens was not properly cleaned and disinfected.

It is important to note that at this time there has been no confirmed case of AIDS being acquired from any type of tear vector. Though this is cause for some relief, it should not lessen the reality that the virus has been isolated in the tears and the consequence of its transmission is

death. It may be possible that the AIDS virus, for some reason, is less virile in the tears or that at any one time there is an inadequate number of viral particles in the tears to cause infection. If the former is true, it is fortunate; if the latter is true, contact lenses could possibly be implicated as a possible vector of AIDS in the future.

Most contact lenses (soft and rigid gas permeable lenses) are composed of a plastic matrix that may act to absorb and hold virus particles. While a momentary exposure to the tear fluid may not result in an infectious dose, a contact lens allowed to remain in an AIDS infected patient's eye for a significant period of time, with viral particles continually being secreted in the tears, may result in the contact lens acting as a viral reservoir. If the contact lens is placed on another patient's eye, without being adequately cleaned and disinfected, it is conceivable that the stored viral particles may leach out in significant enough numbers to cause infection. The cleaning and disinfection protocol in this paper is intended to address possible risk factors to patients that may potentially be exposed to the virus via a contaminated contact lens. It is very likely that this protocol will also render the contact lenses free of other bacterial and viral pathogens.

Another reason for utilizing a standardized cleaning and disinfection system is to reduce the possibility of professional liability claims. It is conceivable that an individual who has contracted AIDS, after being fit

with contact lenses and who knows or has a lawyer who knows the theoretical potential for infection by contact lenses, may hold the contact lens practitioner responsible for the transmission of the disease, resulting in legal litigation. If the practitioner has not addressed the AIDS risk appropriately by implementing prudent safeguards, such as a standardized disinfection system, the practitioner may be hard pressed to refute the plaintiff's claim that he/she had contracted AIDS from a contaminated contact lens.

An additional concern for developing an effective standardized cleaning and disinfection method now, is the potential of genetic mutation. The AIDS virus is capable of genetically reproducing itself, therefore the potential for genetic recombination and mutation is not only possible but probable. Indeed, it is thought that there already exists more than one strain of the virus today. Theoretically, future mutations may result in the development of new strains that may be many times more virile than the present AIDS virus(es). In anticipation of this threat, practitioners should begin to practice safeguards now; if or when new, more virile strains begin to show-up, their impact on contact lens practice will be minimized.

The scenarios mentioned above illustrate the necessity of designing a method or protocol for cleaning and disinfecting all types of contact lenses efficiently and economically. In addition to cleaning and

disinfecting the lenses, the protocol must take into account the contamination of cleaning and disinfecting materials, hardware, and the immediate surrounding area. It must address the potential for recontamination and cross contamination of all materials used during the procedure. Safeguards must also be provided for the protection of the individual performing the task. This protocol, though not tested for effectiveness as designed, is based on techniques that past studies have indicated are effective in killing the AIDS virus. In addition to the AIDS virus, other potential bacterial and viral pathogens should be killed as well. The protocol can not absolutely guarantee the safety of the individual performing the task. Reasonable and effective safeguards are incorporated into the procedures, but nonadherence to the safeguards, poor technique, or failure of equipment to perform adequately, may subject the individual performing the task to possible biohazards. Nothing short of a biological glove box (an environmental isolation chamber which allows the user to manipulate the contents inside) or the donning of an environmental suit would provide an absolute measure of safety, but even these measures cannot guarantee 100% safety.

To some, the protocol and safeguards will seem too involved, complicated, and certain aspects unnecessary; others will consider the procedures and safeguards limited and inadequate. An attempt at practical considerations was made in the design of the protocol, and though

compromises were made, it is believed that the protocol represents a reasonably safe and practical standardized method of addressing the risk of potentially contaminated lenses.

Method and Materials

This protocol is intended for the cleaning and disinfection of both soft hydrogel contact lenses as well as rigid PMMA and gas permeable contact lenses with a hydrogen peroxide system. The protocol is designed in two phases. The first phase is considered the contaminated or red phase and includes procedures for the cleaning and disinfection of the lenses. While in this phase, all surfaces, vials and containers, are considered contaminated and are handled accordingly. Vinyl gloves, eye protection, and a plastic disposable apron must be worn through all steps of this phase. In the second rinse phase or the yellow phase, the vials, contact lenses, and surfaces are considered disinfected and safe, although gloves, eye protection, and a disposable apron are still worn and certain safeguards still observed.

An important consideration in the protocol, as it is designed, is the way the lenses are stored. Soft lenses are generally stored in an unpreserved sterile saline solution in a vial type container with a rubber stopper or screw top. The vials with rubber stoppers are also capped with metal crimp caps when they come from the manufacturer or after they

have been disinfected and are ready for reuse. PMMA contact lenses are generally stored in small labeled containers with a flip or screw top and are stored in a dry state. Rigid gas permeable lenses may be found in vial type containers with screw tops, stored in a sterile saline solution, or in a dry state similar to PMMA lenses. When the lenses are stored in a vial type container, the vial itself can be used as the container for disinfection. It holds a sufficient volume of disinfecting solution to properly disinfect the lens. When the lens is stored in a small flip top or screw top container, which is often the case with PMMA and gas permeable lenses, the lens must be transferred to a contact lens container that holds a significant volume of disinfecting solution to insure adequate disinfection. A container that will hold such a volume of disinfecting solution will be called a receiving container. Lenses that require receiving containers must be handled differently than those that do not need a receiving container. When using a receiving container care must be taken to ensure that the lenses are not interchanged between the wrong containers in the process. Steps must be taken to eliminate the possibility of placing the wrong lens into the original labeled contact lens container. After the transfer of the contaminated lens to the receiving container, the parameter labeled lens container should be secured with a rubber band to the receiving container. This will aid in reducing the possibility of confusion and misplacing of lenses. Because of the

differences in the way the lenses are handled, it is recommended that the soft and rigid contact lenses be done separately, perhaps having one day for soft contact lenses and another day for rigid lenses. This tends to allow for a more consistent and efficient flow to the whole procedure, as there are differences in the procedure for soft and rigid lenses.

The following factors should be taken into account when considering an area location for the performance of the cleaning and disinfection process. The process should be conducted out of the view of patients and isolated from the general activity flow of the staff. The area should have counter top space and easy access to a sink as well as be located near a cabinet or other storage space which provides an isolated environment. This area should be used only for the storage of the protocol materials and solutions. The materials and solutions ideally should be stored in two separate containers with one container for solutions and all materials used for the contaminated or red phase, while the other container should be reserved for solutions and all materials used for the rinse or yellow phase .

A large supply of vinyl gloves is needed to provide protection from the harsh chemicals used and the contaminated lens solutions. An adequate form of protective eyewear should be worn to protect the eyes from the hazards of the hydrogen peroxide used as well as protecting the mucous membranes of the eyes from being penetrated by pathogens should

any of the contaminated solutions splash. It is also desirable to wear a plastic disposable apron during the procedure, should any chemicals or contaminated solutions splash or spill.

The following materials will be necessary to perform the protocol as presently designed: A soft contact lens forceps to hold lenses during the procedure. If the vials in the inventory are sealed with metal crimp caps, a supply of these caps will be necessary as well as a cap crimper for sealing the vials. A large basket style contact lens vial rack will be necessary. This rack will be used to contain the lens vials during the vial disinfection stage. It will be necessary to have a mid-size container (9 X 7 X 2.5 in.) available to serve as a basin to collect the solutions being emptied from the vials. In the protocol this basin is called a receiving basin. To accommodate the vial disinfection stage, a large basin capable of holding the contact lens vial rack with the vials in it will be needed. This basin in the protocol is called a disinfection basin and although it must be large enough to accommodate the contact lens vial rack, it should not be excessively large, since this would result in the use of an excessive amount of hydrogen peroxide during the vial or container disinfection stage. A rigid plastic cover (cover plate) must also be fabricated. The cover plate will be secured to the top of the vials in the contact lens vial rack to prevent the rubber stoppers from floating off and to keep the vials from floating out of the contact lens vial rack during submergence in the

peroxide during the vial disinfection stage. Several nylon or cloth straps will be necessary to hold the cover plate onto the contact lens vial rack.

The solutions necessary for the protocol are all reasonably easy to find and obtain. A large amount of unpreserved aerosol sterile saline will be necessary (2-12 oz. cans per 50 vials per phase). An appropriate lens cleaner for the soft and the rigid contact lenses is needed. Additional considerations for the cleaners will be presented later in the discussion. The disinfecting solution may be any of the commercially available 3% hydrogen peroxide solutions specifically designed for disinfection of contact lenses. Use of bulk commercial peroxide solutions for lens disinfection may result in the absorption of unwanted chemical ions, however, the use of bulk commercial peroxide can be used in the disinfecting basin to disinfect the contact lens containers.

Initially, the contact lens vials and containers should be quickly inspected to ensure that there are no hazards that might cut the hands or gloves during the procedure. The most common hazard is a partially opened crimp top seal. These hazards should be removed or repaired before the gloves are worn. After the visual inspection has occurred, the individual performing the task should put on vinyl gloves to protect the skin from exposure to harsh chemicals and contamination as well as inoculation from openings in the skin. Eye protection and a plastic disposable apron should be donned at this time as well.

The solutions and materials used for the red phase should be assembled in an efficient way on the counter top. It is important to assemble all the materials needed at this stage. If additional solutions are found to be needed at this time, the gloves need to be removed and the solutions retrieved from stock storage. Before beginning to handle any of the contaminated materials again, vinyl gloves should be donned. The individual performing the task should not leave the area once the procedure has started. This will reduce the potential for contaminating other surfaces or areas.

Once all the needed materials are assembled and the individual performing the task is seated comfortably, the actual cleaning and disinfection may begin. If the lens is from a vial, take the rubber stopper or screw top off the vial and while the hands are over the top of the receiving basin, pour the contents of the vial into the palm of the hand, which should be held in a cup-like manner. The solution should be allowed to escape into the receiving basin, while being careful to retain the lens in the palm of the hand. If the lens is in a small flip top container, simply remove the lens with the fingers.

To clean the lens an appropriate contact lens cleaner should be used (see discussion). You may wish to consider the following technique for the cleaning of the soft contact lenses. Though this method appears awkward at first, it has been found it to be an effective but gentle way of cleaning

the lenses while reducing the possibility of tearing the lens. Retrieve the lens from the palm of the hand with the fingers of the other hand. While holding the lens with the fingers, use the free hand to hold and apply the contact lens cleaner to the index finger knuckle of the hand that is holding the contact lens. Place the lens on the knuckle with the contact lens cleaner on it. Use the index finger of the free hand to gently massage the lens on the knuckle using lateral movements (not circular). Both sides of the lens should be cleaned in this manner for 1 minute (30 seconds per side).

The hard lenses can be cleaned in the following manner. Take the lens out of the container and place a drop of lens cleaner on the lens. With the lens between the thumb and index finger, gently massage the lens in a back and forth motion. Care must be taken not to warp the lens.

Once the lens has been cleaned it should be rinsed thoroughly. Grasp the lens **gently** with the contact lens forceps (with protected tips). Try to secure the lens by holding the tips near the middle of the lens. This will reduce the tendency of the lens to fold up or warp during rinsing. Use sterile saline solution (aerosol) to rinse the contact lens cleaner thoroughly from the surfaces of the lens.

Now that the lenses have been thoroughly cleaned and rinsed the disinfection process may begin. The 3% hydrogen peroxide method can be used on all rigid and soft contact lenses. Additional considerations

regarding the disinfection method will be considered in the discussion.

If the lens is stored in a vial, the vial can be used as the container for disinfection. Once thoroughly rinsed, the lens can be returned to the vial for disinfection. This can easily be accomplished by placing the wet lens on the inside lip of the vial and using the disinfecting solution to rinse the lens down the side to the bottom of the vial. The vial should be filled halfway with the disinfecting solution and capped with the rubber stopper or screw top. Invert the vial quickly 2 or 3 times with a finger on the stopper to prevent spilling. It is thought that this will suspend any organisms that may be adhering to the sides of the vial or to the stopper. Allow the lens to soak for 15-20 minutes in the disinfecting solution.

Contact lenses without vials, most often PMMA or gas permeable lenses, may require the use of a receiving container. PMMA and gas permeable lenses are often stored dry and in very small containers capable of holding only a limited volume of liquid. The small volume capacity of most of these containers may not afford adequate disinfection with the liquid peroxide solution. Due to this consideration, a container of a more significant volume should be used. This larger container will be called a receiving container. Once the PMMA or gas permeable lens has been thoroughly cleaned and rinsed, it should be placed in a receiving container. The receiving container should be filled with disinfecting solution three quarters full and the lid closed. Invert the receiving

container 2 or 3 times . The original labeled contact lens container with the parameters listed on it should be secured to the receiving container with rubber bands . This will ensure that the contact lens being disinfected in the receiving container will not be misplaced in the wrong container.

Throughout the course of the disinfection process (red phase) potentially contaminated gloves and surfaces have come into contact with the contact lens containers. This makes it necessary to disinfect the contact lens vials and containers in addition to the lenses. The stoppered vials can be placed in a contact lens vial rack. The cover plate should be placed over the vials in the contact lens vial rack. Secure the cover plate with lashing straps to the contact lens vial rack. Place the contact lens vial rack, with the secured cover plate, in the disinfection basin. The disinfection basin should now be filled with hydrogen peroxide so that the vials are completely covered. Bulk or commercial hydrogen peroxide can be used for this purpose. Allow the vials to disinfect for at least 10 minutes.

In processing rigid lenses the receiving container and the rubber band secured original container may be placed into the disinfecting basin.

Allow the lens case to soak for 10 minutes. Remember that all lenses should soak for 15 to 20 minutes.

While the lens and container are disinfecting, preparation for the

rinse phase can begin. All materials and reusables used during the disinfection phase should be collected and stored in the appropriate container allocated specifically for the purpose of storing contaminated materials. This container should then be stored in an area with limited access and be well marked as a potential biohazard. In addition all surfaces (counter tops, cabinet handles, utensils etc.) that were exposed or potentially exposed should be wiped down with alcohol or household bleach (undiluted), including the outer surfaces of the disinfection basin. The gloves and apron used initially are now potentially contaminated and must be removed because of the risk these garments may re-contaminate the lenses or vials.

After the allotted time for disinfection has occurred, a new pair of gloves and disposable apron should be donned. The actual rinsing procedure can begin. It is important to note that at this stage the surrounding area, the contact lens vials and containers, as well as the contact lenses are considered disinfected and safe to handle and use, though some precautions are still employed (new gloves, eye protection, and a new apron).

To rinse the lens, the lens must first be retrieved. Take the contact lens vial rack containing the vials and remove it from the disinfecting basin. Unfasten the securing straps and remove the cover plate. Remove one vial from the the contact lens vial rack. Take the rubber stopper or

screw top off the vial and while the hands are over the top of the receiving basin, pour the contents of the vial into the palm of the hand, which should be held in a cup-like manner. Allow the solution to escape into the receiving basin, while being careful to retain the lens in the palm of the hand. If the lens escapes, it must be disinfected again. Secure the lens with the fingers. The vial can be rinsed while holding the lens. Fill the now empty vial with sterile saline about half full and invert the vial quickly 2 or 3 times with the thumb over the top of the vial. Empty the saline into the receiving basin. Rinse the lens with the saline, while holding the lens over the receiving basin. Return the lens to the vial by placing the lens on the inside lip of the vial and rinse the lens down the side of the vial to the bottom with sterile saline. Fill the vial three quarters full with sterile saline for storage. Secure the screw top to the vial or place the rubber stopper on the vial, cap the vial with a metal cap and crimp the cap to the vial securely.

If the lens was in a receiving container, first, **retrieve the original labeled contact lens case and dry the case with tissue.**

Then return and rinse the lens in the manner described above. The lens should be gently patted dry and returned to its original labeled container, which should also be dry.

These procedures should be continued until all the lenses have been rinsed. Once the lenses have been rinsed the clean-up can begin. Discard

the empty or almost empty bottles of solutions. Those solution bottles that contain significant volumes of solutions should be stored first in the yellow phase container. Those items originating from the contaminated materials container (i.e. disinfecting basin, contact lens vial rack, cover plate, securing straps) can be placed back in the contaminated materials container. Once these items are back in the contaminated materials container they are considered contaminated again. The gloves should be removed and discarded immediately after going back to the contaminated materials container (the gloves may now be contaminated, so note what has been touched, being sure anything touched is wiped down with bleach). A final wipe down of the area with bleach is an additional precaution. The lenses may now be collected and stored.

There is no formal neutralizing stage for soft contact lenses as presently designed. This stage would add another phase and increase the time and expense of the system making it less attractive to the practitioner having a large number of lenses to be disinfected. Because there is no neutralizing stage, practitioners must be cautioned that the disinfected lenses require 24 to 48 hours of soaking in the vials to properly dilute the hydrogen peroxide.

After the disinfecting stage, some peroxide may remain in the lens. This peroxide slowly diffuses out of the lens and into the saline solution. Before using the lens, it should be removed from the vial, rinsed, and the

saline in the vial drained. The vial should be rinsed, the lens returned to the vial, and the vial refilled with saline. The lens should be allowed to soak for 2-3 minutes at a minimum . This will ensure that the peroxide that had diffused from the lenses into the saline will be removed.

Practitioners disinfecting a small number of soft contact lenses may wish to add a neutralizing step between the disinfection and rinsing stages. All disinfecting precautions done before the rinsing stage would have to be done before the neutralizing phase.

Discussion

The discussion will focus on some of the key design considerations this protocol is based on. One study suggested that cleaning the lenses alone may eliminate the AIDS virus from the lenses.⁴ The study used Boston cleaner for the rigid contact lenses, Pliagel for 37%-43% water content soft contact lenses, and Miraflow for all other soft contact lenses. Using these respective cleaners and a 5 second rinse with sterile saline (Lens Plus), HIV infected lenses were rendered virus free (no characteristic cytoplasmic effects or reverse transcriptase enzyme isolated after 28 days of culture). Practitioners may wish to consider utilizing the cleaners suggested in this study, however, the protocol employs a separate disinfecting stage, making the exact cleaner used

more of a professional preference based on cleaning ability.

The use of a 3% hydrogen peroxide solution in the protocol was based on studies and recommendations of The Centers for Disease Control (CDC). The CDC has indicated that the two most consistently effective means of disinfecting contact lenses are by a standard heat treatment of 172-176 F° for 10 minutes, or exposure to 3% hydrogen peroxide for 10 minutes⁵. The heat treatment, though effective with PMMA lenses and low water content soft contact lenses, may warp rigid gas permeable lenses and damage soft contact lenses with a water content of 55% and above. These limitations make heat disinfection a less than desirable method for general and convenient disinfection, therefore the hydrogen peroxide system is being employed in this protocol. It is important to note that HIV may resist desiccation and when rehydrated may become actively infective⁶.

During the disinfection of the contact lenses the exposure time has been increased from the 10 minutes suggested by the CDC to 15-20 minutes. This increased exposure time is intended to compensate for an unknown variable. The CDC has stated that 10 minutes of direct exposure to 3% hydrogen peroxide is required to kill the virus. The contact lenses, both rigid and soft, are composed of a plastic matrix and it is conceivable that viral particles can be drawn deep into the matrix and insulated from the hydrogen peroxide until the peroxide can permeate the lens. The exact

time it takes the peroxide to permeate the lens is unknown and with rigid gas permeable or PMMA lenses it may be negligible but could possibly be extremely significant in soft contact lenses .

Conclusion

It is likely that, now and in the future, contact lens practitioners will be caring for patients that are HIV positive; patients known to be HIV positive and patients not known to be HIV positive. It is likely that a significant number of individuals have contracted the virus, are asymptomatic, and do not know of their condition. Other individuals who know they are HIV positive may not understand the contact lens practitioner's need to know this information or the afflicted individual may just choose not to tell the practitioner of his/her condition. These circumstances make it difficult for practitioners to differentiate between those who may have the virus and those who may not, making it necessary to assume everyone is HIV positive and to take prudent safeguards with every patient. This system for cleaning and disinfecting soft and rigid contact lenses is designed to address this risk of the AIDS virus in the general population and to be a prudent safeguard contact lens practitioners should employ. The system was designed for the practical and economic large scale cleaning and disinfecting of contact lenses, but may also be utilized in the case of a limited number of lenses as well. The protocol,

though not a perfect system, is thought to be a reasonably safe and effective compromise, which it is hoped, contact lens practitioners will choose to adopt.

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5. CDC Recommendations for preventing possible transmission of human T-lymphotropic virus type III/lymphadenopathy-associated virus from tears. *MMWR* 1985; 34:533-534.
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The following appendix is a concise outline of the protocol presented above. The practitioner may wish to copy this outline and have it available where the procedure is used.

Appendix

Materials Needed: (per procedure)

Materials

2 Receiving Basins
Soft Contact Lens Forceps
Surgical Type Gloves (2 pr. min.)
Metal Crimp Caps
Cap Crimper
Contact lens Vial Rack
Large Disinfecting Basin
Cover Plate
Securing Straps
Eye Protection (2 pr.)
Plastic Disposable Apron (2 pr. min.)

Solutions

Aerosol Sterile Saline Solution (no preservatives)
(Min. 4 -12 oz. cans per 50 vials)
Contact Lens Cleaner
Contact Lens Disinfection Sol. (3% Hydrogen Peroxide)
(Min. 3- 8 oz. bottle per 50 vials)
Bulk 3% Hydrogen Peroxide
Tissue Paper
Household Bleach (2-1 gal. containers)

Red Phase Container Materials

Receiving Basin
Soft Contact Lens Forceps
Surgical Type Gloves
contact Lens Vial Rack
Large Disinfecting Basin
Cover Plate
Securing Straps
Eye protection
Plastic Disposable Apron
Aerosol Sterile Saline Solution (no preservatives)
(Min. 2 -12 oz. cans per 50 vials)
Contact Lens Cleaner
Contact Lens Disinfection Sol. (3% Hydrogen Peroxide)
(Min. 1- 8 oz. bottle per 50 vials)
Bulk 3% Hydrogen Peroxide
Household Bleach (1 gal.)

Yellow Phase Container Materials

Receiving Basin
Surgical Type Gloves
Plastic Disposable Apron
Eye Protection
Aerosol Sterile Saline Solution
(no preservatives)
(Min. 2 -12 oz. cans per 50 vials)
Tissue Paper
Household Bleach (1 gal.)

A letter followed by the number 1 is a procedure for lenses that have come from vials (usually soft contact lenses). A procedure with a letter followed by the number 2 is for lenses requiring a receiving container (usually PMMA or gas permeable lenses).

- Example: **a 1.** = A procedure for a lens from a vial
 a 2. = A procedure for a lens requiring a receiving container
 a1-2.= A procedure common to both.

Cleaning and Disinfecting Phase: (Red Phase)

- 1. Remove any remaining metal caps or metal cap material.**
 - a 1-2.** This is done before the gloves are worn to reduce the possibility of cutting or tearing the gloves during the cleaning and disinfection process.
- 2. Put on protective vinyl gloves.**
- 3. Assemble all materials and contaminated lenses.**
 - a 1-2.** All materials should be assembled in such a way as to allow easy access while being seated. This is necessary to minimize the possibility of inoculating other surfaces such as door knobs or cabinet handles with possible pathogens.
- 4. Retrieve lens from vial or container.**
 - a 1.** Remove the rubber stopper or screw top, and while hands are over the top of the receiving basin, pour the contents of vial into the palm of the hand. The palm should be held in a cup-like manner.
 - b 1.** Allow the solution to escape into the receiving basin, while being careful to retain the lens in the palm of the hand.
 - a 2.** If the lens is in a small flip top or screw top container, simply remove the lens with the fingers.
- 5. Clean the lens**
 - a 1-2.** Use an appropriate contact lens cleaner.
 - b 1-2.** Clean the contact lens:
 - 1.** The lenses should be cleaned on both sides.
 - 2.** The lens should be exposed to the contact lens cleaner for at least 30 sec.

Recommended Cleaning Procedure for Soft Contact Lenses:

- a.** Retrieve the lens from the palm of the hand with the other hand.
- b.** While holding the lens with the fingers, use the free hand to hold and apply the contact lens cleaner to the index finger knuckle of the hand that is holding the contact lens.
- c.** Place the lens on the knuckle with the contact lens cleaner on it.
- d.** Use the index finger of the free hand to gently massage the lens on the knuckle using lateral movements (not circular). Both sides of the lens should be cleaned in this manner.

Recommended Cleaning Procedure for Rigid Contact Lenses:

- a.** Remove the lens from the container.
- b.** Place a drop of lens cleaner on the lens.
- c.** With the lens between the thumb and index finger, gently massage the lens in a back and forth motion. Take care not to warp the lens.

6. Rinse the cleaner from the lens.

- a 1-2. Grasp the lens gently with the contact lens forceps (with protected tips). Try to secure the lens by holding the tips near the middle of the lens. This will reduce the tendency of the lens to fold up or warp during rinsing.
- b 1-2. Use sterile saline solution to rinse the contact lens cleaner thoroughly from the surface of the lens.

7. Disinfect the lens

- a 1. After the lens is thoroughly rinsed, return the lens to the contact lens vial. This can easily be accomplished by placing the wet lens on the inside lip of the vial and using the disinfecting solution to rinse the lens down the side of the vial.
- b 1. Fill the vial halfway with the disinfecting solution and cap the vial.
- c 1. Invert the vial quickly 2 or 3 times with a finger on the stopper to prevent spilling. It is thought that this will suspend any organisms that may be adhering to the sides of the vial or stopper in the disinfecting solution.
- d 1. Allow the lens to soak for 15-20 min. in the disinfecting solution.
- a 2. After the PMMA or gas permeable lenses have been thoroughly rinsed, place the lens in a receiving container.
- b 2. Fill the receiving container with disinfecting solution to three quarters full and close the container. Invert the container 2 or 3 times and allow the lens to soak for 15-20 min.

8. Disinfection of contact lens vials and containers.

- a 1. Place the vials in a contact lens vial holder.
- b 1. Place a thin board or piece of rigid plastic over the vials in the contact lens vial holder. The thin board or plastic piece should cover the entire extent of the contact lens vial holder. The cover plate is intended to prevent the rubber stoppers from floating off the vial, and the vials out of the contact lens vial holder.
- c 1. Secure the cover plate with a lashing strap to the contact lens vial holder.
- d 1. Place the contact lens vial holder with the secured cover plate in the disinfection basin. The disinfection basin should be filled with hydrogen peroxide so that the vials are completely covered. Bulk or commercial hydrogen peroxide can be used for this purpose. Allow the vials to disinfect for at least 10 minutes.
- a 2. Disinfect the original labeled contact lens container
 - 1.) Secure the receiving container to the original labeled contact lens container with rubber bands. This will ensure that the contact lens being disinfected in the receiving container will not be misplaced in the wrong container.
 - 2.) Place the two secured containers in the disinfecting basin
 - 3.) Allow the lens case to soak for 20 minutes.

Rinse Phase (Yellow Phase)

While the lenses and vials are disinfecting, the rinse phase can begin. Collect and put away all materials used during the disinfection process. Reusable items should be stored in an area with limited access and be well marked as a potential biohazard. All surfaces (counter tops, cabinet handles, utensils etc.) that were exposed or potentially exposed should be wiped down with alcohol or bleach, including the outer surfaces of the disinfection basin.

Remove the gloves used to disinfect the lenses and surrounding area and put on new gloves. Residual organisms that may have found their way onto the first pair of gloves may re-contaminate the lenses if this is not done.

After the appropriate time has passed, the actual rinsing can begin. Start with the first lens that was disinfected and work forward.

At this time, the surrounding area, contact lens containers, and contact lenses are generally considered safe to handle and use, though some precautions are still employed.

9. Retrieve lens from vial or receiving container

- a 1. Remove the rubber stopper or screw top and while the hands are over the top of the receiving basin, pour the contents of the vial into the palm of the hand.
- b 1. Allow the solution to escape into the receiving basin, while being careful to retain the lens in the palm of the hand. If the lens escapes it must be disinfected again.
- c 1. Secure the lens with the fingers.

- a 2. If the lens was in a receiving container, first dispose of the disinfecting solution from the original labeled contact lens case and dry the case with tissues.
- b 2. Uncap the receiving container and while the hands are over the top of the receiving basin, pour the contents of the receiving container into the palm of the hand.

10. Rinse vial

- a 1. While holding the lens fill the empty vial with sterile saline and invert the vial quickly 2 or 3 times.
- b 1. Dump the saline into the receiving basin.
- c 1. Place the lens on the inside lip of the vial and rinse the lens down the side of the vial to the bottom with sterile saline for storage. Fill the vial three quarters full with sterile saline. Secure the screw top to the vial or place the rubber stopper on the vial, cap the vial with a metal cap, and crimp the cap to the vial securely.

- a 2. A lens from a receiving container should be rinsed with sterile saline and gently patted dry. Put the dried lens into its original labeled container, which should also be dry.

11. Clean Up

- a. Discard empty or almost empty bottles of solutions. Those bottles that contain significant volumes of solutions should be stored in a location separate and isolated from potentially contaminated solutions.
- b. Those items originating from the contaminated container of materials (i.e. disinfecting basin, contact lens vial holder, cover plate, securing straps) can be placed back in the contaminated materials container. Once back these items are considered contaminated again.
- c. Remove and discard the gloves immediately after going back to the contaminated materials container. (These now may be contaminated, watch what you touch)
- d. A final wipe down of the area with bleach is an additional precaution.