tablets contain papain, pancreatin, or subtilisin, which cause hydrolysis of protein to peptides and amino acids. Typically, these are added to saline solution, but one solution can be prepared using 3% hydrogen peroxide, which combines enzymatic cleaning with disinfection, that is, Ultrazyme Enzymatic Cleaner. After the lenses have been soaked for the recommended time, they should be thoroughly rinsed. This is important to do because a peroxide-soaked lens placed directly into the eye will cause great pain, photophobia, redness, and possible corneal epithelial damage.

Rinsing and Storage Solutions

Saline solutions for soft lenses should have a neutral pH and be isotonic with human tears, that is, 0.9% sodium chloride. Besides rinsing the lenses, these solutions are used for storage, because saline maintains their curvature, diameter, and optical characteristics. The solutions also facilitate lens hydration, preventing the lens from drying out and becoming brittle.

Because they are used for storage, some saline solutions contain preservatives, which while inhibiting bacterial growth can induce sensitivity reactions or eye irritation. Thus, some manufacturers make available preservative-free saline solutions and package them in aerosol containers or unit-of-use vials. The use of salt tablets to prepare a normal saline solution is discouraged because of the potential for contamination and risk of serious eye infections.

Disinfection and Neutralization

Disinfection can be accomplished by either of two methods: thermal (heat) or chemical (no heat). In the past, both methods were equally used; however, the introduction of hydrogen peroxide systems for chemical disinfection has become more popular.

For thermal disinfection, the lenses are placed in a specially designed heating unit with saline solution. The solution is heated sufficiently to kill microorganisms, perhaps for 10 minutes at a minimum of 80°C (176°F). It is important that after disinfection the lenses be stored in the unopened case until ready to be worn. The wearer must also ensure that the lenses have been thoroughly cleaned before using heat disinfection. Otherwise, heating can hasten lens deterioration.

In years past, chemical disinfection was conducted with products that contained thimerosal in combination with either chlorhexidine or a quaternary ammonium compound. Unfortunately, many wearers had sensitivity reactions, and these products and chemical disinfection fell into disfavor. The introduction of hydrogen peroxide systems for chemical disinfection revitalized this method of disinfection. It is thought that the free radicals chemically released from the peroxide react with the cell wall of the microorganisms, and the bubbling action of the peroxide is thought to promote removal of any remaining debris on the lens.

To prevent eye irritation from residual peroxide after disinfection, it is necessary that the lenses be exposed to one of three types of neutralizing agents: the *catalytic type* (an enzyme catalase or a platinum disk), the *reactive type* (such as sodium pyruvate or sodium thiosulfate), or the *dilution–elution* type.

Chemical disinfection systems may come as two-solution systems, which use separate disinfecting and rinsing solutions, or one-solution systems, which use the same solution for rinsing and storage. It is important that the wearer realizes that lenses must not be disinfected by heating when using these solutions.

Products for Hard Contact Lenses

Cleaners

Hard lenses should be cleaned immediately after removal from the eye. Otherwise, oil deposits, proteins, salts, cosmetics, tobacco smoke, and airborne contaminants can build up, interfere with clear vision, and possibly cause irritation upon reinsertion. A surfactant cleaner is used by applying the solution or gel to both surfaces of the lens and then rubbing the lens in the palm of the hand with the index finger for about 20 seconds. Too vigorous rubbing can scratch or warp the lens.