

Panasept - A unique approach to contact lens disinfection

Andrew Matheson describes how Panasept differs from other disinfectants

An ideal contact lens disinfection system needs to protect against microbial contamination without harming the corneal surface or inducing an allergic response, thereby improving the patient comfort and wearing time. It should be simple to use and affordable as patients are then more likely to use the system without cutting corners to either save money or because compliance is too complicated.

The arrival of the lower maintenance options of daily disposable and extended wear contact lenses has prompted solution manufacturers to concentrate on making their systems easy to use.

Many multi-purpose solutions often claim to clean, disinfect, rinse and even moisturise a patient's contact lenses without the need to rub the lenses clean prior to the overnight soak. It is not surprising, then, that such systems can cause corneal staining after lens insertion. This can be especially the case with marginal dry eye patients, who lack the tears to dissipate the chemicals in the disinfection system. It has been found that using a drop containing carboxymethyl cellulose (CMC) can have a cytoprotective effect on the cornea against disinfecting agents in soft lens multi-purpose solutions.^{1,2}

The effective two-step peroxide systems such as 10-10 and Oxysept 2-step, have recently been discontinued, possibly due to them being time consuming and complicated to use, and possibly due to the risk of the patient inadvertently forgetting to neutralise the peroxide before insertion. A painful eye suffering extensive superficial staining results (Figure 2).

It was against this backdrop that I first encountered the novel Canadian contact lens care system called Panasept. It is a hydrogen peroxide-based solution that is used to clean, rinse, disinfect and store soft contact lenses. It does not contain a surfactant cleaner so in our clinics we often use a product such as Miraflow, especially with patients who contaminate their lenses badly, or those fitted with silicone hydrogel contact lenses.

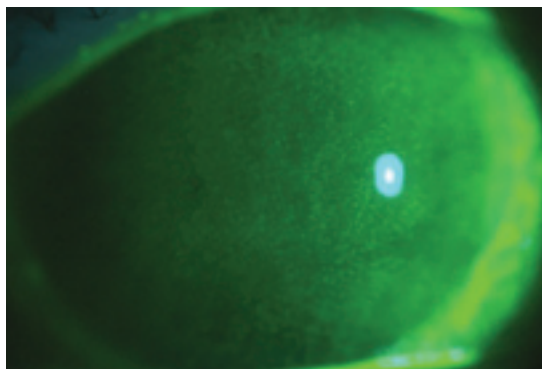


Figure 1
Corneal staining following accidental instillation of un-neutralised peroxide

Panasept uses two methods of disinfection: micro-filtration and hydrogen peroxide. The system consists of a micro-filtration device called the Panasept Purifier, a supply of tear open envelopes containing granular sodium percarbonate, sodium chloride, and disodium EDTA, plus two contact lens cases. The anhydrous crystals are dissolved in distilled water to form a solution consisting of hydrogen peroxide and sodium bicarbonate in a saline solution. This comprises a full year's supply and costs the patient £79.99.

The purifier

The heart of the Panasept system is the unique 'purifier'. This device makes the on-site preparation of freshly hydrated peroxide practical.

It houses a very durable 0.2 micron filter that maintains an absolute barrier against all self-propagating micro-organisms. The spout of the purifier is equipped with a special one-way valve that prevents airborne contaminants from entering. Once the solution has passed through the sterilising filter, it cannot flow back inside. Unlike squeeze bottles, which inhale debris after use, the solution from a Panasept Purifier

remains contaminant-free.

The Panasept Purifier is also equipped with a filter that removes contaminants from the air that flows into the storage tank to replace liquid that has been pumped out. Thus the peroxide solution is filtered as it passes out of the device and the air is filtered as it passes back in to replace the peroxide pumped out.

It is important that either distilled or non-pyrogenic water is used as these processes remove particulate matter which might prematurely block the 0.2 micron filter in the purifier unit. Not all de-ionised water is free from particulate matter. If there is a local difficulty in obtaining distilled water, then non-pyrogenic water is readily obtained from most pharmacies at a cost of £1 to £2 per litre.

Although using tap water does not incur any additional health risk to the patient—as the micro-filter will filter out any bacteria—it will, however, result in a prematurely plugged filter. If the filter becomes plugged, the purifier will no longer allow solution to be discharged. The pump mechanism is designed to fail before the filter bursts due to being blocked, as a safety feature. A purifier that fails due to misuse in this way is not normally replaced under warranty.

When the contents of the sachet are dissolved in water this formulation produces ~70ppm hydrogen peroxide along with sodium bicarbonate. Bicarbonate ions are very important for goblet cell health. The major roles of sodium bicarbonate include the regulation of pH, the re-absorption of sodium and the removal of carbon dioxide from the blood stream. Electrolyte balance is crucial for maintenance of conjunctival goblet cells—for example, if sodium levels are too high, or if bicarbonate levels are too low, mucus-secreting goblet cells are lost (Table 1).

This type of solution has been proven to be safe for use with all soft contact lens materials. In Canada and the US some optometrists use the Panasept system as their disinfection method of choice for RGP lenses with a great deal of success. The pH and the hydrogen peroxide of the Panasept solution remain stable

Table 1
Normal electrolyte concentration in human tears (mMol/Liter)

Sodium	132
Potassium	24
Bicarbonate	32.8
Calcium	0.8



Figure 2
Panasept contact lens system
(a) Sachet is poured into purifier
(b) Non-pyrogenic water is added
(c) Shake well
(d) Solution is micro-filtered when released

within the purifier for more than two weeks, and more than 48 hours within the lens case. Panasept solution also passes Stand Alone Disinfection requirements.⁴

Low peroxide levels

The key difference between the Panasept system and other one step peroxide systems, such as Bausch & Lomb Easysept and CIBA AOSep System is that Panasept has eliminated the need for neutralising solutions.

Panasept employs between 82.5ppm and 67.5ppm of hydrogen peroxide as the active disinfection ingredient. The front surface of the eye is well equipped with the neutralising enzymes, such as catalases, and ascorbates to provide protection from free radicals. Panasept uses concentrations of hydrogen peroxide well tolerated by the eye.

Hydrogen peroxide at much higher concentrations is used in other contact lens care systems which then require neutralisation to reduce the peroxide residuals within the lens matrix.

Research conducted by Dr Murray Sibley⁵ shows these methods leave peroxide residues between 60ppm and 105ppm within lens materials. Because the Panasept solution is already below 105ppm it does not require a second neutralising solution as its hydrogen peroxide levels are within the safe range as determined by Dr Sibley's research. This is supported by the results of the ocular irritation studies and the cyto toxicity testing.

The hydrogen peroxide molecule is highly bacteriocidal once it converts to the peroxy ion, on encountering the metallo-sites on the bacterial cell wall. With bottled peroxide products, the peroxide levels have to be several orders higher than in Panasept, because the phosphate buffers in these solutions insulate the metallo-sites from the peroxide molecule, rendering it much less effective. Because Panasept delivers freshly made solution it needs no buffering and it is very potent at relatively low peroxide concentrations.

The patient dissolves the contents of one Panasept envelope into 200ml

of distilled or non-pyrogenic sterilised water within the storage tank of the Purifier. Once the granules have been completely dissolved, the solution is dispensed by pulling the retractable spout out and pressing the top of the Purifier downward to expel the solution, providing the user with a safe, renewable source of non-buffered hydrogen peroxide solution. Non-buffered hydrogen peroxide solution has a greater effective availability of active peroxy ions for optimal bacteriocidal effect at lower peroxide levels. Contact lenses may be stored up to 48 hours in Panasept solution. After 48 hours, empty the case and repeat steps one to three for daily lens care.

Panasept has been on the market in Canada since 1993, and to date more than 38,000 systems have been sold. It was launched in Europe at the end of 2006. There have also been no significant safety issues with the performance of the product.⁴

Written patient instruction sheets are available to ensure that the system is used optimally. In our practices we have a modified contact lens consent form which emphasises the need to use distilled or non-pyrogenic bottled water. This also reinforces the message to the patient.

Discussion

No system is perfect. Just as we have had some patients sensitive to the perborate/peroxide residuals in Aquify drops or the Regard or Synergi disinfection systems, we have had some patients who experience mild irritation using Panasept. This is very rare. These patients probably lack enough catalase in their tears to neutralise the peroxide traces or enough tears to dissipate them. I must re-emphasise, we use this system on a lot of borderline dry eye patients, so this occurrence is to be expected. Many of them have significant corneal staining anyway as their lenses are being used in a bandage function. A pre-insertion CMC-containing drop (such as Theratears or Refresh) can be cytoprotective.

The disinfectant molecule sizes in

modern multi-purpose solutions are large and do not penetrate the bio-film they help to create well. This is the main reason for frequent storage case replacement with these solution systems. Panasept does not contain any viscosity enhancers and so on to coat the case, and being a small molecule penetrates the bio-film well. In fact, as the case air-dries after the lenses are removed, the peroxide hyper-concentrates, becoming about 100x more bacteriocidal. This is the reason why the Panasept case does not need replacing every month as with multi-purpose solutions. The same hyper-concentration occurs in the spout and internal pipework of the purifier, rendering it germ-free.

Patients who travel on aeroplanes should store the purifier in the hold, possibly carrying a case full of fresh solution in their hand luggage for long haul flights. If the purifier is not to be used for more than 14 days, the solution in the storage tank should be emptied and the device pumped dry, prior to storage in a clean, dry place. Distilled or non-pyrogenic water should be kept in the fridge once opened and disused after six months. Normally a one litre bottle is used in six weeks, so this happens automatically. ●

References

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