Daily disposable lenses: are they now for everyone?

Dr Caroline Burnett-Hodd PhD MSc MCOptom

Daily disposables – contact lenses which are worn for one day only and then thrown away – have been around for almost 20 years. This article discusses the available materials, range and innovations in this increasingly popular mode of lens wear, and considers which patient groups aren’t suited to this option.

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**Learning objectives**

Know the available range of powers, materials and lens designs in daily disposable contact lenses (Group 5.1.1)

Be aware of the prevalence of microbial keratitis in daily disposable wearers.

Understand how different materials, designs and wetting agents affect the wearing experience of daily disposables (Group 5.2.1)

**Learning objectives**

Know the available range of powers, materials and lens designs in daily disposable contact lenses (Group 5.1.1)

Understand the advantages of daily disposable wear over other modalities.

Understand how different materials and designs and wetting agents affect the wearing experience of daily disposables (Group 5.1.2)

**Learning objectives**

Know the available range of powers, materials and lens designs in daily disposable contact lenses (Group 5.1.1)

Be aware of the prevalence of microbial keratitis in daily disposable wearers.

Understand how different materials, designs and wetting agents affect the wearing experience of daily disposables (Group 5.4.1)

**About the author**

Dr Caroline Burnett-Hodd is a fourth generation optometrist working with her father, Nigel, and Sophie Taylor-West at Mr Burnett-Hodd’s specialist contact lens practice in central London. She also works as a consultant to No7 Contact Lenses and, until recently, ran the contact lens service at Croydon University Hospital. Previously, she gained a master’s degree in neuroscience, a PhD in particle physics, and taught secondary school science.
The first commercially available lens was produced in 1995 and eventually marketed as Soflens 1-day by Bausch & Lomb. This was closely followed by Johnson & Johnson’s 1 Day Acuvue. The main benefits for the wearers of daily disposables are their convenience, ease of use and lack of a complicated care regimen. Lenses are easily transportable and can be worn intermittently, for example for sports.

The lenses are packaged in individual blister packs, in an unpreserved solution. This means solution sensitivity is far reduced as the lenses are supplied basically in saline and hygiene is potentially improved as bacterial contamination of storage cases is a strong risk factor for microbial keratitis. In addition, disposing of the lens daily minimises lens deposits, increasing comfort and reducing the risk of an allergic response.

For us, as practitioners, fitting daily disposables is also convenient. Fitting banks and the one-size-fits-all fitting philosophy both lead to a quick and straightforward fitting process, without a real need for keratometry values or other measurements. Also, as the lenses are one-use-only and do not require cleaning, practitioners should be able to worry less about patient compliance and spend less time on patient instruction.

Practitioners in the UK have been enthusiastic in their response to daily disposables and over the years their market penetration in the UK has increased significantly; 38% of patients are now wearing daily disposables. The current plethora of lenses means that we can attempt to fit the majority of our patients with daily disposables, even those with moderate astigmatism or presbyopia. But with so many different lenses available, what is the best option for each patient? Or are the products all the same?

**What’s available?**

Current brands can be differentiated mainly by their material, comfort agents and range. However, there are also differences between their diameter, base curve and design.

**Comfort agents**

Poor comfort is the largest reason for contact lens wear dropout. Different manufacturers have approached this problem in different ways, with subsequent claims for increased comfort. As the lenses will not be conditioned with soft lens solutions, any comfort agent must either be in the blister pack solution or incorporated into the lens itself. Comfort agents aim to reduce friction and to improve wettability.

For example, Focus Dailies AquaComfort Plus (Figure 1) has a triple moisture system integrated into the lens with hydroxypropyl methylcellulose (HPMC) for initial comfort and polyvinyl alcohol (PVA) and polyethylene glycol (PEG), which are released throughout the day as the patient blinks. 1Day Acuvue Moist and TruEye have polyvinyl pyrrolidone (PVP) embedded into the lens matrix, which is not released. Proclear 1 day from CooperVision has phosphorylcholine (PC) molecules in the lens matrix that aim to attract and bind water to the surface, reducing lipid deposition, helping to keep the lenses hydrated and improving comfort. (Figure 2, page 53)

A new lens from Safilens S.p.L, the Fusion 1day, has approached the problem by incorporating a biopolymer of hyaluronic acid and tamarind seed polysaccharide within the lens matrix. These ingredients are released throughout the day. Hyaluronic acid is a naturally occurring viscoelastic polysaccharide found in vitreous humour and synovial joints, while tamarind seed polysaccharide has properties similar to naturally occurring mucins.

There is significant evidence that the wearing of lenses for one day only, the lack of preservatives and the presence of comfort agents, does improve comfort, making daily disposables an appropriate choice for patients who suffer from dryness. As the brands have true differences between their comfort agents, if one lens fails it seems it is worth trying another one.

**Daily disposable lens materials**

Until just a few years ago all daily disposable lenses were made from standard hydrogel materials, for example 1Day Acuvue Moist, Focus Dailies AquaComfort Plus and Soflens Daily. These hydrogel materials have a Dk/t in the mid-teens, which is below the criterion to prevent corneal swelling. Even so, these lenses seem to

<table>
<thead>
<tr>
<th>Brand name</th>
<th>Manufacturer</th>
<th>Material</th>
<th>Water content %/Dk</th>
<th>Comfort agents</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>1Day Acuvue Moist</td>
<td>Johnson &amp; Johnson</td>
<td>Etafilcon A</td>
<td>58/28</td>
<td>PVP</td>
<td>+6.00 to -12.00</td>
</tr>
<tr>
<td>1Day Acuvue TruEye</td>
<td>Johnson &amp; Johnson</td>
<td>Narafilcon A</td>
<td>46/100</td>
<td>PVP</td>
<td>+6.00 to -12.00</td>
</tr>
<tr>
<td>Biotrue ONEday</td>
<td>Bausch &amp; Lomb</td>
<td>Nesofilcon A</td>
<td>78/42</td>
<td>Water content as cornea</td>
<td>-0.25 to -9.00</td>
</tr>
<tr>
<td>Focus Dailies AquaComfort Plus</td>
<td>Alcon</td>
<td>Nelfilcon A</td>
<td>69/26</td>
<td>PVA, HPMC, PEG</td>
<td>+6.00 to -10.00</td>
</tr>
<tr>
<td>Fusion 1day</td>
<td>Safilens S.r.L</td>
<td>Filcon IV</td>
<td>60/40</td>
<td>HA-TSP bi-polymer</td>
<td>+7.00 to -6.00</td>
</tr>
<tr>
<td>Clarity 1day</td>
<td>Sauflon</td>
<td>Filcon II 3</td>
<td>56/86</td>
<td>AET, edges</td>
<td>+8.00 to -10.00</td>
</tr>
<tr>
<td>Proclear 1 day</td>
<td>CooperVision</td>
<td>Omafilcon A</td>
<td>60/25</td>
<td>PC</td>
<td>+6.00 to -10.00</td>
</tr>
<tr>
<td>Dailies Total1</td>
<td>Alcon</td>
<td>Delefilcon A</td>
<td>33-80/156</td>
<td>Gradient of water content</td>
<td>0.50 to -6.00</td>
</tr>
</tbody>
</table>

Table 1 Spherical daily disposable lenses

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However, not every patient tolerates the switch from hydrogel to silicone hydrogel well. Silicone hydrogel is susceptible to lipid deposition and the higher modulus can cause problems with comfort.

Hence, as silicone hydrogel has not turned out to be the perfect lens material that the sector once hoped, the race has been on to develop materials that can deliver the oxygen needed by the eye with comfort more like that of a standard hydrogel.

Several new materials have recently been launched that attempt to address this issue.

In 2012 Bausch & Lomb launched Biotrue ONEday contact lens. The Biotrue material, described as a HyperGel, is inspired by the biology of the eye. Firstly, it contains 78% water, which is the same as the cornea. Secondly, although at 42 it has a far lower Dk/t than TruEye, it is sufficient to deliver the oxygen level needed by the open eye to prevent hypoxia. As daily disposable patients are not supposed to sleep in their lenses, this should be sufficient. Thirdly, the anterior surface of the lens is designed to mimic the tear film’s lipid layer to prevent dehydration.

In 2013, Alcon has launched the Dailies Total 1 lens in the UK. This lens is silicone hydrogel at its core, but graduates from 33% to more than 80% water content from core to surface. The Dk/t is outstanding at 156 and it promises the comfort of a hydrogel if not better.

### Daily disposable range

#### Spherical lenses

Table 1 shows the available spherical daily disposables lenses, the most common range being from +6.00 to -6.00D. However, 1day Acuvue Moist and TruEye lenses go up to -12.00D, while the highest positive lens is Clariti 1day with +8.00D. Some patients who would previously have been seen by the hospital contact lens service can now wear daily disposables like everyone else.

#### Toric lenses

In the past, patients with moderate astigmatism were denied daily disposables, as the maximum cylinder was -0.75DC – for example in the original Focus Dailies Toric lens (now -1.50DC). 1day Acuvue Moist for Astigmatism has extended the maximum cylinder to -2.25DC, which is available at the most common axes (with and without the rule) from +4.00 to -9.00D, and more axes at lower powers (Table 2). The lens features Johnson & Johnson’s Accelerated Stabilisation Design, which has four thicker zones in the mid periphery of the lens and thin zones superiorly and inferiorly (Figure 3). The thin zones sit under the lids when the eye is open, while the thick zones do not. When the patient blinks, the lens should actively be rotated into place.

At present, the only daily disposable lens for astigmatism in silicone hydrogel is the Clariti 1day Toric, which has a maximum cylinder of -1.25DC.

#### Multifocal lenses

The UK has an ageing population who are more likely to have disposable income to spend on contact lenses but also more likely to suffer from comfort and dryness issues. They may also

<table>
<thead>
<tr>
<th>Brand name</th>
<th>Manufacturer</th>
<th>Water content %/Dk</th>
<th>Cylinder</th>
<th>Range</th>
<th>Axes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1day Acuvue Moist for Astigmatism</td>
<td>Johnson &amp; Johnson</td>
<td>58/28</td>
<td>-0.75, -1.25, -1.75, -2.25</td>
<td>+4.00 to -9.00</td>
<td>10, 20, 60, 70, 80, 90, 100, 110, 120, 160, 170, 180</td>
</tr>
<tr>
<td>Focus Dailies Toric</td>
<td>Alcon</td>
<td>69/26</td>
<td>-0.75, -1.50</td>
<td>+4.00 to -9.00</td>
<td>20, 70, 90, 110, 160, 180</td>
</tr>
<tr>
<td>Clariti 1day Toric</td>
<td>Sauflon</td>
<td>56/86</td>
<td>-0.75, -1.25</td>
<td>+4.00 to -8.00</td>
<td>20, 70, 90, 110, 160, 180</td>
</tr>
</tbody>
</table>

Table 2 Toric daily disposable lenses

<table>
<thead>
<tr>
<th>Brand name</th>
<th>Manufacturer</th>
<th>Water content %/Dk</th>
<th>Add Power</th>
<th>Near boost</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proclear 1day Multifocal</td>
<td>CooperVision</td>
<td>60/25</td>
<td>ONE ADD</td>
<td>Yes - non-dominant eye</td>
<td>+6.00 to -10.00</td>
</tr>
<tr>
<td>Clariti 1day Multifocal</td>
<td>Sauflon</td>
<td>56/86</td>
<td>LOW, HIGH</td>
<td>Yes - non-dominant eye</td>
<td>+5.00 to -6.00</td>
</tr>
<tr>
<td>Focus Dailies Progressive</td>
<td>Alcon</td>
<td>69/26</td>
<td>ONE ADD</td>
<td>Yes - both eyes</td>
<td>+5.00 to -6.00</td>
</tr>
</tbody>
</table>

Table 3 Multifocal daily disposable lenses
only want to wear contact lenses intermittently, for example socially. Previously, monovision was the norm but there are now several daily disposable multifocal contact lenses available (Table 3). All of the brands are simultaneous vision centre-near designs, but they each have subtly different fitting strategies. The Focus Dailies Progressive lens has a near boost given in both eyes, dependent on the patient’s add. This near boost is calculated from the formula ‘lens power = spherical power + 1/2 add power.’ For example, a patient with spherical equivalent power of -3.00 and a +2.00 add would need a lens of -2.00D. For Proclear 1 day Multifocal, a near boost of +0.75 to +1.00 (dependent on add power) is given only to the non-dominant eye. Clariti 1Day Multifocal is the only daily lens with two add powers. For this lens, a small near boost is given to both eyes, and the high add is only ever used in the non-dominant eye.

The advantages and disadvantages of simultaneous vision over monovision have been discussed elsewhere. What is clear is that the patient will need to be prepared to compromise if they want to succeed with the lenses.

Lens design, base curve and diameter

Most contact lenses are standard front surface aspheric designs, and it is probable that all lenses give a similar quality of vision. However, Bausch & Lomb Biotrue ONEday and Soflens Daily Disposable could potentially improve definition by reducing the amount of spherical aberration. This relies on the patient having the average amount of spherical aberration, which is not always the case. Some contact lenses claim to improve comfort by having special, reproducible edge profiles – for example Clariti 1day.

In a soft lens that is larger than the cornea and soft enough to drape over it, the base curve is not particularly important. The actual fitting is more dependent on the sagittal depth of the lens as compared to that of the cornea and in general most patients have similar depths. This supports the one-size-fits-all philosophy. Contact lens diameters range from 13.8 to 14.2, which will fit the majority of corneas.

Who can’t wear daily disposables?

Economics dictates that lenses are not produced for those patient groups who do not exist in large enough numbers. Hence the high hyperope or aphake, very high myope or those with oblique axes of astigmatism will not be able to wear daily disposables without a significant compromise.

In addition, the one-size-fits-all strategy means that patients with very flat or very steep keratometry values, or those who have had refractive surgery, a graft or who have irregular corneas, may find that the lenses do not fit stably or comfortably. Patients with large corneas may also find that the lens does not cover the limbus.

Daily disposables and microbial keratitis

It was expected that daily disposables would reduce the rate of microbial keratitis, as the lenses are sterile until the moment the blister pack is opened. However, studies have found that the rate is not lower. Even with the introduction of silicone hydrogel dailies, the rate was similar and, in some cases, more than two weekly and monthly lenses. It has been suggested that poor compliance with the lens – that is, sleeping in the lens or reusing it (especially as the patient will not disinfect the lens before reuse, as the blister pack contains no preservative) – could be the key to the unexpectedly high rate. It may be that the patient is so casual about contact lens use that they are not so careful to wash their hands before insertion and removal and, again, there is no protective effect from the blister pack solution. Although the rate of keratitis is not reduced, it seems the severity is reduced, which is reassuring.

Conclusion

The only significant drawback of daily disposables is their cost, which is significantly greater than a two weekly or monthly lens. For a neophyte, this is not such an issue, but it can be painful for the patient who switches from two weekly or monthly lenses, and an absolute shock for a patient who switches from rigid gas permeable lenses.

However, cost aside, most practitioners today do not hesitate to offer patients a daily disposable option if possible, and as the market grows, the range available should increase and the cost decrease. It may be that in 10 years’ time the thought of having to clean a lens and reuse it will seem completely alien to us.

MORE INFORMATION

References Visit www.optometry.co.uk/clinical, click on the article title and then on ‘references’ to download.

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