Radiation – protect and survive

Optician sees the launch of Essilor's new Crizal UV lens and a new way of thinking about the protection offered by spectacle lenses

Eye care practitioners from around the UK descended upon Cheshire recently for the launch of the Crizal UV lens. The launch consisted of a series of lectures by high profile speakers and an opportunity to see the UV absorption properties of the new lens.

Medical risk

The opening speaker was **Dr Mark Porter**, a general practitioner familiar to many as the doctor in residence for BBC TV's *The One Show* and presenter of Radio 4's *Case Notes*. He reminded delegates that of the ultraviolet radiation from the sun, around 95 per cent of the longer wavelength UVA reached the Earth's surface and penetrated more deeply into the skin. This resulted in melanin aggregation (tanning) but also contributed to ageing of the skin and was implicated in skin cancer.

The ozone layer absorbs most of the shorter wavelength radiation but levels of UV at the surface vary considerably, being much higher at altitude and nearer to the equator and in sunnier seasons. Reflections mean that there is still exposure even in shade, and cloud cover offers little barrier to much UV transmission.

Porter then outlined the various diseases caused by UV exposure. Polymorphic light eruption (or prickly heat) was something most paler skinned people suffered at least once, Porter being no exception as he recalled his disastrous experience on honeymoon.

Dr Mark Porter outlined the various diseases caused by UV exposure

Variable skin pigmentation, lentigo or liver spots, were common in the elderly and result from cumulative UV skin damage (nothing to do with the liver at all). Prolonged sun exposure leads to localised elevated lesions, described as actinic or solar keratosis, and were very common on the heads of bald men in hot climates. Solar keratosis was generally harmless, but there was an association with squamous cell carcinoma and so any persistent elevated lump should be assessed for possible cryotherapy, cautery or excision.

Basal cell carcinomas (BCC) often appeared on the face, lower lid and ear. They were typically characterised by a rolled edge and a central scab. All the speakers emphasised how eye care practitioners at all levels within a practice had a duty of care to recognise and advise on such lesions. Speaking later, **Bill Harvey** (*Optician* clinical editor) reminded delegates that one common presentation of a BCC was on the side of the nose and could sometimes be confused by patients with a sore patch due to spectacle frame pads. This should be borne in mind when patients serially attend for adjustments. Squamous cell carcinomas, were much rarer and varied in appearance, but their tendency to metastasise meant they had a much higher mortality.

Malignant melanomas were a significant killer in the UK and tended to afflict fairer skinned people, those with multiple moles, immune suppressed people and those with a strong family history. Porter reminded the audience of a useful mnemonic when considering if a skin lesion was suspicious – ABCDE. Asymmetry, Border blurring or notching, uneven brown/pink/black Colour, Diameter of more than 6mm, all of which warranted Expert assessment. Porter mentioned how use of appropriate sun screen should be automatic now and hoped that soon we would see the demise of the sunbed and solarium.

An interesting anomaly of improved awareness of the harmful nature of the sun was the rise in problems relating to vitamin D deficiency. UK residents with little sun exposure and a lack of oily fish in the diet were often deficient and this had led to a rise in diseases such as rickets. Furthermore, some recent evidence has linked vitamin D deficiency with multiple sclerosis which may go some way to explain the geographic distribution of this disease.

Harvey followed with a discussion of ocular diseases and reminded everyone of the links between UV and cataract and also the potential for cumulative exposure of short wavelength visible and longer wavelength UV to cause damage further back in the eye. Children should be taught to wear adequate sun protecting sunglasses as routinely as they now were used to wearing sunblock, he argued.

Alaine Riveline: up to 40 per cent of UV exposure happens when we least expect

Protection

Dr Colin Fowler (Aston) gave an excellent explanation of how to reduce or block UV radiation before it caused ocular damage. He explained how the cornea absorbed UV up to 295nm with the remainder being absorbed mostly by the crystalline lens, absorption which becomes more efficient as the lens yellows with age. He began his

discussion of UV protection spectacles by reminding the audience that there was 'nothing new under the sun' and proved this by showing a snow goggle of Inuit origin from centuries ago which had a thin horizontal slit for adequate viewing while reducing harmful reflections from the tundra.

One of the pioneers of using tinted lenses for eye protection was Sir William Crookes (as in Crookes alpha tint) at the start of the 20th century and the first standard for sunglasses in the UK appeared in 1956. There were now three relevant UK standards, BS EN 1836:2005 (for personal eye equipment), BS EN 172:1995 (for industrial use) and the rather bemusing BS EN 13178:2000 which applied to the 'handful of snowmobile users' in the UK.

Fowler reviewed the spectral transmission characteristics of a range of materials, with Crown glass transmitting from around 340nm, CR39 better from the mid 300s, polycarbonate transmitting from near 380nm and Trivex cutting out radiation below around 400nm. Interestingly, tinting may reduce transmission but might not influence the wavelengths transmitted – something practitioners should remember. Fowler reminded the delegates that 'a visible tint does not necessarily mean that a lens gives complete UV protection'. Furthermore, some anti-reflection coatings, in reducing surface reflection from the 400-800nm wavelength range, may actually result in increased reflection at either end of this range.

Eye-sun protection factor

Essilor vice president of global and strategic marketing **Alain Riveline** rounded off the session by describing the new Crizal UV lens. He stated that a significant (up to 40 per cent) amount of UV exposure happened when we least expected, with exposure occuring in overcast conditions and even indoors. Spectacle lenses would prevent direct transmission to the eye and most current lenses cut out at least 95 per cent of the UV radiation.

However, much radiation reached the eye by peripherally bypassing the lenses and, most importantly, a significant amount was reflected from the back surface onto the ocular structures.

'UV reflected onto the eye can reach up to 50 per cent of the total exposure,' Riveline claimed. The Crizal UV lens has an extra layer (Figure 1) on the back surface offering a broad spectrum UV anti-reflection property.

One of the problems at present is a lack of awareness of the ocular dangers of UV by the public and also some uncertainty by public and practitioner alike about the actual protection offered by different lenses, both tinted and otherwise. Essilor has therefore launched the Eye-Sun Protection Factor index with the aim that, just like the SPF number on sunscreen, lenses might be assigned a number that reflected their p|UV protection properties. The index was developed in liaison with Dr K Citek, Professor of Optometry, Oregon. It employs a method of measurement of UV reflection (R_{UV}) technically endorsed by Fraunhofer/IOF, and is based on the amount of irradiance with no lens as compared to when a lens is in place. It is calculated as follows:

$$E\text{-}SPF = \frac{\%\ \text{irradiance}^{\text{no lens}}}{\%\ \text{irradiance}^{\text{lens}}} \approx \frac{1}{T_{UV\ 0°} + R_{UV\ 150°}}$$

T_{uv} represented the front side exposure to UV that is transmitted through the lens when the sun is in front of the wearer, while R_{UV} is the radiation reflected from the back of the lens when the sun is behind the wearer (from 140-155°). The higher the number, the better the protection.

Crizal UV is calculated as having an E-SPF of 25 and, compared with competitior lenses found to have values of 3-5, was currently way ahead because of the back surface reflection control. The properties were most graphically demonstrated by a model head where the UV reflection of the letters 'UV' were clearly seen reflected on the face of the mannequin by a standard lens while there was no such reflection from the Crixal UV lens (Figure 2). Expect to hear more about the E-SPF in the coming months.

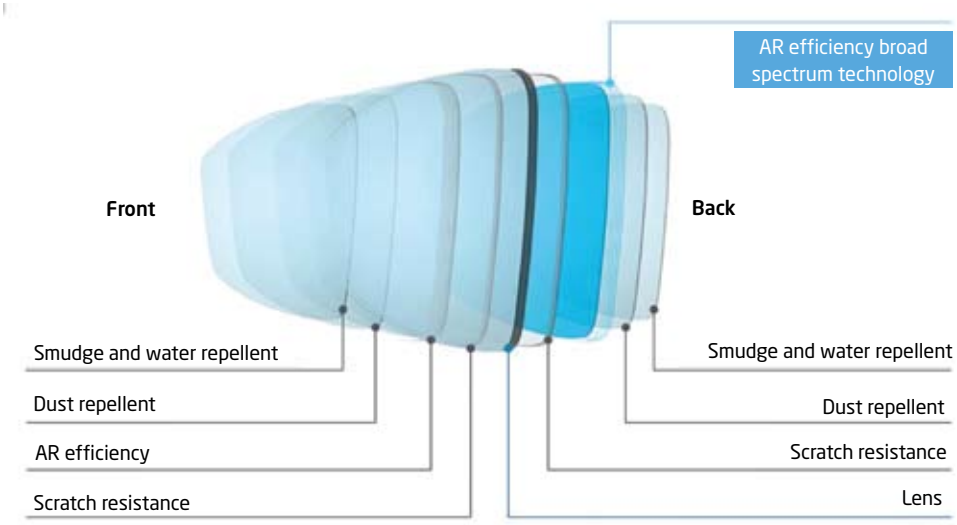

Figure 1 The Crizal UV lens with AR efficiency broad spectrum technology on the back surface

Figure 2 The letters 'UV' were seen reflected on the face of the mannequin by a standard lens while there was no such reflection from the Crixal UV lens