Ultraviolet Radiation and the Eye: Complete Protection Requires Blocking Both Transmission and Backside Reflection

Research shows that effective protection from the serious hazards of ultraviolet radiation (UVR) requires that clear, photochromic, and tinted/polarized lenses protect wearers from both transmitted and reflected UVR.

Chronic exposure to the ultraviolet radiation has been implicated in a number of serious ocular diseases, including pterygium, cataract, and climatic droplet keratopathy; and research has uncovered unexpected risks to the eyes. Unfortunately, the public remains dangerously under-informed about the nature and degree of this risk as well as the circumstances in which eye protection is most necessary.

Unexpected Risks

Research has shown that the time of maximum risk for UVR damage to the eyes is very different from the time of maximum risk to the skin. Risk to the skin is greatest when the sun is highest in the sky—ie, at solar noon and on the summer solstice (June 21st).

But because the eyes are deep set in the orbit, they are partially protected when the sun is high in the sky; so direct ocular UVR exposure is greatest when the sun is somewhat lower in the sky. For spring, summer, and fall, maximum ocular UVR exposure occurs between 8:00 am and 10:00 am, and between 2:00 pm and 4:00 pm. These, however, are not the times that people are most likely to wear sunglasses.1

Side and Back Exposure

Even when the sun is high in the sky, the eye is exposed to a significant amount of UVR that is scattered by clouds or reflected by surrounding surfaces (Figure 1). This indirect radiation is responsible for nearly half of the UVR we receive.2

Most higher-quality sun, photochromic, and clear spectacle lenses effectively block the transmission of UVR, so UVR coming from in front is not usually an issue for people wearing glasses. But eyes still need to be protected from the significant amount of UVR that is reflected off the backside of clear, photochromic, and tinted/polarized lenses (Figure 1).

Measuring Protection

ANSI standards for UVR blocking are designed for sunglasses and are based solely on how much perpendicularly incident UVR passes through the lens; they do not take into account the substantial amount of UVR that comes from the side or is reflected off the backside of the lens. Nor are they applied to everyday use lenses, where UVR protection is equally, if not more, important.

Research by Karl Citek, OD, PhD, has found that while lenses treated to be No-Glare transmit almost all of the visible light spectrum, they actually reflect over 25% of the incident UVR.3 So even lenses that block its transmission can reflect UVR into the eyes when the source is not directly in front of the wearer.4

With this important information in mind, a global index, the Eye-Sun Protection Factor (E-SPF®), was created. Like the SPF for skin, it measures the degree of eye protection provided by a lens. Unlike transmission data alone, however, the E-SPF measures eye protection by integrating reflected UVR data with transmission data (see box).

What Patients Need

Knowing what we now do about sources of UVR exposure, it becomes apparent that for the most complete protection, clear lenses and sun lenses must offer UVR blocking of both transmission and reflection. To address this need, all Crizal® No-Glare lenses have been engineered to virtually eliminate UVR reflection from the backside, for a lens that truly maximizes UVR protection.

REFERENCES