Health & Fitness Tips

UV Radiation - The Blinding Light

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Ultraviolet (UV) radiation comprises invisible high energy rays from the sun that lie just beyond the blue end of the visible spectrum.

Most UV radiation is absorbed by the anterior structures of the eye, although some of it does reach the light-sensitive retina[1]. The UV radiation present in sunlight is not useful for vision.

There are good scientific reasons to be concerned that UV absorption by the eye may contribute to age-related changes in the eye and a number of serious eye diseases.

Protection may be achieved by simple, safe and inexpensive methods such as wearing a brimmed hat and using eyewear that absorbs or reflects UV radiation.

Effects of UV radiation on the eye

Ultraviolet radiation in sunlight is commonly divided into two components: UV-A (320 to 400 nanometers) which causes tanning and is thought to contribute to ageing of the skin and skin cancer, and UV-B (280 to 320 nanometers) which may cause tanning, sunburn and skin cancer.

Clinical experience and evidence from accidents and experimental studies show that UV-B is more damaging, because it has higher energy. Most of the UV-B is absorbed by the cornea and lens of the eye; therefore it can cause damage to these tissues but will not normally damage the retina. However, the retina may be damaged if exposed to UV.

UV-A radiation has lower energy, but may penetrate much deeper into the eye and may also cause injury. Sunlight contains much more UV-A than UV-B.

Neither UV-A nor UV-B has shown to provide benefit to the eye, and neither contributes to vision.

Optimal sun protection should reduce both types of UV radiation to safe levels.

UV-related eye diseases

Ultraviolet radiation may play a contributory role in the development of various ocular disorders including cataract, pterygium, ocular cancers, photokeratitis (flash burns) and corneal degenerative changes. It may contribute to age-related macular degeneration.

Cataract is a major cause of visual impairment and blindness world-wide. Cataracts are a cloudiness of the lens inside the eye that develop over a period of many years.

Laboratory studies have implicated UV radiation as one of the causal factors for cataract. Furthermore, epidemiological studies have shown that certain types of cataract are associated with a history of higher exposure to UV, and especially UV-B radiation.

Age-related macular degeneration is the major cause of vision impairment and blindness in Australia for people over the age of 50[2].

Exposure to UV radiation is damaging to retinal tissue in laboratory experiments, thus scientists have speculated that chronic UV exposure may contribute to ageing processes in the retina[3].

Pterygium is a growth of tissue on the white of the eye that may extend onto the clear cornea where it may distort or block vision. It can also cause irritation. It is seen most commonly in people who work outdoors in the sun and wind, and its prevalence is related to the amount of UV exposure. It can be removed surgically, but often recurs and may cause cosmetic concerns and visual loss if untreated.

Excessive UV exposure is well known to predispose to skin cancer, which includes the eyelids and facial skin.

Photokeratitis is essentially a reversible sunburn of the cornea resulting from excessive UV-B exposure. It occurs when someone spends long hours on the beach or snow without eye protection. It may be extremely painful for one to two days and may result in temporary loss of vision. There is some indication that longterm exposure to UV-B may result in corneal degenerative changes.

Risk factors

No one is immune to sunlight-related eye disorders. Every person, regardless of their background is susceptible to ocular damage from UV radiation that may lead to impaired vision.

Any factor that increases sunlight exposure of the eyes will increase the risk for ocular damage from UV radiation. Individuals whose work or recreation involves lengthy exposure to sunlight are at greatest risk.

Since UV radiation is reflected off surfaces such as snow, water and sand, the risk is particularly high on the beach, while boating or in mountain areas. The risk is greatest during the mid-day hours, from 10 am to 3 pm, and during the summer months. Ultraviolet radiation levels increase nearer the equator, so residents in the Northern parts of Australia are at greater risk. UV levels are also greater at high altitudes.

Children are at a higher risk of sustaining ocular damage from UV radiation than adults. Children typically spend more time outdoors and their ocular structures are more permeable to UV radiation.

Solar radiation damage to the eye may be cumulative and may increase the risk of developing an ocular disorder later in life[4].

Protection from UV radiation

Ultraviolet radiation reaches the eyes not only from the sky above but also by reflection from the ground, especially water, snow, sand and other bright surfaces. Protection from sunlight may be obtained by using both a brimmed hat and UV absorbing eyewear.

A wide-brimmed hat will block roughly 40 per cent of UV radiation and reduces UV that may enter above or around the glasses. There is evidence to suggest that hats alone are not adequate forms of sun protection in a school environment[5]. Ultraviolet absorbing eyewear provides the greatest measure of UV protection, particularly if it has a wraparound design to limit the entry of peripheral rays.

Ideally, all types of eyewear including prescription spectacles, contact lenses and intraocular lens implants should limit the entire UV spectrum (UV-A and UV-B). UV absorption can be incorporated into nearly all optical materials currently in use, is inexpensive and does not interfere with vision. The degree of UV protection is not related to price. Polarisation or photosensitive darkening are additional sunglass features that are useful for certain visual situations, but do not, by themselves, provide UV protection.

The Australian Radiation Protection and Safety Agency recommends wearing sunglasses that absorb more than 95 per cent of the full UV spectrum[6]. Sunglasses should be stable when worn and large enough to provide adequate eye coverage. Additional protection for the retina may be provided by lenses that reduce the transmission of violet/blue light.

Sunglass lenses should not be so coloured as to affect perception of the colour of objects, such as traffic signals. The visible spectrum should be reduced to a comfortable level to eliminate glare and squinting. Individuals who also wear clear prescription eyewear outdoors should consider using lenses which limit UV radiation.

All sunglasses sold in Australia are required to conform to a standard based on the Australian/New Zealand Standard AS/NZS1067:2003, which specifies how much UV protection must be provided. According to the standard, sunglasses in categories 2, 3 and 4 provide “good UV protection” and these are suitable for most outdoor activities.

Category 4 sunglasses are described as “special purpose” as they provide very high sun glare reduction as well as good UV protection and are suitable for people who have a particularly high exposure to UV radiation. However, Category 4 sunglasses should not be used for driving.

It is prudent to protect the eyes of children against UV radiation by having them wear a wide-brimmed hat and sunglasses whenever they are outdoors. Sunglasses or spectacles for children should have lenses made of plastic or polycarbonate rather than glass for added impact protection.

It is generally acceptable for children who wear distance prescription lenses to use clear spectacles with UV protection as well as a hat when outdoors, although a photosensitive tint or prescription sunglasses may offer added glare protection and ocular comfort.

Optometrists Association Australia recommends that all distance prescription spectacles for children incorporate UV protection within the lens material or as a UV-protective coating.

Children learn by way of example, so it is important that supervising adults also comply with sun-safety procedures. Children should be encouraged as early as possible to protect their eyes from all potential hazards, including UV radiation, so that they have the best chance of enjoying a lifetime of good vision.

Source: Article courtesy of Optometrists Association Australia;
http://www.optometrists.asn.au//eyevision/consumers/uv

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