

A substantial part of serious eye diseases, especially those that are related to aging, are at least partly the result of the cumulative life time exposure of the eyes to the sun. The light damage is caused mainly by the short waves on the optical spectrum, especially by the ultraviolet radiation whose rays are invisible and most energetic.

The diseases caused or accelerated by sunlight include:

**Cataract** – Cataract is a cloudiness of the natural eye lens, the vast majority of which are related to aging. When they interfere with vision they are surgically removed and replaced with a plastic artificial lens. Cataracts are the most common cause of blindness in the world, especially in the developing world which lacks enough ophthalmic surgeons to remove them. One of the clearest connections of sunlight to cataract was established while researching the cumulative effect of the sun's radiation on fishermen in Chesapeake Bay in Massachusetts. It was found that with increase in cumulative exposure to ultraviolet radiation comes a constant and progressive risk of developing a common type of cataract. The risk for people who were exposed to above average levels of a certain type of ultraviolet radiation was three times as high as for those who were exposed to average levels of this radiation. Some other extensive surveys showed similar results shown regarding other types of cataracts. Professional exposure to the sun and non-professional out-door employment were found to be correlated to common types of cataracts. These data leaves little room for doubt that continuous exposure to ultraviolet light of the sun is an important factor in the development of age-related cataract.

**Presbyopia** – this is a condition in which the eye lens loses its elasticity and thus depriving the person from focusing on near objects. This problem causes the entire middle-aged population to start using reading glasses. This condition is also probably related, at least partially, to life time cumulative exposure to the ultraviolet radiation, especially when it appears before the age of 40. Numerous epidemiological studies have shown that presbyopia develops earlier in areas that are closer to the equator, which are therefore more exposed to high levels of the sun's radiation. Studies have also found a direct correlation between the amount of sun radiation and average temperature in these areas and the age of onset of presbyopia. Although the evidence about the connection between ultraviolet radiation and presbyopia are not as strong as those that connect this type of radiation with cataract the connection is logical and the evidence for it is solid.

**Age-related Macular Degeneration (AMD)** –AMD, a degeneration of the retina, the light sensitive tissue in the eye, is the most common cause of blindness in the developed world. This condition is diagnosed in about 25% of people older than 75. The disease used to be incurable, but in recent years means were found to partially alleviate it and slow its progression by drugs injected into the eye and laser therapy. AMD is related to accumulated solar radiation - ultraviolet and the blue part of the visible spectrum with their energy-rich rays. Those rays damage the eye's retina by giving rise to oxidative processes that gradually destroy it. In the Chesapeake Bay study referenced above, AMD was found to be more advanced in those fishermen who were more exposed to the sun (especially the blue part of the light spectrum) than in those who were less exposed to it. Another population-based study uncovered a similar result – the disease started earlier in people that were more exposed to the sun and less in those that wore glasses.

**Malignant melanoma of the eye** – not only diseases that can blind but also diseases that can kill such as malignant melanoma of the eye, are connected to exposure to the

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sun. Some research indicates that this type of cancer, like skin melanomas, is connected to exposure to the sun. It has been shown to be more common in countries that are closer to the equator and are therefore more exposed to the sun. Although conflicting results have been published, an extensive case control study has shown that people who spent more time outside their house, got more natural or artificial tans, and did not wear a hat or sunglasses while in the sun, had a significantly higher probability of getting malignant melanoma of the eye.

**Basal Cell Carcinoma** - This, the most common cancer of mankind, which often grows on the eyelids, is definitely associated with sunlight exposure, especially during childhood,. Fortunately it is not very aggressive and its appearance on a visible part of the body makes it amenable to cure by early surgery. Similar but weaker connection exists for the second most common skin cancer – squamous cell carcinoma.

**Pterygium** – this relatively common non-malignant growth on the surface of the eye that is exposed to the sun. It causes cosmetic blemish and is sometimes infected. When the Pterygium spreads to the transparent optical area of the front of the eye it requires surgery to remove it. This surgery needs to be repeated often when the pterygium returns. It has been suspected for a long time that there is a connection between pterygium and exposure to the sun because of its prevalence in geographical areas that are rich in sunshine and its appearance only on the exposed areas of the front of the eye. There is no doubt now that pterygium is indeed connected to exposure to sun exposure

**Rarer diseases of the front of the eye** as Carcinoma In-Situ (Bowen's Disease), Ocular Surface Epithelial Dysplasia, and Climatic Droplet Keratopathy –accumulating epidemiological evidence has pointed to the possibility that these diseases which can cause blindness, such, are also connected to ultraviolet light exposure.

### **Prevention**

There is a very simple and effective way to prevent or delay these diseases and perhaps others whose correlation to sun radiation has not been proven yet – sunglasses that prevent high energy light radiation (blue, violet and ultraviolet rays) from reaching the eyes. The appropriate age to start regularly wearing sunglasses to prevent these diseases is childhood and they should be used whenever a person is exposed to the sun.

The reason is that all the diseases listed above are related to sun light exposure throughout a person's life. The fewer rays that hit the eye, the more these diseases can avoided or delayed. Another significant reason for starting to use sunglasses as early as possible is that while at a young age the lens efficiently transfers almost all the damaging rays. This ability is progressively reduced as the lens gets gradually more cloudy with age. The authors of the malignant melanoma study state that "exposure to sunlight at an early age may be extremely important to the development of intraocular malignant melanoma."

In addition, sunglasses are more important for children than for adults since children spend more time outside than most adults and the damage is cumulative. Under normal conditions, children are exposed to three times as much as sun as adults and most of the exposure to sun happens during childhood. Considering the increasing life expectancy it can be easily predicted that the number of people affected by the different eye diseases at old age will continue to grow.

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Furthermore there seems to be a real threat of an increase in the level of ultraviolet radiation due to the damage to the ozone layer, which typically prevents most of the harmful ultraviolet radiation from reaching the surface of the earth. It can be confidently assumed that this change will also increase the occurrence of the serious age-related eye diseases if it is not prevented by using sunglasses starting at an early age.

Finally, it has to be noted that it has been found that a large proportion of children's sunglasses do not completely block the transfer of ultraviolet radiation into the eye, despite manufacturers claims. Therefore, sunglasses that completely block UV radiation into the eye must be used, especially when it comes to children. This means only sunglasses from known firms about whom it can be assumed that the notes on the packaging regarding UV screening are true and that the sunglasses do indeed protect the eyes. In this respect it should be emphasized that in order to achieve adequate protection, sunglasses must reduce access of sunlight from the sides of the frame. Consequently, it is recommended that curved, head fitting sunglasses be used.

It doesn't seem likely that in the near future there will be indisputable epidemiological research results which prove that using sunglasses from an early age does indeed decrease the rate of eye diseases at a later age. This type of research will have to be performed over several decades and will be very difficult and exceedingly expensive to execute.

Perhaps this type of research will be carried out in the future but for now people should not wait and risk their children's eyes by not using sunglasses, which are an easy, effective, simple, cheap, comfortable and even fashionable preventative measure. The correlation between sun radiation and the different eye diseases has been proven at least as much as the correlation between smoking and heart and lung diseases, if not more, but there is still no health education activity around this subject. Doctors should instruct the people that come into contact with them about the benefits of using suitable sunglasses, starting at an early age.

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