PROTECTING THE EYE AGAINST SUNLIGHT: MORE THAN JUST BLOCKING UV?

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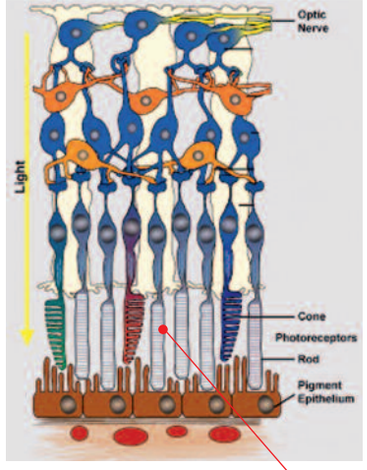

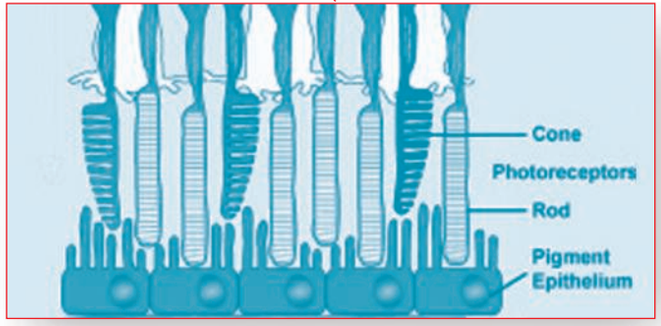

« In fact, the human retina becomes less and less exposed to blue light with increasing age.

But: Scientists hypothetize that light may have a cumulative effect on the retina. Thus, one may be protected at older ages, but the retina „does not forget“ the dose of (blue) light it was exposed to during childhood and youth.

Furthermore, at the same time that the exposure of the retina to blue light is reduced due to the yellow staining of the lens, the number of blue absorbers in the retina increases.

As a consequence, the amount of blue light absorbed by the retina may actually not be reduced. This blue absorber, which forms with age, is lipofuscin, a heterogenous mixture of „metabolic waste“ that cannot be cleared from the retina. Lipofuscin accumulates in the retinal pigment epithelium (Fig.), a layer of cells with essential function for the maintainance of photoreceptors. Lipofuscin compromises the function of the retinal pigment epithelium and increased accumulation of lipofuscin is an indicator for the development of AMD. »

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OPENING OUR EYES

to dangers of blue light

EXPLANATIONS

ESSILOR

WHAT IS **BLUE LIGHT?**

- Also called «HEV» (High Energy Visible), blue light covers wavelengths from 380 to 500 nm: the most energetic in the visible solar spectrum
- Due to its high energy, blue light is more scattered in the atmosphere than the other wavelengths of the visible spectrum (Rayleigh law).

That is why a clear sky appears blue to our eyes. **It is very present also when the sky is very clear, in mountain, on the sea, and around noon**. Blue light is also emitted by many artificial light sources as well as by direct sunlight.

THE **CUMULATIVE EFFECT** OF BLUE LIGHT

- It has a cumulative effect on the retina. From childhood, the eye will be protected from blue light thanks to a powerful self defense process[1]. On the same time, this process will be less efficient over the years[2], and it will make the retina more sensitive to blue light.
- Cellular remnants (lipofuscin) will accumulate in the pigment epithelium (in the retina). Lipofuscin will absorb blue light and generate free radicals, which will lead to a slow degradation of the photoreceptors.
- These cumulative damages are likely to be responsible for retinal diseases such as AMD (Age-related Macular Degeneration).

What is AMD ?

- AMD is a degenerative disease of the eye. It comes when the very delicate cells of the macula, that is to say the visual centre of the retina, are being damaged. The people suffering from this disease cannot focus properly in the very centre of their vision field: the essential area to read, drive, watch television, recognize faces...
- AMD has become the first cause of blindness in industrialized countries[3]. It affects now from 13 to 15 million American people and more than 25 million people in the world. Because of the ageing population a high increase of the cases is likely to happen.

[1] Cellular Renewal, yellow pigments layer (for example lutein) protecting the photoreceptors, and the presence, at RPE level, of antioxidants and melanin, as well as some vitamins (C and E).

[2] At 40 years-old, we have already lost some 20% of our initial retinal melanin and at 65 years-old, some 50%.

[3] Margrain T.H., Boulton M., Marshall J., Sliney D.H. Do blue light filters confer protection against age-related macular degeneration? Progress in Retinal and Eye Research 23 (2004) 523-531.

WHY DO NEED TO **PROTECT** OUR EYES FROM BLUE LIGHT?

- The toxicity of blue light on the retina has been proved experimentally.
- More and more scientists agree to say that repeated exposure to blue light along the life could increase the risk of Age-related Macular Degeneration.

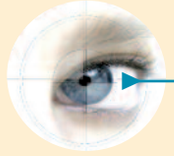
ESSILOR'S **ANSWER** TO BLUE LIGHT

- **Medical lenses**
  Lenses that stop blue light have existed for many years. They are recommended for people who have diseases of the retina; these lenses filter 100% of blue light and will distort colours.
- **Prevention**
  Essilor has created sunglasses that filter harmful blue light, while still maintaining the perception of natural colours. Everyone can benefit from the protection these lenses provide, even when driving.

BLUE LIGHT

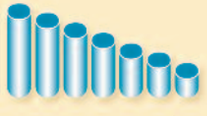
Long-term effect of Blue Light

The retina is protected from Blue Light by



- yellow pigments,
- anti-oxydants,
- melanin,
- vitamins,
- cellular renewal

Decreasing of retina's natural protection with time



Accumulation of cellular debris (lipofuscine)

Weakening of retina

Production of toxic free radicals

Premature ageing of retina
Increased risk of AMD

Factors which reinforce this risk:

- Increased life expectancy
- Greater exposure to sunlight throughout life (leisure, travel,...)