LASTING PROTECTION FOR EYE HEALTH
In 2008, Essilor partnered with Paris Vision Institute to invest in an advanced “eye health defense” research program. Through this partnership, Essilor aims to offer the most complete eye protection against dangerous light, including HEV.

**NEW SCIENTIFIC FINDINGS: LOCATION OF THE MOST HARMFUL HEV LIGHT WAVELENGTHS**

In 2011, discovery of the precise band of light of 40nm (415-455nm) that is the most harmful for the retinal cells: the blue-violet light.

Several studies have shown evidence of the crucial role of light in your patient’s everyday health. They demonstrated that it can be harmful and contributes to developing eye diseases.

**NON-VISIBLE UV HAS BEEN CLINICALLY EVIDENCED TO BE A MAJOR RISK FACTOR IN MAY EYE ILLNESSES, INCLUDING CATARACTS:**
- 20 million procedures every year

**HIGH ENERGY VISIBLE (HEV) LIGHT IS ONE OF THE RISK FACTORS OF AMD ONSET:**
- AMD is the leading cause of blindness in industrialized countries
- There are only a few stabilizing non-curative treatments for AMD today

Note: There are other risk factors contributing to the development of AMD such as age, genetics, smoking, diet, etc.

**IN 2011, DISCOVERY OF THE PRECISE BAND OF LIGHT OF 40NM (415-455NM) THAT IS THE MOST HARMFUL FOR THE RETINAL CELLS: THE BLUE-VIOLET LIGHT**

**RETINAL CELL* DEATH PER WAVELENGTH**

Source: IDV/Essilor R&D 2011

*During in vitro experiments, swine retinal cells were exposed to Blue-Violet light, reproducing the physiological exposure to sunlight of the human eye of a 40-year-old.

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(3) Based in Paris, and linked to Pierre & Marie Curie University, the Vision Institute is considered as one of Europe’s major integrated research centers on eye diseases and vision. 200 researchers and medical doctors and 15 industry players work together for the discovery and clinical evidence of new therapeutic approaches and preventive solutions, as well as innovative compensatory technologies for vision impairments.
BLUE-VIOLET LIGHT INCREASES THE RISK OF RETINAL DAMAGE

CUMULATIVE EXPOSURE TO BLUE-VIOLET LIGHT HAS A DOUBLE EFFECT:
- It increases the production of lipofuscin, a metabolic waste material that accumulates in retinal cells with age. It is commonly known as an «age marker» that may be found in other body organs. The accumulation of lipofuscin in retinal cells can contribute to the deposition of drusens in AMD\(^5\).
- It activates lipofuscin phototoxic components, causing retinal cell death\(^6\) (RPE and photoreceptors).

MOST SENSITIVE POPULATION TO EXPOSURE OF HARMFUL LIGHT

- BEFORE 10, CHILDREN’S UNDER-DEVELOPED EYES EXPERIENCE OVEREXPOSURE TO HARMFUL LIGHT
  They are more exposed than adults to sunlight, which is a very important source of harmful Blue-Violet light and UV\(^7\).
  The crystalline lens and the cornea are still largely transparent to harmful light. The retinal cells receive an excessive amount of Blue-Violet light\(^8\) (may be above physiological threshold).

- WITH AGE, THE RISK OF EYE DISEASES GROWS\(^9\)
  The level of antioxidants present in the eye decreases\(^10\), while the retinal cells sensitivity to Blue-Violet light increases.
  Other risk factors can also precipitate the occurrence of eye diseases: genetic predispositions, smoking, diet, etc.

ACCUMULATION OF LIPOFUSCIN THROUGH LIFE
Source: Adapted from Ong et al., IOVS, 1978; ex vivo, in the total RPE. For in vivo, at fovea and 7° temporal to the fovea, see (Delori et al., IOVS, 2001), faster increase with age.
Outdoor, the sun is the most powerful source of Blue-Violet and UV light, whatever the weather.

Blue-Violet light is also present indoor, exposing people more every day to its dangerous effects.

At the origin of this new trend are the creation of new technological devices, and the replacement of incandescent light sources by luminescent light sources.

The greatest portion of artificial Blue-Violet light can be found in:

- Cool white LED: they are incorporated into most modern lighting and display systems, especially computers, tablets and new generation smartphones (they contain 35% of Blue-Violet light).
- Compact Fluorescent light bulbs (they contain 26% of Blue-Violet light).
ABOVE 455NM, VISIBLE BLUE-TURQUOISE LIGHT IS ESSENTIAL TO VISUAL AND NON-VISUAL FUNCTIONS:

- Stimulation of the pupillary constriction reflex centered at ~480 nm\(^{(11)}\)
  Retina’s natural protection against light overexposure.

- Synchronization of the “human biological clock” in a band of 30nm, from 465 to 495nm\(^{(12)}\)
  Sleep/wake cycle, memory, mood, cognitive performance, etc.

EXISTING PROTECTIVE LENS SOLUTION: LOW VISION FILTERS

Tinted lenses filter UV rays and all Blue light (Blue-Violet and Blue-Turquoise). Designed for patients already diagnosed with AMD, they are the most PROTECTIVE VISUAL AID available for them today.

However, they are not used as PREVENTIVE SOLUTION by people at risk of developing AMD later in life (due to genetic predispositions or lifestyle) for different reasons:

- they are not clear lenses (cosmetic aspect is not suitable for all daily life situations)
- they are not selectively filtering Blue light, which may:
  - alter patients’ perception of colours
  - disrupt the functioning of their human biological clock and pupillary constriction reflex

ALL BLUE WAVELENGTHS ARE NOT HARMFUL TO HEALTH

TODAY, NO CLEAR LENS PREVENTS RETINAL CELLS DEGENERATION
NEW DAILY SOLUTION OF EYE SELECTIVE PROTECTION

Result of 20 years of R&D expertise, CRIZAL PREVENCIA lenses deliver: A SELECTIVE AR TECHNOLOGY able to combine 3 key features at the same time:

1. FILTERS OUT HARMFUL LIGHT
   - *In vitro* retinal cell tests evidenced a reduction of cell death by 25%, with a 20% cut of the Blue-Violet light\(^{(13)}\).
   A protection level which could alleviate the cumulative risk of AMD.

   - Provides 25 times more protection against UV rays vs. a naked eye, thanks to its front and back protective properties (E-SPF 25\(^{(14,15)}\)).

2. LETS THE ESSENTIAL VISIBLE LIGHT PASS THROUGH (including 96% of blue-turquoise)
   - To preserve visual and non-visual functions.

3. ENSURES AN EXCELLENT TRANSPARENCY AT ALL TIME
   - Provides an optimal clarity of vision every day (clear AR lens: visible reflection = 0.6% on each side)
   - Keeps Crizal premium coating benefits against smudges, scratches, dust and water.

THE MOST COMPLETE PROTECTION ON A CLEAR LENS
REFERENCES


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10. Yu et Al, IOVS, 2012;p<0.014


13. Crizal®Prevencia™: the first preventive non-tinted daily wear glasses to protect from UV and harmful blue light, Coralie Barrau, Amelie Kudla, Eva Lazuka-Nicoulaud, Claire Le Covec, Point de Vue No. 69, Fall 2013.


Essilor International is the world leader in the design, manufacture and customization of ophtalmic lenses. Active on five continents, Essilor offers a wide range of lenses under the flagship Varilux®, Crizal®, Optifog®, Xperio® and Essilor® brands to correct myopia, hyperopia, presbyopia and astigmatism.

Essilor Crizal® Prevencia™ lenses are Class I medical devices intended for the correction of ametropias and presbyopia, offering selective protection from harmful blue light and UV rays. Essilor informs you that the above information is general information given as prevention and public awareness. For more information Essilor invites you to consult a healthcare professional (eye doctor, ophthalmologist).