



Beat The Blues: Inside and Out

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Disclosures

- I have worked/consulted for the following in some capacity over the last 18 months (and will not be influenced through the course of this lecture):
 - Allergan, Alcon, Bausch & Lomb, Zeiss Meditec, Essilor, Kemin, Luneau vision, Genetech
 - Maculogix, Optos, Optovue, VSP, ZeaVision

Conclusion



- We are exposed to more harmful blue wavelength light now than ever before
- There are ways to protect our eyes from this light
 - Internal protection
 - MPOD (as built by diet and supplementation)
 - External protection
 - Glasses lenses (Coatings and materials)
- Optometry is the front line on true eye protection

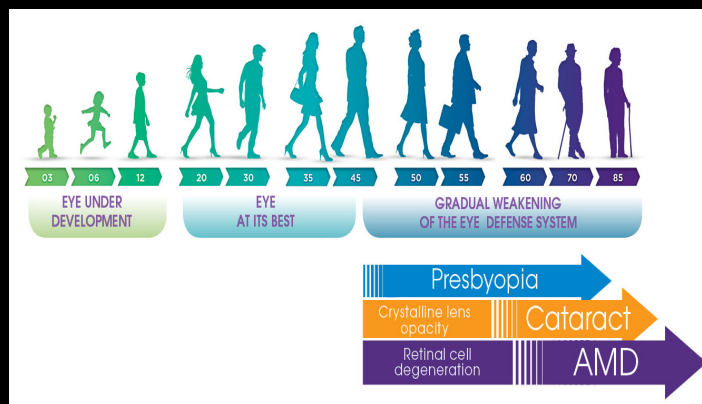


A Few Survey Questions

- Who is on the computers \geq 2hrs?
- Who has kids that are on ipads, smartphones, etc > 3hrs/day?
- Who works or lives under NEW CPF bulbs?
- Who has a smart iphone?

Who needs to put that device down and pay attention?

Our vision changes as we age and our eyes become more vulnerable



The prevalence of eye disease increases with age

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Patients who critically need protection span across ages



BEFORE 15

Children's eyes are under-developed

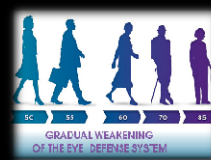
- Eye structures are more transparent and offer little natural protection against harmful light
- Retinal cells receive more exposure to Blue-Violet light



BETWEEN 16 AND 45

Increasing prevalence of harmful light sources

- LED screens (TVs, smartphones, computers) found in many modern devices
- Compact fluorescent lighting



AFTER 45

Patients at risk for development of eye disease (AMD screening integration)

- With age, the eye becomes more fragile as the eye defense system weakens
- Family history of AMD increases risk

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The Digital Era Facts

- ~70% of Americans use a smart phone & 40% use tablets
 - 60% spend at least 5hrs on such devices



Lighters in 1993

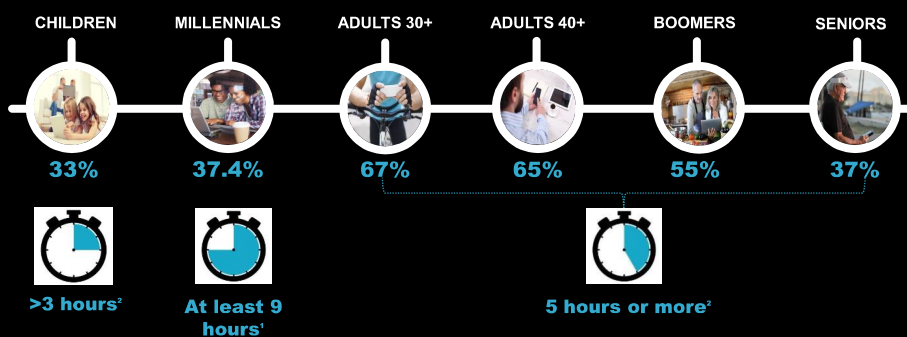


2013

Vision Council report 2013

Blue Light Exposure... More Than Ever

We can't live without technology!



These statements have not been evaluated by the Food and Drug Administration. This product is not intended to diagnose, treat, cure, or prevent any disease.

Sources: (1) The Vision Council (2015) Hindsight is 2020. Protect your Eyes from Digital Devices https://www.thevisioncouncil.org/sites/default/files/VC_DigitalEyeStrain_Report2015.pdf (2) The Vision Council (2016) Eyes Overexposed: The Digital Device Dilemma. http://www.thevisioncouncil.org/sites/default/files/VC_2016EyeStrain_Report_WEB.pdf Image sources: Shutterstock_30543732, Shutterstock_307728164, Shutterstock_307728165, Shutterstock_316716955, Shutterstock_353744254, Shutterstock_353744253, Shutterstock_353744259, Shutterstock_100508500, Shutterstock_153740261



Blue Light From Sunlight

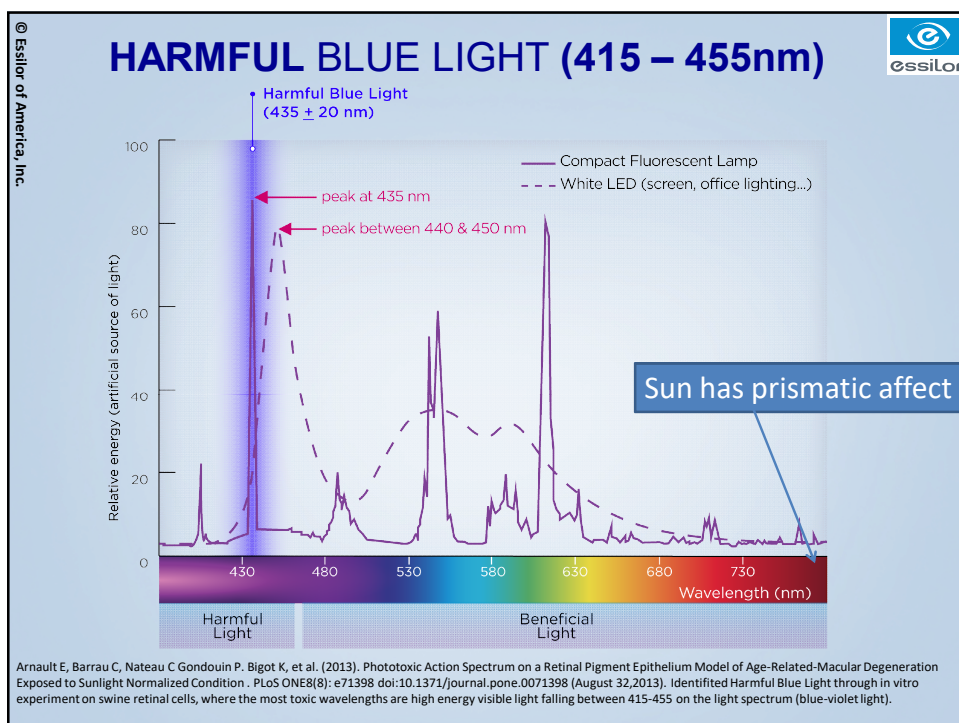



The sun emits both UV and blue light


- Exposure varies but occurs 365 days a year
- The average portion of blue light that is found in sunlight during the day is between **25-30%**
- Approximately **40-50%** exposure occurs when not in direct sunlight

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Source: Why should I care about blue light? Owen R. Grieb, O.D., M.P.H., F.A.A.O. Eye Vision Associates Northport VAMC. Image source: Katin







Newer LED Lights

- LED lighting in NA market: **+45%** per year through 2019¹
- The LED lighting in NA market: \$4.8 billion in 2012 - \$42 billion by 2019¹
- Contain **35%** blue light levels as compared to 3% in incandescent bulbs^{2,3}

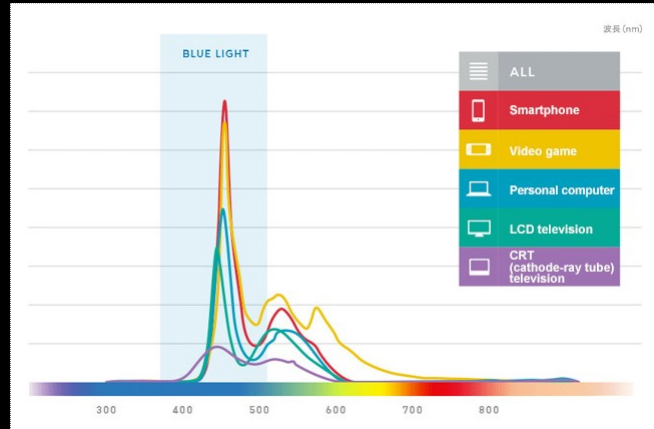
Compact fluorescent lights

Contain about **25%** blue light^{2,3}

These statements have not been evaluated by the Food and Drug Administration. This product is not intended to diagnose, treat, cure, or prevent any disease.
 Sources: (1) WinterGreen Research, Inc. <http://wintergreenresearch.com/reports/LED%202013%20press%20release.pdf> (2) Why should I care about blue light? Owen A. Graft, O.D., M.P.H., F.A.A.O. Eye Vision Associates Northwest YAKC. (3) Blue Light Hazard: New Knowledge, New Approaches to Maintaining Ocular Health <http://www.optics.com/content/dam/rogers/rogers%20blue%20light%20hazard%20white%20paper.pdf> Downloaded June 3, 2016. Image source: Karim

Blue Light From Electronic Devices

Technology increasing in modern daily life...

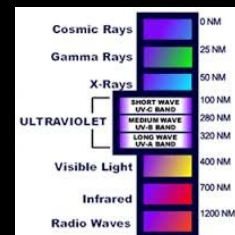


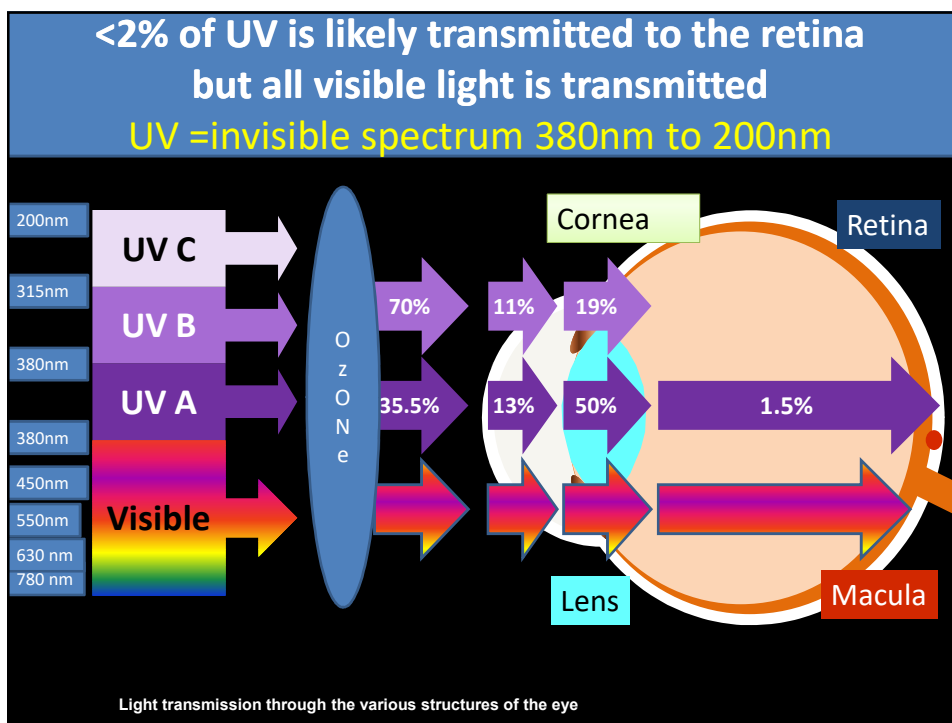
These statements have not been evaluated by the Food and Drug Administration. This product is not intended to diagnose, treat, cure, or prevent any disease.
Source: http://blue-light.biz/english/about_blue-light.html. Image source: Picture reprinted with permission of the Blue Light Society.



But.....

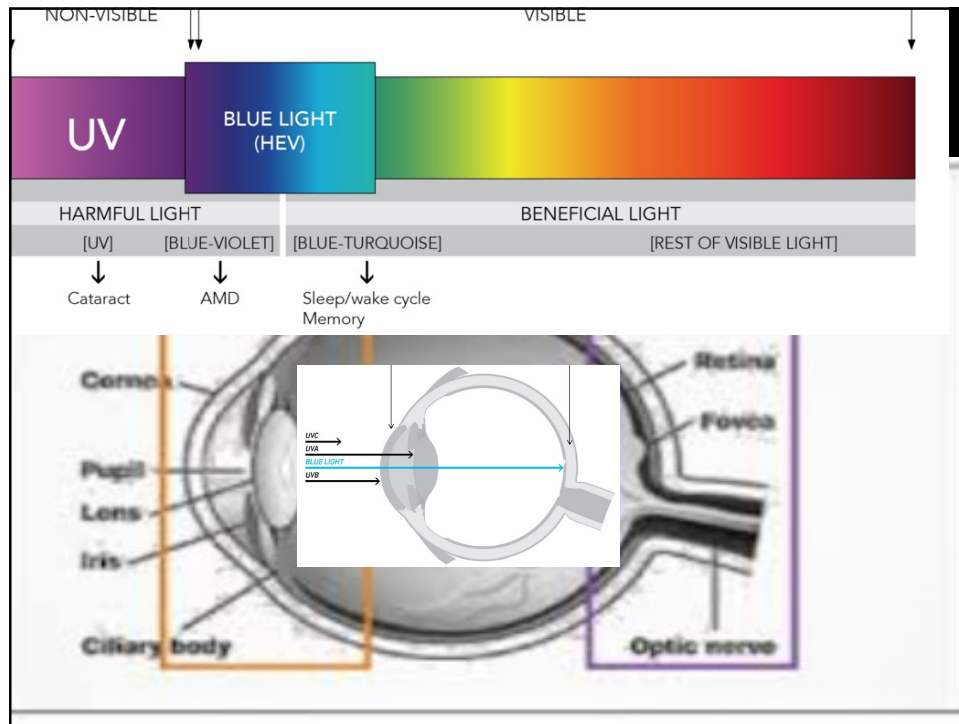
Weren't we taught that UV is what we need to worry about?





Conditions associated with UV exposure are generally confined to the anterior seg

- Cancers of ocular adnexa
- Pterygia/Pinguecula
- Photokeratitis
- Cataract



BLUE LIGHT



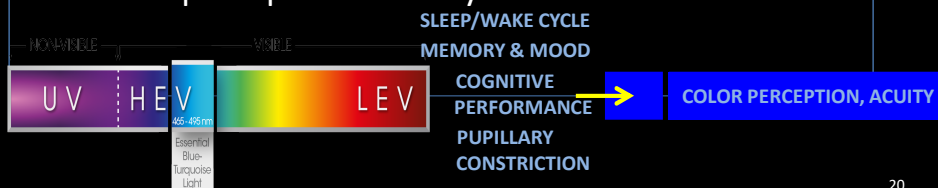
The GOOD BLUE

- Not all “blue” is bad: That is why selective filtering is important!
- Blue-turquoise helps visual and non-visual functions



BLUE Light is important for vision & everyday health

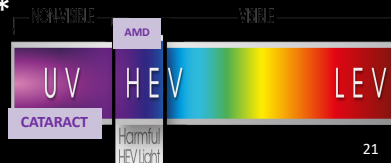
- Beneficial Light
 - **Blue-Turquoise light** (465nm-495nm) plays an essential role in regulating the sleep/wake cycle, memory, cognitive performance, and other contributing factors to general wellness
 - Increase Blue light = decrease melatonin = stay awake
 - Rest of the visible light spectrum is essential for color perception & acuity



Yet, **BLUE** Light can contribute to severe eye diseases

- Harmful **BLUE** Light
 - **UV light** damages the front-side of the eyes (i.e. the crystalline lens and cornea) and is a major risk factor for the development of many eye diseases, including cataract
 - **Blue-Violet light** (415nm-455nm) is high-energy visible (HEV) light and could be harmful to retinal cells and a risk factor for the onset of age-related macular degeneration (AMD), the leading cause of blindness in adults over 60*

*Taylor HR, West S, Munoz B, Bressler SB, et al. The long-term effects of visible light on the eye. Arch Ophthalmol. 1992;110: 99-104 [FN 51].



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Blue Light Benefits

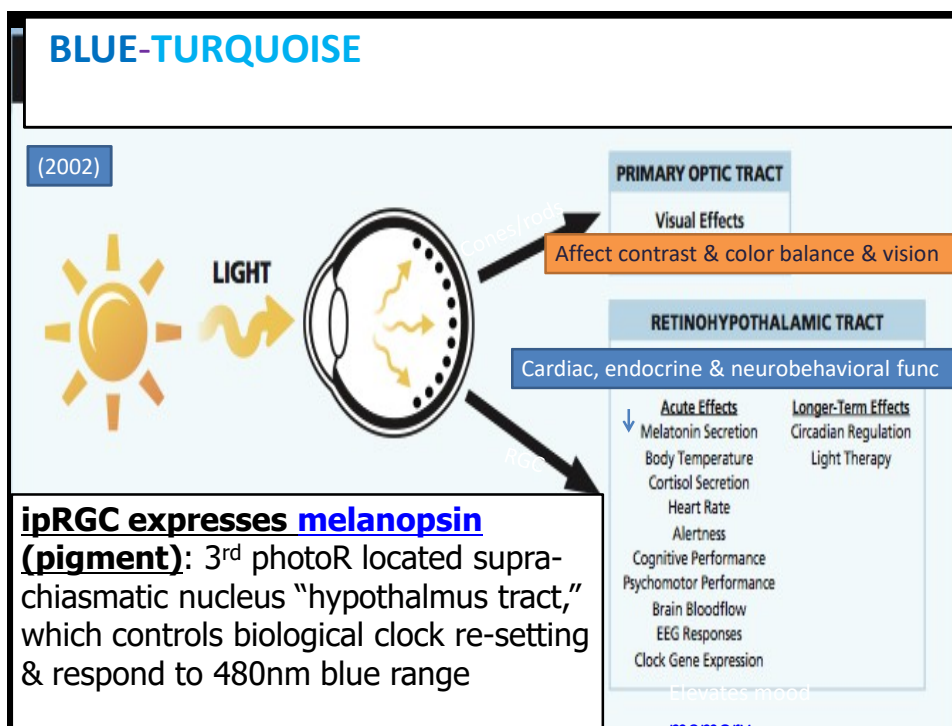
We need some **blue light**

- ✓ Helps regulate circadian rhythm¹ (body's natural sleep/wake cycle)
- ✓ Helps regulate the body's natural sleep²
- ✓ Boosts/improves alertness³
- ✓ Helps maintain and regulate memory, and cognitive function⁴ (brain responses to cognitive tasks)
- ✓ Elevates mood, hormonal balance⁵



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Sources: (1) Cajochen C, et al. J Clin Endocrinol Metab 2005; 90:1311-6. (2) Campbell SS, et al. J Biol Rhythms. 1996;10(2):129-32. (3) Vieux AU, et al. Scandinavian journal of work, environment & health. 34 (4): 237-206. (4) Vieux AU, et al. 13 (10): 429-438 DOI: 10.1016/j.sbs.2009.07.004. (5) Leht, S, et al. 114 (4): 457-462 DOI: 10.1007/s00702-006-0621-4. (6) Monteleone P, et al. Prog Neuropsychopharmacol Biol Psychiatry 2010. Image sources: Shutterstock, 355811336



Blue light & Sleep

- Pineal gland

Recommendations

Another study by Chang 2015 showed that pts who read on e-readers had significant delay in sleep onset vs. control group w more subjective tiredness feeling and alertness the next day

- Blue light delays sleep 2x longer than green light (shifted circadian rhythms by twice as much "3 hours vs. 1.5 hours" by suppressing melatonin 2x as much

Inhibition

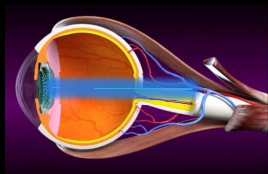
Melatonin

CC(=O)NCCC1=CC=C2C(=C1)C(=C(C=C2)OC)C

Blue light has a dark side
Harvard Medical school Newsletter May 2012

YET...Violet Blue Light = Likely More Eye Damage

Overexposure to blue light can negatively impact vision



- The **anterior structures** can't filter blue light on their own⁷
- Blue light passes easily through our cornea and lens onto the retina
→ induces damage to the photoreceptor cells⁷

Cumulative exposure to blue violet can may lead to:

70%
of adults who report
regular usage of
devices experienced
symptoms of digital
eye strain*

DIGITAL EYE STRAIN SHORT TERM EFFECTS^{1,2,3}

HEADACHES
BLURRED VISION
DRY EYES
EYE STRAIN
EYE FATIGUE



BLUE LIGHT LONG TERM EFFECTS^{1,2,5}

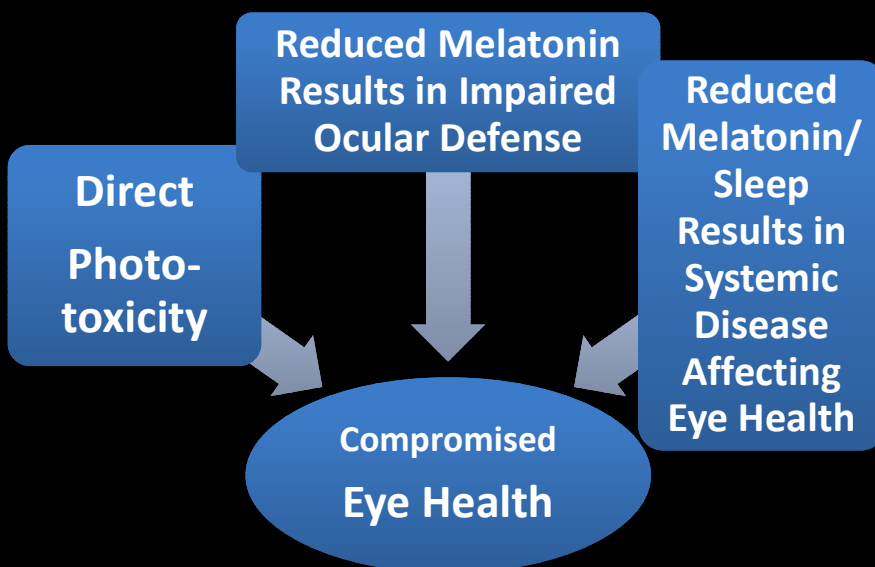
• RETINAL DAMAGE
• POOR GLARE RECOVERY
• REDUCED VISUAL PERFORMANCE
• AGE-RELATED EYE CONDITIONS

EYES NEED PROTECTION FROM HARMFUL BLUE LIGHT

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Sources: (1) Wu, J. et al. (2008). Sun. Optometric, 51, 481-491. (2) Figueira, P. et al. (2008). Acta Otorhinolaryngica, 58, 6-15. (3) The Vision Council. (2016). Eyes Overexposed: The Digital Device Dilemma. http://www.thevisioncouncil.org/assets/default/files/2016_VC_2016EyeStrain_Report_WEB.pdf (4) Yagi, A. et al. Appl. Ergon, 40, 1047-1054 (2009) (5) American Optometric Association - Light and Eye Damage - Gregory M. Goot, O.D., Ph.D. (2014). <http://www.aoa.org/Documents/CRG/Blue%20Light%20and%20Eye%20Damage.pdf> (6) Kawabata, F. and Tsuji, T. (2011). Effects of dietary supplementation with a combination of fish oil, bilberry extract, and lutein on subjective symptoms of asthenopia in humans. Biomed Res, 32, 287-293.

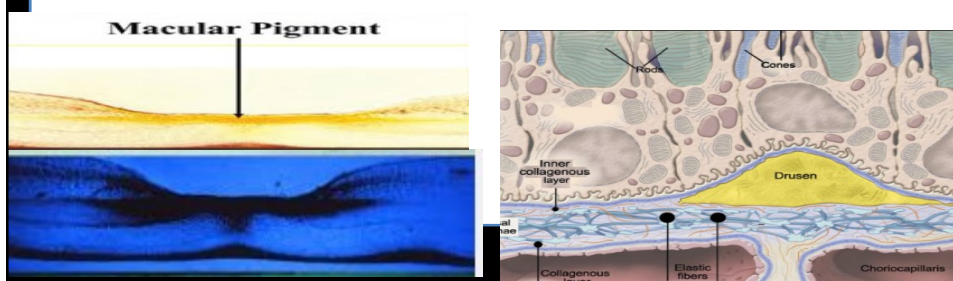
Affects of blue light to our overall eye health



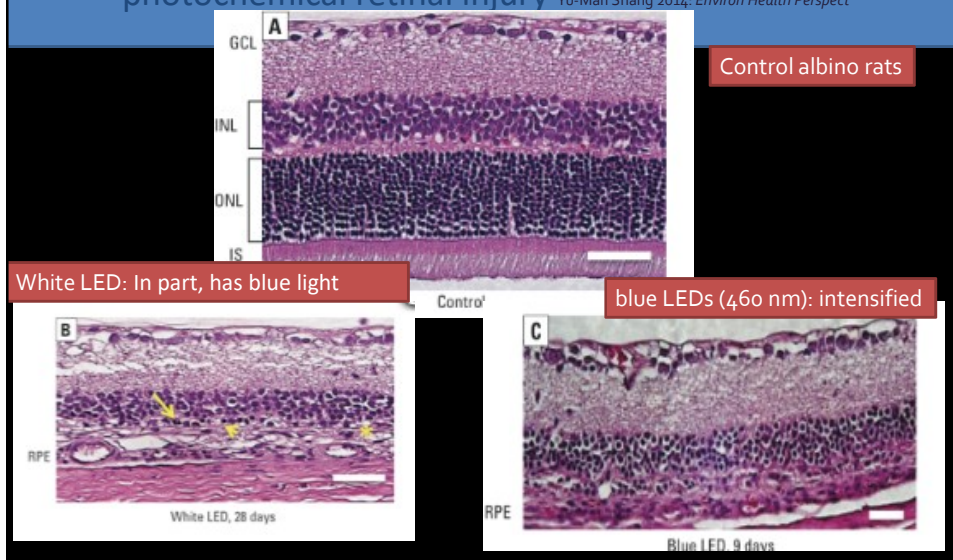
Oxidative stress contribute to drusen & LP formation & cell apoptosis

We have BUILT in mechanism to protect up against blue light= MP

- **Blue light exposure** on cultured RPE cells led caused cell death, while placing blue blocking filters over it protected them (Braunsten '05)
- Chesapeake Bay Waterman Study found that AMD was more common in **men** who were exposed to increased levels of **blue light**



Albino Rats exposed to **blue light** show deterioration effects on the retina massive apoptotic cell death...indicating photochemical retinal injury Yu-Man Shang 2014; Environ Health Perspect



Is blue light linked to AMD?

Eur J Ophthalmol. 2015 Feb 12;25(2):128-33. doi: 10.5301/ejo.5000520. Epub 2014 Sep 4.

Effect of the blue filter intraocular lens on the progression of geographic atrophy.

Pipis A¹, Toulou E, Pillunat LE, Augustin AJ.

- N= 66 eyes (27 w blue filter IOL & 39 w a non-blue filter IOL)
- Method: Prospective study
- Results: Blue light filtering IOLs may provide additional visual benefit for AMD patients because blue light is selectively scattered by the ocular media and its attenuation has been associated with improvements in contrast sensitivity and a reduction in glare sensitivity
- **Wolffsohn OVS 2000**
- **Blue light filter** on GA affect
 - 4.72 size
 - 0.72mm progression at 1 yr

Blue filter IOL

Sense Of Urgency

Lack of Awareness

73%

Of adults are unaware of the potential danger of blue light to the eye¹

WHAT CAN I DO TO PROTECT MY EYES THEN?



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Source: (1) Thevisioncouncil.org - Eyes overexposed: the digital device dilemma - 2016 Digital eye strain report

69% of adults use a smart phone

90% of adults spend over 2 hrs/day on digital devices

70% complain about neck and shoulder pain

66% people feel that digital screens require additional effort to see well

75% suffer from tired eyes

The Vision Council, "Hindsight is 20/20/20: Protecting Your Eyes from Digital Devices 2015 Digital Eye Strain Report," 2015 Consumer quantitative study - 4000 individuals - US, Fr, Br, CH (Br & CH: online representative) - Ipsos - 2014

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Harmful Blue Light and its possible link to AMD...


"The potential connection between blue-light phototoxicity and retinal diseases such as AMD suggests that reducing blue-light exposure would be beneficial to long-term ocular health."

(Source: Blue Light Hazard: New Knowledge, New Approaches to Maintaining Ocular Health, Report of a Roundtable March 16, 2013; New York City, NY, USA.)

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Do you realize you already linked AMD to blue light???

- What do you recommend for AMD pt (AREDS 2 study), a pt at risk for AMD (Seddon 1994), What nutrients can help decrease glare and increase CS (ZVF/LAST Study)?
- You cannot reduce their
- But you can reduce the patient's exposure

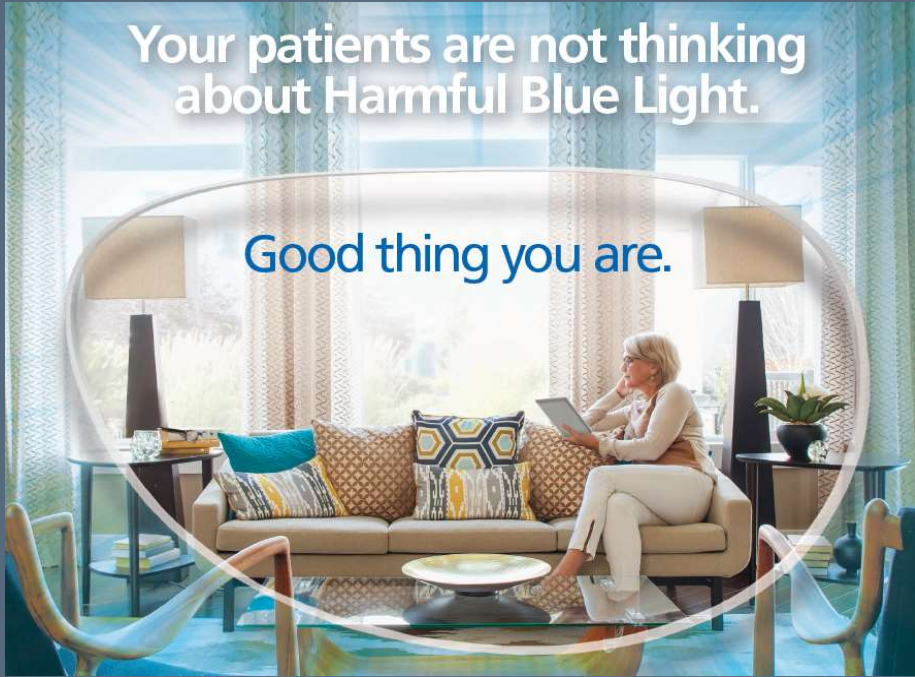


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Cervantes-Castaneda et al., Lack of benefit of early awareness to age-related macular degeneration. Eye. 2008; 22(6):777-81
Scilley et al., Early age-related maculopathy and self-reported visual difficulty in daily life. Ophthalmology. 2002; 109(7):1235-42.

Your patients are not thinking about Harmful Blue Light.

Good thing you are.



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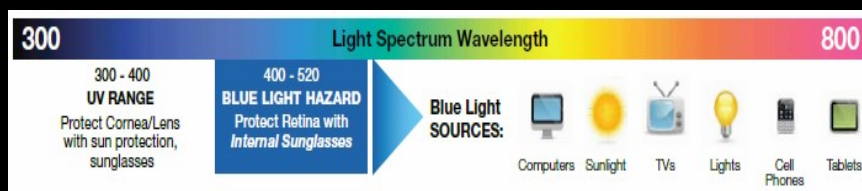


Macular Pigment Defined

- Where is macular pigment located?
 - In the macula (Henle fibers of the photo-receptors)
- A healthy fovea contains 2 times as much zeaxanthin vs. lutein
- Zeaxanthin and Lutein are AREDS 2 Study ingredients – AMD standard of care
- Why is macular pigment important?
 - Improves visual performance (night driving, glare, contrast sensitivity, reaction time)
 - Reduces AMD Risk (harmful blue light, oxidative stress)

Why is Macular Pigment Important?

- Macular pigment increases **blue-light protection**
- Macular pigments provide **localized antioxidant protection**
- High energy **blue light** is damaging to the retina and visual cells

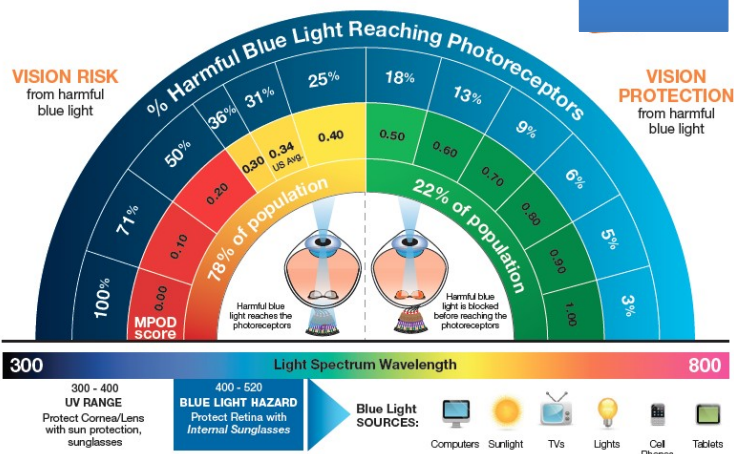


MPOD and Blue Light damage

MPOD: Protecting the Eyes from Harmful Blue Light with Internal Sunglasses.

Zeaxanthin and Lutein increase Macular Pigment Optical Density.

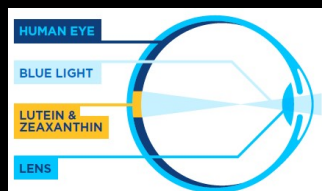
Internal "shades"



** Cullen, Ophthalmology 2001; 108: 730-737. Hammond, Recent Research Dev. Nutr. 2002; 8)

Naturally... From the Inside

Make Lutein + Zeaxanthin part of your daily routine



- Lutein and zeaxanthin are the **ONLY** nutrients that are deposited by your body specifically into your eyes to help filter harmful blue light.^{3,7}
- Unfortunately, your body doesn't make lutein or zeaxanthin²

Lutein & Zeaxanthin are powerful antioxidants⁴ & your natural defense against blue light³

PROTECT EYES
FROM OXIDATIVE
STRESS & FREE
RADICALS⁴



FILTER
HARMFUL
BLUE LIGHT
RAYS³

THE MORE LUTEIN AND ZEAXANTHIN IN YOUR EYE... THE MORE BLUE LIGHT WILL BE ABSORBED^{5,6}

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Sources: (1) Landrum J and Bone R (2001). Arch Biochem Biophys. 385: 28-40. (2) Calvo N (2005). Crit Rev Food Sci and Nutr. 45: 671-696. (3) Barker, F, et al. (2011) Invest Ophthalmol Vis Sci 52:3934-3942. (4) Bernstein P, et al. (2016). Prog Retin Eye Res. 50: 34-66. (5) Woodruff and Hammond B (2002). Prog Retin Eye Res. 21: 225-240. (6) Stillingham J and Sredewy D (2013). Invest Ophthalmol Vis Sci 54: 3538-3546. (7) Perry A, et al. J Food Comp Anal. 22: 9-16

How To Get Lutein and Zeaxanthin?

Important nutrients found naturally in the diet

Eat Lutein/Zeaxanthin-Rich Foods¹



CONTENT PER SERVING¹

- Spinach: 20.4 mg/cup (cooked)
- Eggs: 0.3 mg/1 large
- Broccoli: 1.3 mg/cup (raw)
- Corn: 2.4 mg/cup

Studies
suggest that we
need **10 mg of
lutein + 2 mg of
zeaxanthin
daily^{2,3}**

Are You Getting Enough?

PROBABLY NOT!

**Most people only get 1-2 mg
from diet alone⁴**



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Sources: (1) U.S. Department of Agriculture, Agricultural Research Service. 2016. USDA National Nutrient Database for Standard Reference, Release 28. Nutrient Data Laboratory Home Page. <http://www.ars.usda.gov/bahnrc/nd/> (2) Age-Related Eye Disease Study 2 (AREDS2) Research Group (2014). JAMA Ophthalmol. 132: 142-149. (3) Hammond B, et al. (2014). Invest Ophthalmol Vis Sci. 55: 6383-6389. (4) Johnson E, et al. (2010). J Am Diet Assoc. 110: 1357-1362. Image sources: Shutterstock. 15284433, Shutterstock. 23724610, Shutterstock. 13925997, Shutterstock. 191946374, Shutterstock. 279024541, Shutterstock. 21411938

A Comprehensive Approach Makes Sense!

- **Internal Protection (EyePromise & MPOD)**
 - Dense MPOD filters most of the harmful blue light spectrum.
 - Increasing MPOD from a lower baseline takes time. (Herman Study - Blue Light Dashboard)
 - Dense or thick macular pigment acts as “Internal Sunglasses” in the protection against harmful blue light
- **External Protection (Blue light lenses)**
 - Lens technology filters part of the harmful blue light spectrum immediately.



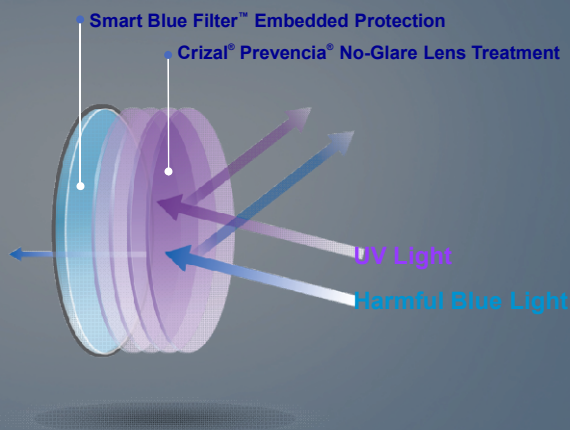
Crizal[®] PREVENCIA[®]



Smart Combination

Smart Blue Filter™ + Crizal® Prevenica®

- Together they reduce Harmful Blue Light by 30%
- Allow essential Blue-Turquoise Light to pass through






RESULTS can go a long way

- FILTER** harmful blue light
- NORMALIZE** sleeping patterns
- PROTECT** against UV radiation
- IMPROVE** contrast & reduce glare
- OFFER** better depth & color perception
- IMPROVE** visual acuity & night vision

*Based on in vitro tests on swine (pig) cells

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Thank You

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- Allow beneficial blue light to pass through Crizal® Previncia® transmits 96% of Blue-Turquoise light, [465-495 nm], thus preserving
- visual functions as well as some non-visual functions such as:
 - stimulation of the pupil reflex, the retina's natural protection against over-exposure to light, centred at 480 nm,
 - synchronisation of the biological clock (waking/sleep cycles, hormonal cycles, memory, cognitive performance, etc.) centred on a 30 nm bandwidth, [465-495 nm].
- 3. Whilst guaranteeing excellent lens transparency Crizal® Previncia® ensures optimal vision clarity with overall visual transmission of
- 98%. This lens also retains the benefits offered by former generations of the Crizal range: the most efficient dirt-resistance on the market as
- well as excellent resistance to scratching, dust and water. (Fig.3)