

Blue Light Is Causing Blindness

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✓ Fact Checked

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STORY AT-A-GLANCE

- › Before the advent of artificial lighting, many went to bed and got up with the sun; lighting at night comes at a price as it affects health, interrupting sleep patterns, circadian rhythms and the perpetuation of animal species
- › Data show blue light from digital devices activates retinal in your eye to attack macular photoreceptor cells, accelerating age-related macular degeneration, a leading cause of blindness
- › Exposure to blue light also affects your ability to produce enough melatonin to achieve quality sleep, thus increasing your risk of heart disease, stroke, obesity and other health problems
- › Data show vitamin E reduces damage from blue light; consider using blue light-blocking glasses while using digital devices, using LED lighting with safer rating, and eating foods high in omega-3 fats and anthocyanins to protect your sight

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Before the invention and distribution of artificial lighting, the sun was the major source of light and determined how people spent their evenings. It is easy to take for granted the extended days and added lighting. However, humans and animals are paying a price as it throws off circadian rhythms, interrupts sleep and affects the development of disease and perpetuation of animal species.

One pervasive light source comes from digital devices, which become more popular every year. Mobile device use varies, but research shows desktop device use is important during daytime hours, and mobile use increases in the evenings and at night.¹

Statistics show 77% of Americans own a smartphone, 75% own a laptop or desktop computer and 50% own tablets; 20% of Americans are smartphone-only internet users and 25% of U.S. adults say they are "almost always" online.²

Research demonstrates how blue light emitted from your favorite digital device may be speeding eye damage and accelerating macular degeneration (AMD), the leading cause of blindness.³ Before sharing specifics of how blue light interacts with your eye, let's quickly review some important eye structures and nutrients for eye health.

How You See

Your ability to see occurs as a collection of structures that help to gather and send information to your brain. One of those structures is the macula, a small area just 2 millimeters wide, located in the back of your eye. The macula is in the middle portion of the retina and made up of light-sensitive cells called cones and rods, which are essential for central vision.

Light passes through the cornea, a dome-like structure over the eye, which bends the light through the pupil and aims it at the lens.⁴ The lens focuses the image on the retina. Photosensitive tissue called photoreceptor cells in the retina help convert the light into electrical signals that travel along the optic nerve to your brain where the information is processed, and you "see."

The light passing through your eyes is in a range of visible and sometimes invisible light rays. Sunlight contains red, orange, yellow, green and blue rays, depending upon the energy and wavelength of the individual ray. When combined, it creates white light, or sunlight.⁵

There is an inverse relationship between the wavelength and the amount of energy in the light wave. Relatively long wavelengths have less energy and shorter wavelengths

have more energy.⁶

Rays on the red visible light spectrum have longer wavelengths and less energy. However rays on the blue spectrum have shorter wavelengths and more energy.⁷ Blue light is generally defined in a range from 380 to 500 nanometers.

Without photoreceptor cells in the retina, visual information would not trigger a biochemical response.⁸ This biochemical response is due in part to a molecule called retinol, a form of vitamin A. This is what was studied by the University of Toledo researchers.

Digital Blue Light May Accelerate Macular Degeneration

Although mobile device use is prolific among teenagers, most adults spend more time on their digital devices than they may believe. In a national survey including 1,800 parents of children ages 8 to 18, the researchers found adults spend an average of 9.3 hours every day in front of a variety of digital screens.⁹

The study from the University of Toledo found blue light emitted from digital electronics may accelerate AMD. According to the researchers, the blue light affects retinol and results in the death of photoreceptor cells in the macula. What the study failed to address is that blue light is likely only able to cause this damage if you have an excess of linoleic acid (LA). If you LA levels are normal it is far less likely to cause this damage.

While macular degeneration is more common in older years, researchers discovered blue light essentially poisons the photoreceptor cells. Kasun Ratnayake, a Ph.D. student from the research group, commented:¹⁰

"It's toxic. If you shine blue light on retinal, the retinal kills photoreceptor cells as the signaling molecule on the membrane dissolves. Photoreceptor cells do not regenerate in the eye. When they're dead, they're dead for good."

In further research, and to prove his point, senior researcher Ajith Karunaratne, Ph.D., and his team introduced retinal molecules to cancer and heart cells and then exposed

those to blue light.¹¹ They found no activity was generated with green, yellow or red light. Blue light, however, produced toxicity, killing any cell type exposed. Karunarathne commented:¹²

"Every year more than 2 million new cases of age-related macular degeneration are reported in the United States. By learning more about the mechanisms of blindness in search of a method to intercept toxic reactions caused by the combination of retinal and blue light, we hope to find a way to protect the vision of children growing up in a high-tech world."

Retinal is essential in order to trigger photoreceptor cells to produce electrical signals. However, retinal is not limited to the eye. In fact, it can be present throughout your body, indicating the toxicity could potentially be more widespread than this study analyzed.¹³

What Is Macular Degeneration?

Macular degeneration is a problem occurring in your retina when the macula is damaged. It is the leading cause of vision loss and affects nearly 10 million Americans, more than glaucoma and cataracts combined.¹⁴ With AMD, you lose your central vision and cannot see fine details, whether you're looking at something close or far away.¹⁵

However, your peripheral vision — side vision — remains intact. For instance, if you're looking at an analog clock, you'll see the numbers but not the hands. There are two types of AMD, the dry form and the wet form. Dry AMD is more common, accounting for nearly 80% of all people with the condition.

Dry form occurs when parts of the macula become thinner with age and small clumps of protein cloud your vision. Wet form of AMD is less common but much more serious. This occurs when normal blood vessels grow under the retina, leaking blood and other fluids and cause scarring of the macula and quicker loss of vision.

Oftentimes you don't realize you have the condition until your vision becomes very blurry, you lose clear color vision, straight lines look wavy or a dark area appears in the center of your vision.¹⁶ Risk factors for AMD include being:¹⁷

Overweight**Caucasian**

Smoking cigarettes**Over 50 years old**

Having a family history of AMD**Having heart disease**

Blue Light Inhibits Quality Sleep Critical for Your Health

Studies have also found links between blue light exposure at night and certain types of cancer, diabetes, heart disease and obesity.¹⁸ This may be due in part to the fact that blue light at night reduces sleep quality by inhibiting melatonin secretion. If you're like many people, you're getting six hours or less each night. Even many children are sleep deprived.¹⁹

The Centers for Disease Control and Prevention (CDC)²⁰ state a lack of sleep is a public health epidemic, noting insufficient sleep is linked to a wide variety of health problems. For instance, regularly getting less than five hours may double your risk of heart disease and stroke.

A lack of sleep also increases your risk for car accidents and other work-related incidents, reduces your ability to learn and think critically, and increases your risk of depression²¹ and loneliness.^{22,23,24}

To enjoy quality sleep, it's important to get bright light exposure in the early part of the day. This enables your pineal gland to produce melatonin at night in roughly an approximate contrast to the amount of bright light exposure you received earlier in the day.

This means if you're in darkness all day, your body does not appreciate the difference and will not optimize melatonin production essential to quality sleep. Next, it's important to avoid blue light at night as it impedes the production of melatonin.

As your brain begins progressively increasing melatonin production around 9 p.m., it acts as a marker of your circadian phase or biological timing. In other words, the hormone influences the time of day or night your body thinks it is, regardless of what the clock says. Melatonin also is an antioxidant for your mitochondria, helping reduce your potential risk for cancer.

Vitamin E May Reduce Blue Light Damage

Interestingly, the researchers in the featured study found alpha-tocopherol, a derivative of vitamin E, stopped the photoreceptors and other cells from dying when exposed to retinal and blue light.²⁵ However, the process becomes less efficient with age and as your immune system slows down.

Data have revealed vitamin E may play a significant role as a regulator of signal transduction, gene expression and redox sensor, minimizing oxidative stress related brain damage.²⁶ Naturally occurring vitamin E exists in eight chemical forms, of which alpha-tocopherol is one.²⁷

Your serum (blood) concentration depends on the function of your liver, which takes up the nutrient after it has been absorbed in your intestines. Your body preferentially uses alpha-tocopherol, functioning as a chain-breaking antioxidant.²⁸ It's estimated nearly 90% of Americans do not meet the recommended daily allowance of 15 milligrams per day.

Some clinical evidence suggests vitamin E may be beneficial in managing AMD. Nine foods that contain high amounts of vitamin E include:²⁹

Sunflower seeds	Almonds	Spinach
Swiss chard	Avocado	Turnip greens
Asparagus	Beet greens	Mustard greens

Linoleic Acid Is a Primary Driver of Macular Degeneration

Many chronic metabolic and degenerative diseases, including age-related macular degeneration, are caused by a preponderance of industrial vegetable oils in the diet. Vegetable oils are a concentrated source of omega-6 linoleic acid (LA), which can lead to a severe imbalance between the omega-6 to omega-3 ratio in your diet, a condition that can't be easily corrected by simply taking more omega-3.

The reason for this is because these oils trigger mitochondrial dysfunction that then drives the disease process, and several studies^{30,31,32} have demonstrated the truth of this. Seed oils and other foods high in LA, like chicken and pork, destroy mitochondrial signaling in the adipocyte and disrupt your metabolic functioning.

Eating a high-fat diet, when the fats are primarily LA from processed vegetable and seed oils, is far worse than eating a chronic high-carb diet. The type of fat is of crucial importance, as it impacts your mitochondrial, cellular and metabolic functioning.

Fats like LA can persist in your cell membranes for months to years, continuing to wreak havoc with your metabolism the entire time, while the sugar is quickly metabolized. Unfortunately, many health authorities have insisted – and still insist – omega-6-rich oils like soybean, corn and canola oil are healthier than saturated animal fats such as butter and lard, and this myth has been a tough one to dismantle, despite the evidence against it.

The good news is that simply replacing dangerous seed and vegetable oils with healthy saturated fats can go a long way toward boosting your health and reducing your risk of chronic disease and AMD.

Reduce Your Risk for Macular Degeneration

Blocking blue light may help reduce your risk and improve your sleep. In addition to eating foods high in vitamin E, there are other strategies you may consider to reduce the potential risk of AMD.

- **Blue blocking glasses** – Blocking blue light helps regulate your internal clock to control sleep patterns and reduces the negative effect the high energy wavelengths have on your macula. One of the least expensive and simplest ways to achieve this is to wear blue light-blocking glasses after 7 p.m. If you consistently use a digital device during the day, consider using the glasses each day after noon.
- **Install blue-blocking software on your digital devices** – **Iris** is the absolute best one and I have used it for many years. If you use Iris at night, you won't need blue blocking glasses.
- **Replace LED lights with incandescent bulbs** – LED lighting is mandated in the U.S. and much of Europe to conserve energy, but the biological impact is significant. Unfortunately, many of the LED lights sold today emit a large portion of aggressive blue light.
- **Sleep in total darkness** – Protecting your eyes from light at night, no matter how minute the exposure, will help you achieve deeper and more restorative sleep. Consider sleeping with a mask, removing all light emitting objects from your room and using room darkening blinds.
- **Eat foods to protect your sight** – You may help protect your sight eating nutrient-dense foods. Omega-3 fats help improve cell structure and protect your sight, while whole foods high in anthocyanins and bioflavonoids help protect your cells from free radical damage.

Sources and References

- ¹ [Smart Insights, July 11, 2018](#)
- ² [Pew Research Center, Mobile Fact Sheet](#)
- ³ [Scientific Reports, 8:10207](#)
- ^{4, 8, 13} [Mother Nature Network, August 9, 2018](#)
- ^{5, 6, 7} [All About Vision, Blue Light: It's Both Bad and Good For You](#)
- ⁹ [Scientific American, March 1, 2017](#)
- ^{10, 12} [Fortune, August 15, 2018](#)
- ^{11, 25} [Big Think, August 14, 2018](#)
- ¹⁴ [American Macular Degeneration Foundation, What is Macular Degeneration?](#)
- ^{15, 17} [American Academy of Ophthalmology, May 17, 2018](#)

- ¹⁶ [American Optometric Association, Age-Related Macular Degeneration](#)
- ¹⁸ [Harvard Health Publishing, August 13, 2018](#)
- ¹⁹ [Gallup Poll, December 19, 2013](#)
- ²⁰ [CNN, June 23, 2017](#)
- ²¹ [WebMD, 10 Things to Hate About Sleep Loss](#)
- ²² [Nature Communications 2018; 9: 3146](#)
- ²³ [Gizmodo August 14, 2018](#)
- ²⁴ [ABC News August 14, 2018](#)
- ²⁶ [Biofactors, 2012;38\(2\):90](#)
- ²⁷ [National Institutes of Health, Vitamin E](#)
- ²⁸ [Linus Pauling, Vitamin E](#)
- ²⁹ [World's Healthiest Foods, Vitamin E](#)
- ³⁰ [STAT April 19, 2017](#)
- ³¹ [BMJ 2016;353:i1246](#)
- ³² [NIH Grantome, Dietary Treatment of Hyperlipidemia in Women vs Men](#)

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