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LETTER TO THE EDITOR

Reply to letter from Mainster M.A. & Turner P.L. titled "Blue light's benefits vs blue-blocking intraocular lens chromophores"

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Dear Editor,
We are pleased to reply to the letter from Mainster and Turner concerning our review article [1].

We referred to "published" references [2, 3] by Mainster for his preference for violet-blocking intraocular lenses (IOLs). The quote which contradicts their viewpoint [4] is correctly attributed to the patent with Mainster as the principal inventor [5]. Any reader of the patent would reasonably surmise that the principal inventor would have accepted the quoted statements in the patent. AMO OptiBlue IOLs based on this patent were available to Mainster as he comparatively evaluated them [3].

The referred 1986 paper by Mainster suggested only an ideal short wavelength cut-off for 10% transmittance value, which can be met by many possible complete spectral transmittance curves, unlike the specific preference in the patent and his later papers [2, 3, 5].

Views by Mainster and Turner related to circadian rhythm photoentrainment, including unsubstantiated concerns for pediatric patients are in error, since they are based on computations using erroneously constructed action spectra with a peak of 460 nm as published by two investigators in 2001 before the discovery of intrinsically photosensitive retinal ganglion cells (ipRGC) in 2002 [1, 6]. In addition to ipRGC cells, additional contributions by medium wavelength cones as found in animal investigations are also supported by later independent measurement of the light-induced human melatonin suppression which gives a relatively broad peak from 460 to 500 nm [6, 7]. Lack of any concern for circadian photoentrainment for blue light-filtering IOLs, and its validation by the two human sleep studies, is summarized in our review article [1, 6].

Unlike their viewpoint [4] with glaring omissions, our review [1] discusses three scotopic clinical studies showing no clinically detectable disadvantage for blue light-filtering IOLs in scotopic conditions. In patients with early AMD, even with higher simulated blue-light filtering, timed performances of block manipulation by hand and ambulation by walking though two mobility courses under scotopic conditions was the same as for colorless IOLs [8]. While Mainster and Turner state photoreceptive benefits of colorless IOLs, there is no supporting clinical evidence. In addition, blue light-filtering IOLs have been confirmed to be safe in millions of pseudophakic patients since 2003.

Their letter ignores the comparative glare study showing reduced effect of glare disability on simulated driving performance for blue light-filtering IOLs [9].We acknowledge the proof reading error in the Hammond et al. paper where the two bulbs were mislabeled in their figure 3 [10]. Our resultant erroneous sentence should be corrected to state that

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the Xenon glare source has relatively greater energy from shorter wavelength [1]. But this minor error does not at all affect the study's scientific validity and key findings related to reduced glare disability, better heterochromatic contrast threshold, and faster recovery from photostress in eyes implanted with blue light-filtering IOLs [1, 10]. In addition, the target and glare sources need not be the same during the day, because natural outdoor backgrounds are more likely to be an atmospheric blue and targets are more likely to be mid-to-long wavelength [10].Their suggestion of wearing sunglasses in dazzling conditions is unrealistic at night to reduce glare or photostress effects while driving against an opposing lane of cars with Xenon headlights.

Unlike their examination of selected epidemiological studies, we reviewed in-vitro, animal, clinical, and epidemiological studies related to photoprotection by blue light-filtering IOLs [1]. In summary, we did not find any validated risk for photoreception by blue light-filtering IOLs, while finding many investigations which suggest their benefits of creating better vision and reduced glare while protecting against retinal phototoxicity and its associated potential risk for AMD.

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