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Regulation of the circadian activity by melanopsin cells in ambient light conditions filtered to wavelengths below to 500 nm

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Abstract

Purpose To study the variations in the circadian activity in the mouse behaviour with different composition of the luminous spectra. Blue light has been identified as one cause of retinal damage. Nevertheless, these wavelengths (400-500nm) are important in the process of intrinsically photosensitive ganglion cells (ipRGCs) activation. These cells are essential in not forming images processes such as the pupillary reflex, regulation of the circadian activity and/or release of melatonin. Further, ipRGCs are necessary and sufficient to maintain the synchronization of endogenous cycles with circadian activity of each individual.

Methods By using Circadian Activity cages and different mouse models, we have investigated their behaviour when exposed to the entire light spectrum or to different amounts of the light-filtered blue component. We have analyzed the behaviour of C57BL6J mice, which have all retinal photosensitive cells, and Rd10 mice, who comprise ipRGCs as the only photosensitive cells in their retinas by postnatal day 100.

Results The use of diverse mouse models has allowed us to investigate the contribution of different photoreceptor classes to the regulation of circadian activity in distinct light conditions. We have observed that ipRGCs are sufficient to maintain the synchronization of endogenous cycles with circadian activity of each individual. Mouse behaviour changes depending on the amount of blue light.

Conclusion The maximum activation of melanopsin-expressing cells is conditioned by the presence of filters for wavelengths below 500nm. Variations in behaviour exist depending on the amount of visible blue light filtered.

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