

Regulation of the Neurotrophin Receptor Trkb by Visible Light

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Introduction: Of all neurotrophins, brain-derived neurotrophic factor (BDNF) seems to show most actions on the retina. Thus, through the TrkB receptor, BDNF controls the remodeling of the neuronal structures of the eye in a cell-specific and experiment-dependent manner.

Purpose: To examine variations in the BDNF receptor TrkB produced in response to prolonged exposure to circadian cycles of light.

Methods: We examined the eyes of experimental rabbits exposed for two years to circadian cycles of white light, blue light and white light lacking short wavelengths. For the trial the animals had been implanted with a transparent intraocular lens (IOL) and a yellow AcrySof® (ALCON) IOL, one in each eye. After sacrificing the animals, the retinal layer was dissected from the eye and processed for gene expression analysis using primers for TrkB.

Results: Prolonged light exposure resulted in elevated expression levels of the TrkB receptor as follow: 1.8 times in response to white light, 2.3 times in response to blue light, and 3.9 times in response to white light devoid of short wavelengths. In eyes implanted with a yellow IOL, a 4.2-fold increase in TrkB expression was observed.

Conclusions: Exposure to light, irrespective of its characteristics, led to the increased expression of the TrkB receptor. Expression levels were elevated most in response to white light devoid of short wavelengths. This finding suggests that the cells of the retinal layer expressing the receptor, which have yet to be identified, are capable of reacting to the neuroprotective stimuli mediated by this molecule.