REGULATION OF THE NEUROTROPHIN RECEPTOR TrKb BY VISIBLE LIGHT

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Introduction:

Light exposure produces three types of detrimental effect on the retina:
- -Photomechanical
- -Photothermal
- -Photochemical.

Age-related Macular Degeneration (AMD) and other retinal diseases are known to be associated with light intensity, the (short) wavelength of light and the exposure time.
We examined changes in the neurotrophin receptor, TrkB, which could be involved in protection mechanisms against the toxic effects of light since its physiological ligand, BDNF, is known to protect against light-induced retinal degeneration.
Neurotrophins are a family of growth factors that exert their actions in nerve tissue, especially on the organs and cells of the immune system.
Of these, BDNF seems to show most actions on the retina. Experiments have shown that by acting on TrkB it is possible to control, in a cell-specific and experiment-dependent manner, remodelling of the neuronal structures of the visual system.
Permanent light exposure affects the bipolar and gangliar neurons of the retina. Given that these cells express TrkB and the beneficial effects of BDNF, we examined whether TrkB/BDNF variations were produced in our experimental model in an effort to provide experimental evidence for the use of this neurotrophin **receptor** in the treatment of light-induced retinal damage, as already proposed for the treatment of retinitis pigmentosa, macular degeneration or glaucoma.

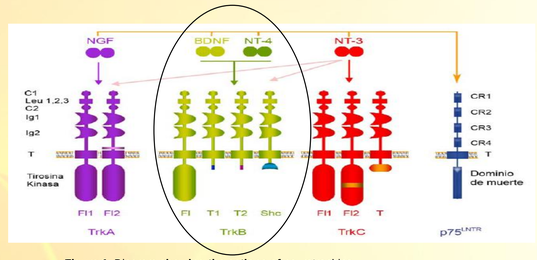


Figure 1. Diagram **showing the actions of** neurotrophins

Objetives:

To examine the effect of phototoxic light exposure on the retina and of preventing such an effect through the use of intraocular lenses that block the blue portion of the visible spectrum.

To examine variations in the expression of the BDNF receptor, TrkB, produced as the consequence of permanent exposure to light.

Figure 2. Electromagnetic spectrum visible to humans

Figure 3. Yellow IOL

Materials and methods:

Adult pigmented rabbits were exposed for 2 years to circadian cycles.
Of light of varying spectral composition

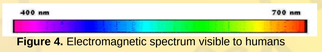
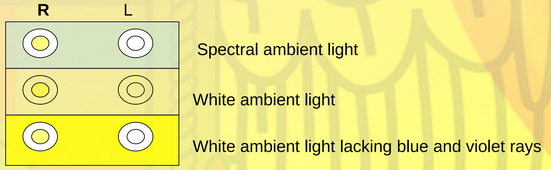


Figure 4. Electromagnetic spectrum visible to humans

Figure 5. Yellow IOL

Clave	Intervención	Exposición	Tiempo
	OI	OD	
13	T	A	Amarilla	2 años
G1	T	T	No expuesto	2 años
G3	T	A	Blanca	2 años
G5	T	A	Amarilla	2 años
G6	T	A	Azul	2 años
E2	T	A	Azul	2,5 años

Table 1. Used animals



Yellow intraocular lens
Transparent intraocular lens

Figure 6. Diagram showing the types of ambient light (yellow, white and blue) the rabbits were exposed to and the intrecular lenses (left eye I transparent, right eye D yellow) implanted in the rabbits.

Primers Used:

TrkB: up: 5 '-GGG GAA GGA GCC TTC GGG-3', down: 5'-CAT CCA TCG GAT GGG CAA CAT-3'

Results:

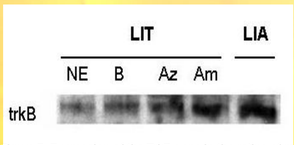


Figure 7. Expression of the TrkB gene in the retina of rabbits permanently exposed to light for 2 years. NE: non exposed; W: white light; Bl: blue light; Y: white light lacking the blue portion of the spectrum. TIL: transparent intraocular lens; YIL: yellow intraocular lens.

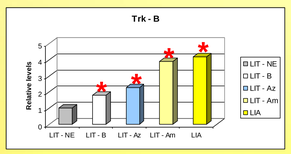


Figure 8. Results Trk- B

Our findings suggest that permanent exposure to light upregulates TrkB expression as follows (**Figure 7**):
- 1.8-fold increase was observed for white light
-2.3-fold for blue light
-3.9-fold for yellow light.
In animals implanted with a transparent/yellow intraocular lens, TrkB expression was 4.2-fold basal levels.

Conclusions:

The expression of trkB, the physiological receptor for BDNF and NT-4, is p-regulated by permatent light exposure, the changes being more evident in animals under white-filtered light and those with a yelow lens implanted.

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