REGULATION OF THE NEUROTROPHIN RECEPTOR TrkB BY VISIBLE LIGHT

C. Sanchez-Ramos1A, J.A. Vega2, M.E. del Valle2, A. Lang3, A. Fernandez-Balbuena1, J.M. Benitez-del Castillo4
A: Optic II, Neurocomputation and Neurorobotic Group, 1: Univ Complutense Madrid, Spain; 2: Morphology and Cell Biology, Universidad de Oviedo, Oviedo, Spain.
7th Asian Cataract Research Conference (ACRC) an the Cataract Satellite Meeting of the 18th International Conference Eye Research (ICER), Xian, China Septiembre 2008
cellars@opt.ucm.es

Introduction:

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

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 expression-dependent manner, remodelling of the neuronal structures of the visual system.

Permanant light exposure affects the bipolar and ganglial 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.

Objectives:

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.

Materials and methods:

Adult pigmented rabbits were exposed for 2 years to circadian cycles.

Of light of varying spectral composition

Results:

Our findings suggest that permanent exposure to light upregulates TrkB expression as follows (Fig. 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 permanent light exposure, the changes being more evident in animals under white filtered light and those with a yellow lens implanted.

References:

Acknowledgement:

ONCE: Organización Nacional de Ciegos Españoles
Fondo de Investigación Universitaria
Clínica veterinaria UCM