ROLE OF METALLOPROTEASES IN RETINAL DEGENERATION INDUCED BY VIOLET AND BLUE 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.

The enzymes metalloproteases (MMPs) are involved in degeneration processes and are responsible for degrading the basal membrane and extracellular matrix. The synthesis of these proteases in phototoxic processes mediated by light is supported both by experimental and clinical data.

Patients with AMD show the build-up and deposition of extracellular matrix molecules beneath the pigment epithelium (drusen) and this has led to the proposal that these formations could be linked to deficient MMP production by the pigment epithelium.

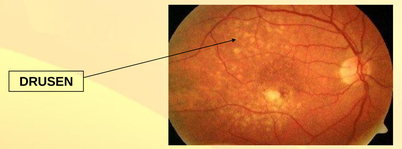
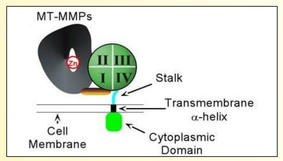


Image 1. Retina with AMD

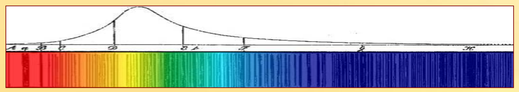


Appears 1. Constructs of the MMPS

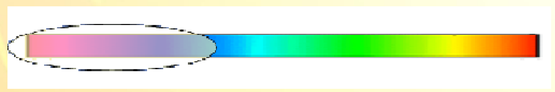
Objectives:

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

To contribute to existing knowlegde of metalloprotease regulation in light-induced retinal degeneration.



Appears 2. Electromagnetic visible spectrum for the human



Appears 3. Part of the electromagnetic spectrum with the blue light

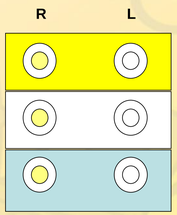
Materials and methods:

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

Of light of varying spectral composition

Yellow intraocular lens

Transparent intraocular lens



White ambient light lacking blue and violet rays

White ambient light

Spectral ambient light

Figura 4. Diagram showing the types of ambient light (yellow, white and blue) the rabbits were exposed to and the introcular lenses (left eye I transparent, right eye D yellow) implanted in the rabbits.

Image 2. Yellow intracular lens

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

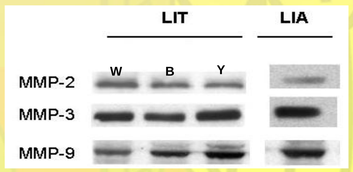
Primers used:

MMP-2: up: 5'-CCA CTG CCT TCG ATA CAC-3', down: 5'-GAG CCA CTC TCT GGA ATC TTC AAA-3'

MMP-3: up:5'-GCT TTG AAG GTC TGG GAG GAG GTG-3',down: 5-CAG CTA TCT TCC TGG GAA ATC CTG-3'

MMP-9: up: 5'-GTT CCC GGA GTG AGT TGA-3', down: 5'-TTT ACA TGG CAC TGC AAA GC-3'

Results:



Appears 5. Expression of the genes MMP-2, MMP-3 and MMP-9 in the retina of rabbits exposed to permanent lighting for 2 years.

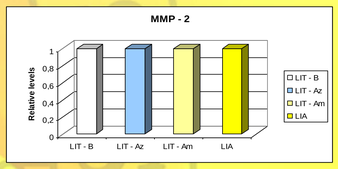


Table 2. Results MMP-2

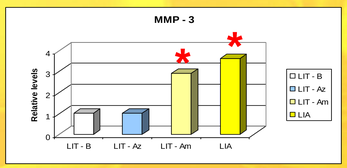


Table 3. Results MMP-3.

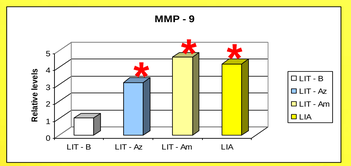


Table 4. Results MMP-9.

Conclusions:

Our findings indicate:

Exposure to long periods of light increases the expression of some MMPs and this could have harmful effects on the retina since it indicates damage to the extracellular matrix.

Increased MMP expression could determine the faster turnover of the extracellular matrix to avoid the formation of matrix deposits.

Light exposure or the intraocular implant of a yellow lens do not modify MMP-2 expression.

In animals exposed to light lacking the blue portion of the spectrum and in animals implanted with a yellow intraocular lens, MMP-3 expression was 2.9 and 3.6 times higher than in controls, respectively.

Similar behaviour was observed for MMP-9 expression which was upregulated in: animals exposed to blue light (3.1 times), animals exposed to white light lacking the blue portion of the spectrum (4.6 times) and animals fitted with a yellow intraocular lens (4.2 times).

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