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Trpv4 Is Expressed In The Retina Of Zebrafish And It Is Regulated By Light

Celia Sanchez-Ramos, Sr.¹, Cristina Bonnin-Arias¹, Eva Chamorro¹, Juan J. Navarro-Valls¹, Antonino Germana, Sr.², Jose A. Vega, Sr.³. ¹Neurocomputing & Neurorobotics, Univ Complutense de Madrid, Madrid, Spain; ²Universidad de Messina, Messina, Italy; ³Universidad de Oviedo, Oviedo, Spain.

Purpose: This study examines the developmental changes in the retinal expression of TRPV4, and the effects of light on the expression of this ion channel.

Methods: We examined the retinas of zebrafish at different ages (from 3 days post-fertilization -dpf- to 100 days dpf), as well as the effects of continuous light (15 days) and continuous darkness exposure (15 days), or exposed to light of different spectral composition (over an average time of 15 days). The expression and distribution of TRPV4 was analyzed using PRC, Westernblot and immunohistochemistry.

Results: TRPV4 was detected at the mRNA and protein levels (96 kDa) in the eye of zebrafish at all ages sampled. Immunohistochemistry revealed the presence of TRPV4 in a population of the retinal cells identified as amacrine cells on the basis of their morphology and localization within the retina. TRPV4 was first (3 dpf) found in the soma of cells localized in the inner nuclear and outer nuclear layers, and thereafter (10 pfd) also in the inner plexiform layer. The adult pattern of TRPV4 expression was achieved by 40 pfd the TRPV4 positivity being restricted to the soma of some cells in the inner and outer nuclear layers. Exposure of adult zebrafish to continuous white light resulted in no changes in the expression and distribution of TRPV4, whereas exposure to blue light increased expression of TRPV4 gene and TRPV4 immunoreactivity in the inner and outer nuclear layers of the retina, as well as in the ganglionic cell layer; exposure to ultra-violet light resulted in similar changes to those observed in blue light exposed animals. Darkness decreased TRPV4 expression, and abolished TRPV4 immunoreactivity in amacrine cells, but was detected in the ganglion cell layer.

Conclusions: These data demonstrate the occurrence and developmental changes in the expression and localization of TRPV4 in the retina, and suggest that this ion channel is involved in the maturation of the visual process. On the other hand, the up-regulation of TRPV4 gene, as well as the changes in the TRPV4 distribution, after blue and ultraviolet light exposure suggests that the blue region of the light spectrum regulates Ca^{2+} ion channels and might be related to the phototoxic changes induced by light.

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