ACID-SENSING ION CHANNELS 2 AND 4 (ASIC2, ASIC4) ARE REGULATED BY LIGHT IN THE ZEBRAFISH RETINA

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PURPOSE

Acid-sensing ion channels (ASICs) are H+-gated cation channels that monitor deviations from the physiological values of extracellular pH. ASIC genes in zebrafish (zASICs) are expressed in the central nervous system and the retina. pH variations in the retina are thought to be involved in the fine-tuning of visual perception and in the adaptation of the retinal responses to different light intensities. Moreover, ASIC2 knock-out mice are also more sensitive to light-induced retinal degeneration. This study examines the effects of continuous light or darkness exposure in the mRNA levels and cell distribution of ASIC2 and ASIC4 in the retina of adult zebrafish.

METHODS

The retinas of adult zebrafish exposed to light-darkness rhythm, or to continuous light (10 days) or continuous darkness (10 days) were studied. Total RNA was extracted from retinas isolated from adult zebrafish. Levels of mRNA for the genes zASIC2, and zASIC4 were determined by qRT-PCR, and the cell localization using immunohistochemistry.

RESULTS

Detectable ASIC2, ASIC2, and ASIC4 mRNA levels were detected in the adult zebrafish retina. The protein products of both ASIC2 isoforms were detected in the photoreceptor cells, pleximorm layers and ganglion cells layers and the optic fascicle; ASIC4 immunoreactivity was detected in the photoreceptor cells and ganglion cell layer. Continuous light exposure resulted in decrease levels of ASIC2 mRNAs and the proteins were detected in the same cells as in control; ASIC4 mRNA levels were up-regulates and the intensity of immunoinaging as well. Continuous darkness exposure resulted in not changes neither in ASIC4 mRNA levels or protein expression, whereas down-regulatesASIC2 mRNA and the immunoreactivity was absent.

CONCLUSIONS

The variations in the expression of ASIC2 and ASIC4 genes and proteins after continuous light and darkness exposure demonstrate that they are regulated by light and suggest changes in the extracellular pH that must be regulated in these environmental conditions.