DOI: 10.46991/JISEES.2025.SI1.131

What Is Known About Phototransduction in the Gastropod Retina?

Valery V. Zhukov*, Irina N. Dominova, Michail V. Saphonov, Marita H. Mahova

Institute of Medicine and Life Sciences (MEDBIO), Immanuel Kant Baltic Federal University, Kaliningrad, Russian Federation

ABSTRACT

The retinal photransduction pathways in ocular ciliary (rhabdomeric) photoreceptors of gastropods remain unexplored. The main dates on molecular mechanisms of phototransduction in rhabdomeric photoreceptors was obtained in studies in *Drosophila*. Discovered inositol phosphate pathway is claimed to be universal for such type of photoreceptors of all invertebrates. In molluscs this view has been validated by studies of ocular photoreceptors in cephalopods and the microvillar photoreceptors of the double retina in some bivalves. No such studies have been conducted for gastropods retinal photoreceptors. Present study focus on some molecular components of phototransduction in the retina of two freshwater gastropods, *Lymnaea stagnalis* and *Pomacea canaliculata*. Electrophysiological recordings have established a critical dependence of the light responses of *L.stagnalis* isolated eye on the presence of [Ca^{2+}]. The retained component of ERG in Ca^{2+}-free solution was effectively suppressed by chelating the divalent ions in the cytoplasm with EGTA-AM. The same effect was reversibly inhibited by the application of 2aminoethyl diphenyl borate and ryanodine, indicating that the corresponding receptors may be present in the membranes of the endoplasmic reticulum. qPCR analysis detected transcriptions of the G-protein genes selected for the study in *P. canaliculata* organs: transcripts of Gq gene in the cerebral ganglion and eye stalks whereas, the Go gene in eyes were detected. The totality of the obtained data in general fits into the scheme of inositol phosphate signaling pathway of phototransduction in gastropod retina although it is not its strict evidence.

Keywords: gastropods, microvillar photoreceptors, phototransduction, G-protein, inositol phosphate signaling pathway

References:

1. Fain, G.L.; Hardie, R.; Laughlin, S.B. Phototransduction and the evolution of photoreceptors. *Curr. Biol.* **2010**, *20*, R114–R124. DOI:10.1016/j.cub.2009.12.006
2. Zhukov, V.V.; Saphonov, M.V.; Calcium Component of the Retinal Light Response in the Snail *Lymnaea stagnalis*: a Pharmacological and Ultrastructural Study. *J. Evol. Biochem. Physiol*. **2020,** *58*, 652–665. DOI:10.1134/S0022093022030036

*Corresponding Author:

Valery V. Zhukov, Institute of Medicine and Life Sciences (MEDBIO), Immanuel Kant Baltic Federal University, 2 Universitetskaya str., Kaliningrad, 236040, Russian Federation.
Email: valerzhukov@mail.ru