

Short day exposition affects the brain serotonin system in zebrafish *Danio rerio*

Sorokin I.E.*, Evsiukova V.S., Kulikov A.V.

Institute of Cytology and Genetics, SB RAS, Novosibirsk, Russia

* *sorokin.iv.ev@gmail.com*

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Motivation and Aim: Reduction of natural illumination in fall/winter months causes in vulnerable individuals seasonal affective disorders (SAD) – a significant medical, economic and social problem for countries located in high and temperate latitudes [1, 2]. Although some authors show the involvement of brain neurotransmitter, serotonin (5-HT), in the mechanism of SAD, the role of brain 5-HT system in the pathogenesis of SAD is still obscure. Existing models of SAD include either nocturnal animals (laboratory mice) or wild diurnal rodents with a poorly studied genome. This greatly complicates the study of the mechanisms of SAD. Diurnal animal zebrafish (*Danio rerio*) seems to be more suitable model organism for studying the mechanisms of SAD compared to nocturnal mice. The aim of the study is to compare the level of 5-HT, 5-HIAA, the activity of tryptophan hydroxylases, as well as the concentration of mRNA of the genes *Tph1a*, *Tph1b*, *Tph2*, *Mao*, *Slc6a4a*, *Htr1aa*, *Htr2aa* in the brain of male and female *D. rerio* kept at short (4:20) and normal (12:12) daylight hours.

Methods and Algorithms: Here we compare the level of 5-HT, 5-HIAA, the activity of tryptophan hydroxylases, as well as the concentration of mRNA of the genes *Tph1a*, *Tph1b*, *Tph2*, *Mao*, *Slc6a4a*, *Htr1aa*, *Htr2aa* in the brain of male and female *D. rerio* kept at short (4:20) and normal (12:12) daylight hours.

Results: The exposition to short day did not alter 5-HT level, but increased concentration its main metabolite, 5-hydroxyindoleacetic acid in the brain. The short day exposition decreased expression of *Mao* gene, encoding the main enzyme of 5-HT degradation, but did not alter the expression of *Tph1a*, *Tph1b*, *Tph2*, *Slc6a4a*, *Htr1aa*, *Htr2aa* genes, encoding the key enzymes of 5-HT synthesis, tryptophan hydroxylases, 5-HT transporter, 5-HT1A and 5-HT2A receptors, in zebrafish brain compared to those reared at normal day.

Conclusion: Thus, zebrafish are sensitive to short daytime and can be used as a promising model organism for study the involvement of 5-HT in SAD mechanism.

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References

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