

SUPPLEMENTARY MATERIALS

The Biochemical Model of the Synapse in Turpaev's Studies

D. A. Sakharov

Kol'tsov Institute of the Developmental Biology, Russian Academy of Sciences, Moscow, Russia

Received April 17, 2018

Supplementary file S7

**EFFECTS OF SEROTONIN AND ITS NEUROTOXIC ANALOGUE ON THE DEFENSIVE REFLEX
CONDITIONING IN SNAIL**

V. V. Andrianov^{1}, T. K. Bogodvid^{1,2}, K. L. Gainutdinov¹*

¹Kazan Federal University; ²Volga Region State Academy of Physical Culture, Sport and Tourism, Kazan; Russia

**e-mail: slava_snail@yahoo.com*

One of the most intriguing complex functions of the brain is its ability to store information obtained in the experience, and remember most of it. It is namely memory that is the mechanism of storing and/or remembering this information. Neuromodulation can have a significant influence on the long-term memory formation (Sakharov, 2012). One of those neuromodulators in the simple nervous system of mollusks is serotonin (5-HT). 5-HT is one of the widespread and well-investigated transmitters in the nervous system. It has been found that 5-HT is the main transmitter that modulates the withdrawal behavior in mollusks and is necessary for associative learning on the basis of withdrawal reflexes. In addition to the well-known role of 5-HT as a mediator in synaptic transmission, it has been shown that it can perform integrative functions during its release into the extracellular milieu. A large of experiments caused usage of 5-HT bath application as a reinforcing stimulus in the models of cellular analogues of learning. On the other hand, the neurotoxic analogue of serotonin 5.7-dihydroxytryptamine (5.7-DHT), which leads to 5-HT depletion, is used to study the role of the serotonergic system in the evaluation of behavior.

Therefore it was studied the role of 5-HT in the mechanisms of learning using the "neurotoxic" analogue of serotonin 5.7-DHT or precursor of 5-HT syntheses, 5-hydroxytryptophan (5-HTP). For the experiments, the terrestrial snails were used. There were developed a conditioned defensive reflex to the tap on the shell and food aversion. For 5-HT depletion its neurotoxic analogue of 5.7-DHT at a dose of 20 mg/kg of body weight was used. It was found that injection of 5.7-DHT a week before the training disrupts conditioning. Within two weeks of neurotoxin application, the ability to learn had recovered. Daily injection of serotonin before a training session accelerated defensive reflex conditioning and daily injections of 5-HTP in snails with a deficiency of serotonin induced by 5.7-DHT restored the snail's ability to learn. The received results suggest the necessity of 5-HT for the process of formation of long-term memory in the terrestrial snail.

Supported by RFBR (grant 18-015-00274).