

Modulation of defensive reflex conditioning in snails by serotonin

Andrianov V., Bogodvid T., Deryabina I., Golovchenko A., Muranova L., Tagirova R., Vinarskaya A., Gainutdinov K.

Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

© 2015 Andrianov, Bogodvid, Deryabina, Golovchenko, Muranova, Tagirova, Vinarskaya and Gainutdinov. Highlights • Daily injection of serotonin before a training session accelerated defensive reflex conditioning in snails. Daily injection of 5-hydroxytryptophan before a training session in snails with a deficiency of serotonin induced by the “neurotoxic” analog of serotonin 5,7-dihydroxytryptamine, restored the ability of snails to learn. • After injection of the “neurotoxic” analogs of serotonin 5,6- and 5,7-dihydroxytryptamine as well as serotonin, depolarization of the membrane and decrease of the threshold potential of premotor interneurons was observed. We studied the role of serotonin in the mechanisms of learning in terrestrial snails. To produce a serotonin deficit, the “neurotoxic” analogs of serotonin, 5,6- or 5,7-dihydroxytryptamine (5,6/5,7-DHT) were used. Injection of 5,6/5,7-DHT was found to disrupt defensive reflex conditioning. Within 2 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. We discovered that injections of the neurotoxins 5,6/5,7-DHT as well as serotonin, caused a decrease in the resting and threshold potentials of the premotor interneurons LPa3 and RPa3.

<http://dx.doi.org/10.3389/fnbeh.2015.00279>

Keywords

Associative learning, Identified neurons, Membrane potential, Serotonin, Snail, Threshold potential