

## Responses of withdrawal interneurons to serotonin applications in naïve and learned snails are different

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### Abstract

© 2017 Bogodvid, Andrianov, Deryabina, Muranova, Silantyeva, Vinarskaya, Balaban and Gainutdinov. Long-term changes in membrane potential after associative training were described previously in identified premotor interneurons for withdrawal of the terrestrial snail *Helix*. Serotonin was shown to be a major transmitter involved in triggering the long-term changes in mollusks. In the present study we compared the changes in electrophysiological characteristics of identifiable premotor interneurons for withdrawal in response to bath applications of serotonin (5-HT) or serotonin precursor 5-hydroxytryptophan (5-HTP) in preparations from naïve, neurotoxin-injected or associatively trained snails. It was found that 5-HT or 5-HTP applications caused a significant decrease of membrane potential in premotor interneurons of naïve snails, associatively trained snails and snails with impaired serotonergic system by injection of a selective neurotoxin 5,7-dihydroxytryptamine (5,7-DHT) 1 week before the experiments. Applications of 5-HT or 5-HTP did not cause significant changes in the action potential (AP) threshold potential of these neurons in naïve snails. Conversely, applications of 5-HT or 5-HTP to the premotor interneurons of previously trained or 5,7-DHT-injected snails caused a significant increase in the firing threshold potential in spite of a depolarizing shift of the resting membrane potential. Results demonstrate that responsiveness of premotor interneurons to extracellularly applied 5-HT or 5-HTP changes for days after the associative training or serotonin depletion. Similarity of the effects in trained and 5,7-DHT-injected animals may be due to massive release of serotonin elicited by 5,7-DHT injection. Our results suggest that serotonin release due to aversive conditioning or elicited by the neurotoxin administration triggers similar changes in resting membrane potential and AP threshold in response to bath applications of 5-HT or its precursor 5-HTP.

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### Keywords

5-hydroxytryptophan, Associative learning, Identified neurons, Membrane potential, Serotonin, Snail, Threshold potential

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