

Gap junctions contribute to the regulation of walking-like activity in the adult mudpuppy (*necturus maculatus*)

Lavrov I., Fox L., Shen J., Han Y., Cheng J.
Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

© 2016 Lavrov et al. This is an open access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited. Although gap junctions are widely expressed in the developing central nervous system, the role of electrical coupling of neurons and glial cells via gap junctions in the spinal cord in adults is largely unknown. We investigated whether gap junctions are expressed in the mature spinal cord of the mudpuppy and tested the effects of applying gap junction blocker on the walking-like activity induced by NMDA or glutamate in an in vitro mudpuppy preparation. We found that glial and neural cells in the mudpuppy spinal cord expressed different types of connexins that include connexin 32 (Cx32), connexin 36 (Cx36), connexin 37 (Cx37), and connexin 43 (Cx43). Application of a battery of gap junction blockers from three different structural classes (carbenexolone, flufenamic acid, and long chain alcohols) substantially and consistently altered the locomotor-like activity in a dose-dependent manner. In contrast, these blockers did not significantly change the amplitude of the dorsal root reflex, indicating that gap junction blockers did not inhibit neuronal excitability nonselectively in the spinal cord. Taken together, these results suggest that gap junctions play a significant modulatory role in the spinal neural networks responsible for the generation of walking-like activity in the adult mudpuppy.

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