



Abstract

General

Note

R94 - PRESYNAPTIC MODULATION OF PRIMARY AFFERENT INPUT TO SPINAL DORSAL HORN NEURONS BY LAMINA I PROJECTION NEURON LOCAL AXON COLLATERALS

Research data poster

Sensory system and disorders (incl.pain)

(including from NeurotechEU colleagues)

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Abstract

Our earlier morphological findings proved that local ipsilateral axon collaterals of lamina I projection neurons (PNs) in the dorsal horn segregate into different classes, based on their distribution, and these differences suggest distinct roles in sensory information processing. Nevertheless, their exact targets and the corresponding function are still not known. To allow detailed visualization and selective optogenetic manipulation of lamina I PNs and their collaterals, we injected AAV vectors into the lateral parabrachial complex of mice to retrogradely transfect lamina I PNs and induce TdTomato or Channelrhodopsin2 expression in them.

TdTomato positive collaterals were found in the proximity of CGRP and IB4 positive primary afferents, suggesting a putative presynaptic function in the transmission of sensory information. Optogenetic activation of the collaterals resulted in a reduction of Delta and C fiber evoked mono- and polysynaptic currents in random dorsal horn neurons from laminae I-II. Besides the presynaptic inhibition, however, the frequency and amplitude of spontaneous EPSCs registered from the neurons increased during activation of the collaterals. Our preliminary serial block-face scanning electron microscopy (SBF-SEM) results showed that although axon varicosities of PN collaterals approached dendritic profiles covered with other axon terminals, axo-axonic synapses could not be detected. Furthermore, PN collateral varicosities outside the grey matter (in the dorsolateral funiculus), despite their higher density, did not form synaptic contacts.

Our findings suggest that the reduction of primary afferent input upon PN axon collateral activation is less likely to be a direct presynaptic effect, and it rather depends on activation of a subset of primary afferent targeting interneurons.