IN BRIEF

COMPUTATIONAL NEUROSCIENCE

Pathological effect of homeostatic synaptic scaling on network dynamics in diseases of the cortex

Fröhlich, F. *et al. J. Neurosci.* **28**, 1709–1720 (2008)

Many CNS disorders are associated with an EEG pattern consisting of repetitive low-frequency discharges. The authors used a computational model to examine the homeostatic plasticity mechanisms that occur after different degrees of deafferentation (destruction of axons leading to loss of synaptic inputs). Above a critical degree of deafferentation, a compensatory increase in excitatory transmission induced periodic oscillations and impairment of information transmission. This study sheds light on the network changes that occur in cortical disorders and might indicate potential avenues for intervention.

SYNAPTIC PHYSIOLOGY

Smaller dendritic spines, weaker synaptic transmission, but enhanced spatial learning in mice lacking Shank1

Hung, A. Y. *et al. J. Neurosci.* **28**, 1697–1708 (2008)

The postsynaptic density (PSD) scaffold protein Shank1 is thought to be important for spine morphogenesis. The authors showed that Shank1$^{-/-}$ mice have a selective loss of larger PSDs and reduced basal synaptic transmission, consistent with such a role. The mice exhibited impaired contextual fear memory. Interestingly, they showed enhanced learning in a spatial memory task, but lacked the ability to retain the memory over 28 days. The authors suggest that Shank1 promotes the growth of large dendritic spines, which are required for long-term memory retention.

PAIN

Distinct roles of matrix metalloproteases in the early- and late-phase development of neuropathic pain

Kawasaki, Y. *et al. Nature Med.* 10 Feb 2008 (doi:10.1038/nm1723)

Neuropathic pain mechanisms are poorly understood. The authors revealed that two different matrix metalloproteases (MMPs) have distinct roles in different phases of neuropathic pain. Using a combination of pharmacological and genetic approaches, they showed that rapid upregulation of MMP9 activity in dorsal root ganglion (DRG) neurons contributes to the early phase of neuropathic pain after spinal nerve ligation, whereas delayed upregulation of MMP2 in DRG satellite cells and spinal astrocytes contributes to the later phase. Inhibition of these enzymes might provide a new approach for the treatment of neuropathic pain.

TECHNOLOGY

Video-rate far-field optical nanoscopy dissects synaptic vesicle movement

Westphal, V. *et al. Science* 21 Feb 2008 (doi:10.1126/science1154228)

The limited spatial and temporal resolution of existing techniques has made it difficult to observe synaptic vesicle movements in nerve terminals in living neurons. The authors showed that the high resolution of stimulated emission depletion (STED) microscopy allows the movements of synaptic vesicles in cultured hippocampal neurons to be recorded. They observed restricted vesicle movement within synaptic boutons and more rapid movement between boutons.