From Neuroplasticity to Drug Development for Amblyopia, Alzheimer's Disease, and Motor Rehabilitation

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Memory is stored in neural networks via changes in synaptic strength mediated long-term potentiation (LTP). Here we show that a cholecystokinin-(CCK)-B-receptor antagonist blocks high-frequency stimulation (HFS)-induced neocortical LTP, whereas local infusion of CCK induces LTP in the auditory cortex. We identified that entorhinocortical terminals release CCK, which enables neocortical LTP and the formation of cue-cue associative memory. The CCK knock-out mouse lacked HFS-induced CA3-CA1 LTP and impaired spatial memory. High-frequency optical activation of hippocampus-projecting terminals from entorhinal cortical neurons in the induced heterosynaptic CA3-CA1 LTP. These finding lead to the drug development for treating Alzheimer's Disease and facilitating motor rehabilitation. Thalamocortical neurons express CCK. HFS of the medial geniculate body induced thalamocortical LTP in wildtype mice. We further found that our CCKBR agonist could cue amblyopia in the mouse model.