ELSC Seminar: Ofer Yizhar

November 19, 2015

On the topic of "Understanding the roles of amygdala-prefrontal connections through targeted optogenetic perturbation"

ELSC cordially invite you to the lecture given by:

Ofer Yizhar
Department of Neurobiology, Weizmann Institute of Science

On the topic of

"Understanding the roles of amygdala-prefrontal connections through targeted optogenetic perturbation"

The lecture will be held on Thursday, November 19, 2015 at 17:00, at ELSC: Silverman Bldg., 3rd Wing, 6th Floor, Edmond J. Safra Campus

Light refreshments at 16:45

Abstract:

Fear-related disorders are thought to reflect strong and persistent learned fear associations resulting from aberrant synaptic plasticity mechanisms. The basolateral amygdala (BLA) and the medial prefrontal cortex (mPFC) play a key role in the acquisition and extinction of fear memories. Strong reciprocal synaptic connections between these two regions are believed to play a role in the encoding of fear memories, but the contribution of these projection pathways to memory formation and maintenance remains elusive. We evaluated several optogenetic approaches for silencing presynaptic terminals. Surprisingly, we found that sustained activation of Arch, a light-gated proton pump that is commonly used for optogenetic silencing, paradoxically causes presynaptic calcium influx and neurotransmitter release. This increase in neurotransmission was mediated by presynaptic alkalization and calcium influx, and resulted in recruitment of local-circuit feed-forward inhibition, potentially confounding the interpretation of such experiments. We therefore established an optogenetic stimulation protocol that evokes long-term depression in BLA-mPFC synapses. Using this approach, we explored the role of the BLA-mPFC pathway in fear learning. We found that attenuation of synaptic strength in this pathway prior to fear conditioning leads to impaired learning. In mice that have already acquired the cued fear association, depotentiation of BLA-mPFC inputs prior to extinction training facilitated the extinction process. Our findings suggest a new role for the BLA-mPFC pathway not only in the acquisition but also the maintenance of learned associations and provide a framework for functional analysis of long-range projections.
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