

ErbB4 functioning in fear memory within the main part of intercalated cells

Shen et al.

Chen Shen, Heath Robinson, Hongsheng Wang and Lin Mei

Department of Neurosciences, Case Western Reserve University School of Medicine, Cleveland, OH

The intercalated cells of amygdala are composed of a lot of clusters and together form a neuronal net that covers the rostral half of the basolateral amygdala. The morphology study of ITC showed that there are two general types of intercalated neuron, medium (soma diameters: 7-12 μm) and large (15-30 μm) neurons. Based on their location and several functioning studies, the intercalated cells of amygdala are thought to be important for both fear expression and fear extinction. The intercalated cells (ITC) can be separated as the medial paracapsular ITC (Imp) and the main ITC nucleus (Im). The Imp receives fear learning modulated sensory inputs during fear expression and provide feedforward and feedback inhibition to its downstream targets, whereas the Im is activated during fear extinction and further inhibits the central medial amygdala. In Mei lab's previous study, Jonathan et al. showed that the ITC clusters are nicely covered by ErbB4 expression, thus lead us to ask the function of ErbB4 within the ITC. Previous studies proved that the ErbB4 null mice exhibit less freezing time after fear conditioning but the same fear level during the conditioning. However, all those studies are either whole brain knockout or PV-Cre specific knockout, which cannot address the function of ErbB4 specifically within the ITC. Here we would like to use electrophysiology, optogenetics and gene editing to explain how ErbB4 regulates ITC function during fear conditioning. The understanding of ErbB4 function in fear memory may shed light on future therapeutic regimen for fear disorders.