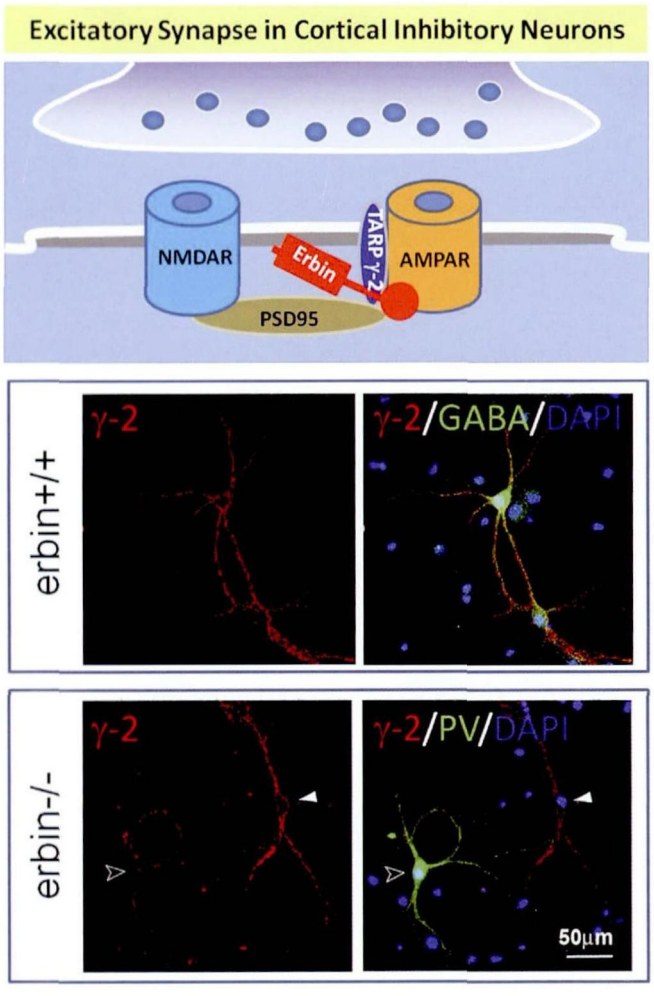
Novel regulation on excitatory synaptic transmission in cortical interneurons

Inhibitory interneurons, which count 10%—20% of neurons in cortex, regulate the firing of excitatory neurons and are critical to sophisticated brain functions. Disruption of the excitability of cortical interneurons has been implicated in neurological and psychiatric disorders including epilepsy, schizophrenia and autism. Unlike the excitatory synapses of excitatory neurons whose molecular composition and regulation are extensively studied, our knowledge of these of inhibitory neurons is limited. Dr. Tao Yanmei, Professor in the Institute of Developmental and Regenerative Biology in Hangzhou Normal University, in collaboration with Dr. Lin Mei, Professor in the Institute of Molecular Medicine and Genetics, Georgia Regents University, published an article recently in *Nature Neuroscience* (**2013**, 16: 290—299) and reported that Leucine-Rich-Repeats and PDZ containing protein (LAP) Erbin regulates excitatory synaptic transmission in cortical interneurons.



Erbin was expressed specifically in the GABAergic interneurons, particularly in the parvalbumin-positive neurons, in cortex where it binds TARP γ−2, an auxiliary subunit of AMPA-type glutamate receptors. Depletion or knockdown of Erbin promotes the degradation of TARP γ−2, and thus blocks the surface expression of AMPA receptors and reduces specifically the amplitudes of miniature excitatory postsynaptic currents (mEPSC) in interneurons, but not in pyramidal neurons. Erbin null mice exhibit impaired pre-pulse inhibition and hyperactivity, suggesting Erbin may regulate critical pathways for pathogenesis of psychiatric disorders. Erbin binds TARP γ − 2 through a site within a. a. 1151—1244 and the interaction with Erbin is crucial for γ − 2's function on surface AMPA-receptor retention. In addition to abnormal behaviors, mice expressing an Erbin truncation mutant that is unable to bind γ − 2 exhibit reduced surface AMPA receptors and mEPSC specifically in the parvalbumin-positive cortical neurons.

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