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NEUROSCIENCE 2014

Presentation Abstract

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Presentation Title:	Inhibitory control of dynamic range of hippocampal dentate granule cell population
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Presentation time:	Sunday, Nov 16, 2014, 1:00 PM - 5:00 PM
Presenter at Poster:	Sun, Nov. 16, 2014, 3:00 PM - 4:00 PM
Topic:	++B.09.d. Oscillations and synchrony: Other
Authors:	***C.-T. LEE**, C.-C. LIEN; Inst. of Neuroscience, Natl. Yang-Ming Univ., Taipei, Taiwan
Abstract:	The hippocampus plays an important role in learning and memory. The dentate gyrus (DG), which serves as a gateway to the hippocampus, filters the excitatory afferent inputs from the cortex and sends the outputs to other hippocampal areas. Little is known, however, about the range of afferent input strengths that DG granule cell (GC) populations can represent. We found that the dynamic range that GCs can represent is much narrower compared to

CA1 pyramidal cells. We examined the intrinsic properties, excitatory and inhibitory postsynaptic conductance evoked at threshold input strength of GCs recruited over the range of input strengths and founded that all these factors are not correlated to threshold input strength. However, application of gabazine, a $GABA_A$ receptor antagonist, revealed that feedforward inhibition participates in narrowing the dynamic range of GC populations, which is striking contrast to the CA1 region, the output station of the hippocampus. Examination of threshold input strength and spike delay suggested that this feedforward inhibition is primarily mediated by fast-spiking interneurons and molecular layer interneurons. By using optogenetics, we found that parvalbumin (PV)-expressing interneurons are primarily involved in regulating the dynamic range of GC populations during period of sparse activity. By contrast, GC dynamics during series of incoming activities are differentially regulated by PV- and somatostatin (SST)-expressing interneurons. PV-expressing interneurons control the onset of spike series, whereas SST-expressing selectively regulate the dynamics in the late spike series. Together, our results indicate that GABAergic interneurons constrain the dynamic range of dentate GC populations during different states of neuronal activities.

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INTERNEURON

GABAERGIC

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