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Research Article

Role and Significance of Differential Synaptic Integration

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Abstract

The dentate gyrus goes under continuous reorganization and lamination in foetal life.

Interneurons with identified synaptic connection undergoes migration from outer layer to inner region of molecular layer.

Keywords: CNP-Expressing Progenitors; Cell Migration; Hippocampus; Synaptic Transmission; GABAA Receptors; Presynaptic Regulation

Introduction

Identification of developing interneurons throughout the hippocampal ML of the dentate gyrus.

The CNP -EGFP mouse allows identification of Developing GABAnergic interneurons in early postnatal Molecular layer [1].

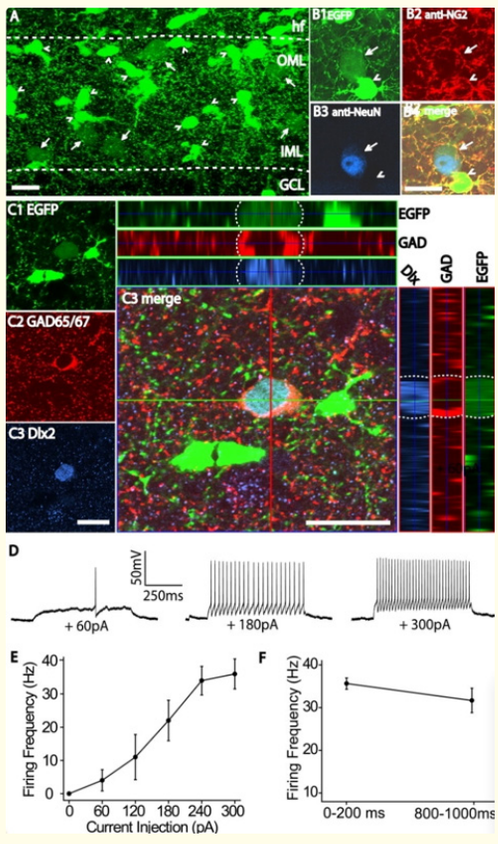
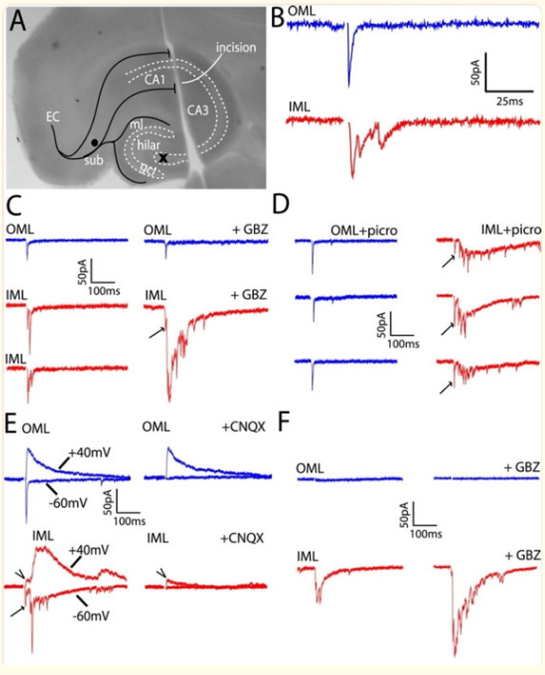


Figure 1

A, Bright EGFP+, small, irregularly shape of cells and fainter EGFP+, larger round/ovoid-shaped cells are presented throughout the ML. B, The bright EGFP+ cells corresponded to NG2+ CNP gene-expressed in progenitors, whereas faint EGFP+ cells are the NeuN+ [2] neurons, C, Stacked focal images with corresponding orthogonal reconstructed demonstration that these neurons are developing phase interneurons, based on GAD65/67 and Dlx2 expression. D, E, Elicited action potential firing in response to varying current injections demonstrates a fast-spiking phenotypes [3].

Evoked excitatory transmission to developing OML and IML interneurons.



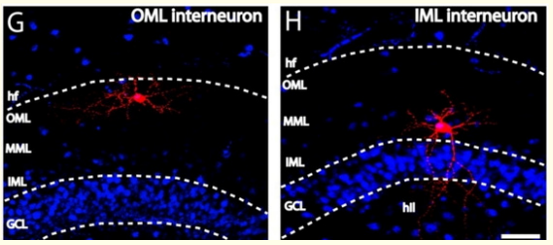


Figure 2

OML and IML interneurons are differently integrated into the excitatory hippocampal circuit as a consequence of dendritic field reorganized. A, EPSCs in OML and IML interneurons were evoked by subicular (perforanted paths; filled circle) or CA3 pyramid layer (cross) stimulated. In all [4]. experiments, an incision was made between the CA1 and CA3. All blue and red traces denote evoked responses from OML and IML, respectively. B, Subicular stimulates elicited monosynaptic EPSC response in OML interneurons but shows results in a "flurry" of asynchronous EPSCs in IML interneurons. C, Addition of 10 μm GBZ had no effect over the evoked EPSC response in OML interneurons but results in a large barrage of EPSCs present in IML interneurons. Traces present on the right are 3–5 min after addition of GBZ. D, Same results are attained after preincubation of slices with 50 μm picrotoxin (picro). C, D, highlighted the presence of initial EPSC that is [5] temporally very close to the stimulus. E, OML interneurons display an NMDA receptor-mediated outward EPSC, even after the application of 10 μm CNQX, indicated that the response are monosynaptic. In IML interneurons, an outward NMDA receptor-mediate a response as observed that is temporally coincident with the initial inward AMPA receptor-mediated EPSC (arrowhead and arrow). This is followed by a barrage of AMPA receptor-mediated EPSCs with corresponding NMDA receptor currents [6]. After CNQX application, only the NMDA receptor responds (arrowhead) that was temporally coincident with the initial AMPA receptor response similar, indicating that this was indeed monosynaptic. F, CA3 stimulation in the presence of GBZ elicited no response in OML interneurons, but an EPSC profile similar to that seen after perforant path stimulation (in absence and presence of GBZ) was noted in IML [7] interneurons. G, H, Biocytin filling of OML and IML interneurons shows distinct no overlapping dendritic fields. EC, Entorhinal cortex; hf, hippocampal fissure; hil, hilar region; sub, subiculum. Scale bar, 50 μm [8].

Selective inhibition of monosynaptic perforanted path transmission by group II and III mGlus in IML and OML developing interneurons. All blue and red traces denote evoked EPSC responses from OML and IML, respectively. A, B, DCG-IV inhibited AMPA receptor-mediates monosynaptic EPSC peak responses after per-

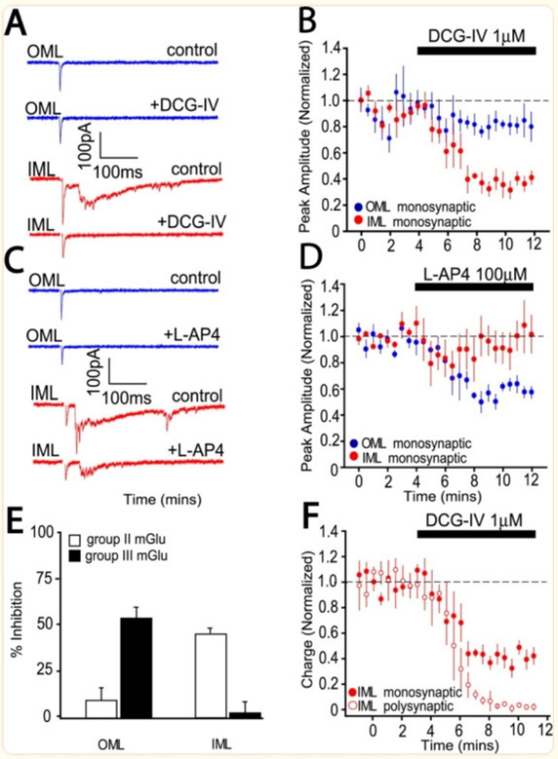


Figure 3

forant path stimulation in IML but not OML interneurons. C, D, l-AP4 inhibits the AMPA receptor-mediates [9] monosynaptic EPSC peak responses after perforant path stimulation in OML but not IML interneurons. E, Bar graph illustrating differential inhibition by group II (open bars) and group III (filled bars) mGlu activation on the perforant path evoked EPSCs in OML and IML interneurons. F, In IML interneurons, DCG-IV inhibited the charge transferred by the monosynaptic responds in a [10] quantitatively in a likely manner to that noted with EPSC peak measurements (red filled circles in F vs red circles in B). DCG-IV totally abolishes the charge transferred by the EPSC barraged (A; F, open red circles).

Discussion

- Development of interneurons in hippocampus
- Histological studies
- Intertransmission through synapses.

Conclusion

Significance and function of differential synaptic Integration.

Conflict of Interest

Author declare their is no conflict of interest.

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