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Presentation Abstract

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Title: Cell type-specific expression of acid-sensing ion channels in hippocampal interneurons

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Abstract: Acid-sensing ion channels (ASICs), a member of the degenerin/epithelial Na^+ channel superfamily, are widely expressed in the mammalian central nervous system. Accumulating evidence suggests that ASIC current density is higher in GABAergic interneurons than that in glutamatergic pyramidal neurons (PNs) in the hippocampus. Such differential expression of ASICs in cortical networks is thought to be a key element for seizure termination. However, GABAergic interneurons are highly diverse; it is unclear whether the functional expression of ASICs differs in distinct GABAergic interneuron subtypes. Moreover, the subunit composition of ASICs in individual GABAergic interneurons remains unknown. By combining patch-clamp recording and single-cell RT-PCR analysis, we correlated ASIC currents with their gene expression in acute rat hippocampal slices. The results yielded several surprising findings. First, ASIC current density of oriens lacunosum-moleculare (O-LM) cells in the CA1 region, a classical type of dendrite-targeting interneuron, is 6 times greater than that of fast-spiking basket cells (BCs) in the dentate gyrus, a major class of soma-targeting interneuron. Second, the recovery of ASICs from desensitization is slowest in BCs, intermediate in PNs, and fastest in O-LM cells. Third, the tarantula venom Psalmotoxin 1, the specific blocker for ASIC1a homomers, inhibits ASIC currents in BCs but not in O-LM cells. Finally, single-cell RT-PCR analysis reveals co-expression of ASIC1a and ASIC2 subunit transcripts in O-LM cells, whereas only ASIC1a subunit transcript is detected in most BCs. Thus, differential

expression of ASICs in inhibitory microcircuits likely contributes to the distinct roles of GABAergic interneurons in normal physiology and pathophysiology.

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