論文内容の要旨

論文題目
グルタミン酸受容体脱感作の短期的シナプス抑圧への影響

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Paired-pulse depression (PPD) is a form of short-term synaptic plasticity. Although PPD is considered to occur by changes in transmitter release probability, desensitization of postsynaptic AMPA receptors (AMPARs) could contributes to PPD. To clarify the involvement of AMPAR desensitization in PPD, using paired-pulse glutamate application in patches excised from postsynaptic cells, we investigated relationship between PPD and AMPAR desensitization at the calyx of Held synapse in the developing rat auditory brainstem. We found that AMPAR desensitization contributed significantly to PPD before the onset of hearing (P10-12), but that its contribution

became negligible after hearing onset. During postnatal development (P7-21) the recovery of AMPARs from desensitization became faster. Concomitantly, glutamate sensitivity of AMPAR desensitization declined. Single-cell reverse transcription-polymerase chain reaction (RT-PCR) analysis indicated a developmental decline of GluR1 expression that correlated with speeding of the recovery of AMPARs from desensitization. Transmitter release probability declined during the second postnatal week. Manipulation of extracellular Ca^{2+} and Mg^{2+} ratio, to match release probability at P7-8 and P13-15 synapses, revealed that the release probability is also an important factor determining the involvement of AMPAR desensitization in PPD. We conclude that the extent of involvement of AMPAR desensitization in short-term synaptic depression is determined by both pre- and postsynaptic mechanisms.