



NR1基因敲除对小鼠前额叶脑区LTP的影响

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Long-term potentiation of prefrontal cortex in NR1 knockout mice

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摘要 用前脑特异性NR1基因敲除小鼠, 采用离体脑片场电位技术, 研究了NR1亚基在前额叶脑区突触可塑性中的作用. 刺激强度—反应(input-output curve)和双脉冲抑制反应(paired pulse depression, PPD)的结果表明, 与同窝对照组小鼠相比, NR1基因敲除小鼠前额叶脑区的基本突触传递无明显变化. 采用高频刺激(100 Hz, 1 000 ms ×2, 间隔30 s)在小鼠的前额叶脑区诱导长时程增强(long-term potentiation, LTP), 与对照组小鼠相比, NR1基因敲除小鼠前额叶脑区的LTP明显受损. 以上数据提示, NR1亚基在前额叶脑区LTP的诱导中起着重要的作用.

关键词: N-甲基-D-天门冬氨酸受体 前额叶皮层 长时程增强

Abstract: This study investigated the prefrontal synaptic plasticity of forebrain-specific NR1 knockout mice by using the vitro field potential recording technique. The results from the input-output and paired pulse depression curves suggest that the basal synaptic transmission is normal in the prefrontal cortex of NR1 knockout mice. Prefrontal long-term potentiation (LTP) induced by high frequency stimulation (two trains of 100 Hz with 1 s duration and 30 s interval) was abolished in slices of NR1 knockout mice. These results indicate that NR1 is critical in the induction of long-term potentiation in prefrontal cortex.

Key words: N-methyl-D-aspartic acid receptor prefrontal cortex long-term potentiation

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[1] BLISS T V, COLLINGRIDGE G L. A synaptic model of memory: long-term potentiation in the hippocampus[J]. Nature, 1993, 361: 31-39.



[2] MALENKA R C, NICOLL R A. NMDA-receptor-dependent synaptic plasticity: multiple forms and mechanisms[J]. Trends Neurosci, 1993, 16: 521-527.



[3] BEAR M F, MALENKA R C. Synaptic plasticity: LTP and LTD[J]. Curr Opin Neurobiol, 1994(4): 389-399.

[4] NAKANISH S. Molecular diversity of glutamate receptors and implications for brain function[J]. Science, 1992, 258: 597-603.



[5] HOLLMANN M, HEINEMANN S. Cloned glutamate receptors[J]. Annu Rev Neurosci, 1994, 17: 31-108.
















[6] SHENG M, CUMMINGS J, ROLDAN L A, et al. Changing subunit composition of heteromeric NMDA receptors during development of rat cortex[J]. Nature, 1994, 368: 144-147.



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- [7] TSIEN J Z, HUERTA P T, TONEGAWA S. The essential role of hippocampal CA1 NMDA receptor-dependent synaptic plasticity in spatial memory[J]. *Cell*, 1996, 87: 1327-1338. 
- [8] CUI Z, WANG H, TAN Y, et al. Inducible and reversible NR1 knockout reveals crucial role of the NMDA receptor in preserving remote memories in the brain[J]. *Neuron*, 2004, 41: 781-793. 
- [9] TANG Y P, SHIMIZU E, DUBE G R, et al. Genetic enhancement of learning and memory in mice[J]. *Nature*, 1999, 401: 63-69. 
- [10] ROBBINS T W. From arousal to cognition: the integrative position of the prefrontal cortex[J]. *Prog Brain Res*, 2000, 126: 469-483. 
- [11] GOTO Y, YANG C R, OTANI S. Functional and dysfunctional synaptic plasticity in prefrontal cortex: roles in psychiatric disorders[J]. *Biol Psychiatry*, 2010, 67: 199-207. 
- [12] MATSUDA Y, MARZO A, OTANI S. The presence of background dopamine signal converts long-term synaptic depression to potentiation in rat prefrontal cortex[J]. *J Neurosci*, 2006, 26: 4803-4810. 
- [13] ZHAO M G, TOYODA H, LEE Y S, et al. Roles of NMDA NR2B subtype receptor in prefrontal long-term potentiation and contextual fear memory[J]. *Neuron*, 2005, 47: 859-872. 
- [14] DEBNE D, GUERINEAU N C, GAHWILER B H, et al. Paired-pulse facilitation and depression at unitary synapses in rat hippocampus: quantal fluctuation affects subsequent release[J]. *J Physiol*, 1996, 491 (Pt 1): 163-176.
- [15] NICOLL R A, MALENKA R C. Contrasting properties of two forms of long-term potentiation in the hippocampus[J]. *Nature*, 1995, 377: 115-118. 
- [16] DURAND G M, KOVALCHUK Y, KONNERTH A. Long-term potentiation and functional synapse induction in developing hippocampus[J]. *Nature*, 1996, 381: 71-75. 
- [17] HIRSCH J C, CREPEL F. Postsynaptic calcium is necessary for the induction of LTP and LTD of monosynaptic EPSPs in prefrontal neurons: an in vitro study in the rat[J]. *Synapse*, 1992(10): 173-175.
- [18] WATANABE M, KODAMA T, HIKOSAKA K. Increase of extracellular dopamine in primate prefrontal cortex during a working memory task[J]. *J Neurophysiol*, 1997, 78: 2795-2798.
- [19] COURTNEY S M. Attention and cognitive control as emergent properties of information representation in working memory[J]. *Cogn Affect Behav Neurosci*, 2004(4): 501-516. [20] MATSUO K, GLAHN D C, PELUSO M A, et al. Prefrontal hyperactivation during working memory task in untreated individuals with major depressive disorder[J]. *Mol Psychiatry*, 2007(12): 158-166.
- [20] FUSTER J M. The prefrontal cortex-an update: time is of the essence[J]. *Neuron*, 2001, 30: 319-333. 
- [21] WILKINS A J, SHALLICE T, MCCARTHY R. Frontal lesions and sustained attention[J]. *Neuropsychologia*, 1987, 25: 359-365. 
- [22] ROSSI S, CAPPAS F, BABILONI C, et al. Prefrontal [correction of Prefrontal] cortex in long-term memory: an “interference” approach using magnetic stimulation[J]. *Nat Neurosci*, 2001(4): 948-952.
- [23] HERRY C, GARCIA R. Prefrontal cortex long-term potentiation, but not long-term depression, is associated with the maintenance of extinction of learned fear in mice[J]. *J Neurosci*, 2002, 22: 577-583.
- [24] EGERTON A, REID L, MCKERCHAR C E, et al. Impairment in perceptual attentional set-shifting following PCP administration: a rodent model of set-shifting deficits in schizophrenia[J]. *Psychopharmacology (Berl)*, 2005, 179: 77-84. 
- [25] KOCERHA J, FAGHIHI M A, LOPEZ-TOLEDANO M A, et al. MicroRNA-219 modulates NMDA receptor-mediated neurobehavioral dysfunction[J]. *Proc Natl Acad Sci USA*, 2009, 106: 3507-3512. 
- [1] 王德恒;白静;崔一卉;司文;曹晓华. 大脑前额叶扣带回皮层调制丘脑触觉信息的途径研究[J]. *华东师范大学学报(自然科学版)*, 2008, 2008(2): 59-62,1.

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