

研究论文

围产期慢性尼古丁摄入对子代小鼠学习与记忆的影响

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摘要:

尼古丁对学习记忆间接作用的研究鲜有报道。昆明小鼠母鼠受孕后随机分为对照组(CON)和尼古丁组(NIC)。CON组母鼠自由饮水,NIC组母鼠饮水中给予浓度为50 μg/mL的尼古丁。子代小鼠60日龄时,进行Morris水迷宫实验,之后在体记录海马区穿通纤维通路(perforant pathway,PP)至齿状回(dentate gyrus,DG)的长时程增强(long-term potentiation, LTP)。结果显示,NIC组仔鼠的逃避潜伏期从第3天开始明显大于CON组,目标象限停留时间所占百分比和穿越平台次数均低于CON组,LTP群峰电位幅值和场兴奋性突触后电位斜率也都显著低于CON组。说明由母体摄入的尼古丁,可经胎盘和乳汁明显作用于其子代,导致子代学习记忆功能的明显损伤,其可能机制是因为海马神经元突触传递可塑性的效率显著降低。

关键词: 尼古丁 子代小鼠 学习与记忆 Morris水迷宫 长时程增强

Effects of Chronic Exposure to Nicotine at Perinatal Period on Learning and Memory Ability of Offspring Mice

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Abstract:

The effects of perinatal exposure to nicotine on learning and memory ability of offspring mice are rarely reported. The pregnant Kunming mice were divided randomly into two groups, which were a control group (CON) and a nicotine group (NIC). In the CON group, mice had free access to water during gestation and lactation, while dams in the NIC group were given 50 μg/mL nicotine through water. Adult male offspring mice were chosen for further experiments. The Morris water maze test was performed. Afterwards, the in vivo long-term potentiation (LTP) was recorded in a perforant pathway→dentate gyrus neural pathway in the hippocampus. The results show that the escape latency in NIC group was higher than that in CON group. The percent of the objective quadrant and the number of times in crossing hidden platform in NIC group were lower compared to that in the control group. Furthermore, the population spike (PS) amplitude and the slope of the field excitatory post synaptic potential (fEPSP) in the NIC group were lower than that in the control group. These findings suggest that nicotine ingested by mothers may effect on their offspring mice through placenta and milk, which impairs the learning and memory ability of offspring mice. One of the potential mechanisms is that it may damage neuron synaptic plasticity in the hippocampus.

Keywords: Nicotine Offspring mice Learning and memory Morris water maze Long-term potentiation

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