

论著

莪术油对慢性低氧大鼠学习与记忆和海马p-CaMKII表达的影响

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摘要 目的: 探讨不同浓度的莪术油注射液对慢性低氧大鼠学习与记忆的影响和可能的机制。方法: 将SD大鼠随机分为对照组、慢性低氧组、慢性低氧+低、中和高浓度的莪术油组, 持续饲养28 d。实验结束次日, 测试大鼠学习和记忆成绩的变化; 测定血清和海马组织MDA和SOD的浓度; 测定海马组织Ca²⁺浓度; 观察磷酸化Ca²⁺/钙调蛋白依赖性蛋白激酶II (p-CaMKII) 在海马组织染色和表达情况; 应用透射电镜观察海马组织超微结构的变化。结果: 慢性低氧组发现隐蔽平台的潜伏期延长; MDA含量明显增高, SOD活力明显降低;

[Ca²⁺]_i明显增高; p-CaMKII染色较弱和表达量明显降低。中、高浓度莪术油组发现隐蔽平台的潜伏期缩短 (P<0.05); 莪术油各组MDA含量均显著降低; 中、高浓度莪术油组血清SOD活力显著增加; 莪术油各组 [Ca²⁺]_i明显降低; 中、高浓度莪术油组p-CaMKII免疫组化染色较强, 表达量也明显增加 (P<0.05, P<0.01)。慢性低氧组突触界限不清楚, 树突棘和轴突均见水肿, 突触囊泡及突触后致密物质消失; 随着莪术油浓度的增加, 突触和线粒体水肿逐渐减轻, 突触后致密物质逐渐增多。结论: 莪术油能够通过清除和对抗自由基的产生, 增加突触后致密物质的表达来改善低氧大鼠学习和记忆能力, 此作用呈剂量依赖效应。

关键词 [低氧](#); [莪术油](#); [学习](#); [记忆](#); [磷酸化Ca²⁺-钙调蛋白依赖性蛋白激酶II](#)

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Effect of curcuma aromatica oil on learning, memory and hippocampal p-CaMKII expression in rats exposed to chronic hypoxia

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Abstract

AIM:
To investigate the effects of different concentrations of curcuma aromatica oil on learning and memory in rats exposed to chronic hypoxia. METHODS: The rats were divided randomly into the control, chronic hypoxia and chronic hypoxia with low (LC), middle (MC) and high (HC) concentrations of curcuma aromatica oil groups. After 29 d, all animals were examined to obtain the scores of leaning and memory. The SOD activity and MDA content were determined in the serum and hippocampus, the [Ca²⁺]_i in hippocampus was also detected. The staining and expression of p-calcium/calmodulin-dependent protein kinase II (p-CaMKII) in the hippocampus was observed and measured. RESULTS: ① In the chronic hypoxia group, the latency to find the hidden platform remarkably prolonged and the MDA content was obviously higher, but the SOD activity was significantly lower. Meanwhile, hippocampal [Ca²⁺]_i was markedly increased. The immunostaining of p-CaMKII was much weaker in hippocampus as well as its expressions (P<0.01). ② The latency to find the hidden platform was remarkably shorter in groups with MC and HC (P<0.05). The MDA content was obviously lower among groups treated with curcuma aromatica, but SOD activity was significantly higher in groups with MC and HC. Meanwhile, hippocampal [Ca²⁺]_i was markedly decreased in all groups treated with curcuma aromatica oil (P<0.01). The hippocampal immunostaining of p-CaMKII was much stronger in the MC and HC as well as its

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expression ($P < 0.05$, $P < 0.01$). Under the electron microscope, synaptic boundaries were not distinct, the edema of dendrite spine and axon was seen, synaptic vesicles and postsynaptic densities (PSD) were disappeared in the chronic hypoxia group. With rising of the concentration of curcuma aromatica oil, the edema of synapse and mitochondria was mitigated and the PSD was increased gradually. CONCLUSION: Curcuma aromatica oil might enhance learning and memory capacities of rats exposed to chronic hypoxia by cleaning up and antagonizing the production of the free radical and increasing the p-CaMKII expression in PSD. The effects are dose-dependent.

Key words [Hypoxia](#) [Curcuma aromatica oil](#) [Learning](#) [Memory](#) [p-calcium-calmodulin dependent protein kinase II](#)

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