

电磁脉冲辐照对培养的大鼠下丘脑神经细胞内外 LDH、AST、CHE、K⁺ 和Na⁺ 的影响

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为探讨电磁脉冲对下丘脑神经细胞损伤的机制, 测定了电磁脉冲辐照培养下丘脑神经细胞前后细胞内LDH 和培养上清中LDH、AST、CHE、K⁺、Na⁺ 浓度及与时间的关系。对新生的Wistar乳鼠下丘脑神经细胞在6孔板中进行原代培养, 在培养14天时, 用高场强EMP模拟源(场强为 6×10^4 V/m, 脉冲上升时间为20 ns, 脉宽为30 μ s, 主要频率成分为0—100 MHz), 以脉冲重复频率为2.5次/min, 辐照2 min。并于辐照后0 h(即刻)、1 h、6 h、12 h和24 h应用生化检测试剂盒测定细胞内和培养上清中LDH及培养上清中AST、CHE、K⁺、Na⁺ 浓度。结果表明, 电磁脉冲辐照后即刻就可引起培养上清LDH、AST明显升高; 辐照后1 h细胞内LDH明显降低, 而培养上清中LDH、AST、CHE、和K⁺ 明显升高; 辐照后6 h细胞内LDH明显降低, 而培养上清中LDH、AST、CHE、K⁺ 和Na⁺ 明显升高; 辐照后12 h细胞内LDH明显降低, 培养上清中CHE、K⁺ 和Na⁺ 明显升高; 辐照后24 h上述所有指标基本恢复。由此可以认为, 电磁脉冲辐照后可引起下丘脑神经元细胞膜的损伤。

THE INFLUENCES OF EMP IRRADIATION OF RAT HYPOTHALAMUS IN VITRO ON INTRACELLULAR LDH AND LDH、AST、CHE、K⁺ AND Na⁺ IN CULTURE MEDIUM

After rat hypothalamus was irradiated by electromagnetic pulse (EMP) in vitro the intracellular LDH and LDH、AST、CHE、K⁺ and Na⁺ in culture medium were measured to analyze the EMP radiation injury mechanism of hypothalamus neurons. Method as follows: Hypothalamus neurons of wistan rat in neonatal moment were cultured in six 6-hole boards. One board was control sample and other five boards were irradiated by high field strength 5 EMP (electromagnetic pulse, EMP) within 2 minutes. The electromagnetic pulse simulator provides 5 pulses/min with a high electric field intensity 60 KV/m, 20 nsec rise time and 30 μ s pulse width. The intracellular LDH of neuron and LDH、AST、CHE、K⁺ and Na⁺ in culture medium were measured at 0 h, 1 h, 6 h, 12 h and 24 h after the neurons being irradiated, using reagent boxes(Beijing Zhongsheng high-tech Bioengineering Company). All data was analyzed by statistical software Spss8.0. The results of measurement show intracellular LDH was decreased from 1 hour after irradiation and through to 12 hour, while LDH and AST in culture medium were increased at 0 hour after irradiation and at 1 h and 6 h were increased significantly CHE and K⁺ in medium also increased significantly at 1 h after EMP irradiation. Na⁺ in medium increased at 6 h. Both K⁺ and Na⁺ at 12 h after EMP irradiation still high in medium. All these substances at 24 hours after irradiated by EMP were restored to the original value in no difference with the control. The results suggest that EMP could injure the membranes of hypothalamus neurons.

关键词

电磁脉冲(Electromagnetic pulse (EMP)); 下丘脑神经元(Hypothalamus nerve cell); 乳酸脱氢酶(LDH); 谷草转氨酶(AST); 胆碱酯酶(CHE); 钾离子(K⁺); 钠离子(Na⁺)