

论著

铅抑制急性分离的大鼠背根神经节慢失活钾电流

戴晓青, 阮迪云*

(中国科技大学生命科学院神经毒理学实验室, 安徽 合肥 230027)

收稿日期 2001-12-17 修回日期 网络版发布日期 2009-1-15 接受日期 2002-3-1

摘要 目的 慢失活外向K⁺电流(I_D)对于长时程持续刺激中延迟动作电位的发放, 调节其发放频率和复极化有重要意义, 其改变对神经元的兴奋性产生重要影响, 因此研究铅(Pb²⁺)对神经元细胞 I_D 的效应, 并初步探讨其作用机理。方法 应用全细胞膜片钳技术, 根据动力学和药理学特性分离鉴定大鼠背根神经节(DRG) I_D , 观察Pb²⁺对 I_D 的抑制效应。结果 Pb²⁺以浓度依赖性方式抑制 I_D 。0.1, 1.0, 10.0 和100.0 $\mu\text{mol} \cdot \text{L}^{-1}$ Pb²⁺对+60 mV处 I_D 的抑制率分别为(6.9±0.6)%、(29.3±3.0)%、(85.9±5.1)%和(99.4±7.0)% ($n=15$), IC_{50} 为2.4 $\mu\text{mol} \cdot \text{L}^{-1}$ 。 I_D 的激活具有电压依赖性, Pb²⁺对 I_D 的抑制作用也具有电压依赖性, 最大抑制作用发生在+60 mV处。10.0 $\mu\text{mol} \cdot \text{L}^{-1}$ Pb²⁺使得 I_D 电流的稳态激活曲线向去极化方向移动, 并延长 I_D 的激活时间常数, 提示Pb²⁺增加了 I_D 的激活时程。结论 Pb²⁺显著抑制DRG神经元 I_D 电流, 导致神经元的兴奋性增加, 这可能是Pb²⁺影响神经细胞功能的作用机理之一。

关键词 [铅](#) [大鼠](#) [神经节, 脊](#) [钾通道](#) [膜片钳技术, 全细胞](#)

分类号 [R994.3](#)

Inhibitory effect of Pb²⁺ on slow-inactivating K⁺ current in acutely isolated rat dorsal root ganglion neurons

DAI Xiao-Qing, RUAN Di-Yun*

(Neurotoxicological Lab, School of Life Science, University of Science and Technology of China, Hefei 230027, China)

Abstract

AIM Slow-inactivating K⁺ current (I_D) possesses an important role in delaying the discharge of action potential after a period of long duration, modulating the frequency of the repetitive firing and repolarization. Modulation of I_D generates a powerful effect on neuronal excitability. Therefore, the inhibitory effects and mechanism of Pb²⁺ on I_D were investigated in rat dorsal root ganglion (DRG) neurons. **METHODS** With the whole cell patch clamp technique, I_D was isolated based on the kinetics and pharmacological properties, and the inhibitory effects of Pb²⁺ on I_D were investigated in rat acutely isolated DRG neurons. **RESULTS** The results showed that 0.1, 1.0, 10.0 and 100.0 $\mu\text{mol} \cdot \text{L}^{-1}$ Pb²⁺ inhibited the amplitude of I_D by (6.9±0.6)%, (29.3±3.0)%, (85.9±5.1)% and (99.4±7.0)% ($n=15$), respectively, IC_{50} was 2.4 $\mu\text{mol} \cdot \text{L}^{-1}$. It suggested that the inhibition of Pb²⁺ on I_D be dose dependent and saturated. The activation of I_D was voltage-dependent, and the inhibition of Pb²⁺ was also voltage-dependent. The strongest inhibition of Pb²⁺ was at +60 mV. The activation curve of I_D was shifted to depolarization direction with Pb²⁺. The activation time constant was enlarged with Pb²⁺, suggesting that Pb²⁺ increase the activation course of I_D . **CONCLUSION** The inhibition of Pb²⁺ on I_D significantly increase the excitation of DRG neurons, which maybe take an important part in Pb²⁺ neurotoxication.

Key words [lead](#) [rats](#) [ganglia](#) [spinal](#) [potassium channels](#) [patch clamp technique](#) [whole-cell](#)

DOI:

扩展功能

本文信息

- ▶ [Supporting info](#)
- ▶ [PDF\(402KB\)](#)
- ▶ [\[HTML全文\]\(0KB\)](#)
- ▶ [参考文献](#)

服务与反馈

- ▶ [把本文推荐给朋友](#)
- ▶ [加入我的书架](#)
- ▶ [加入引用管理器](#)
- ▶ [复制索引](#)
- ▶ [Email Alert](#)
- ▶ [文章反馈](#)
- ▶ [浏览反馈信息](#)

相关信息

- ▶ [本刊中 包含“铅”的 相关文章](#)
- ▶ 本文作者相关文章
- [戴晓青](#)
- [阮迪云](#)

