

苦皮藤素IV麻醉机理的膜片钳研究

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用膜片钳技术研究了植物杀虫剂苦皮藤素IV对棉铃虫幼虫离体培养中枢神经细胞钠通道门控过程的影响。结果表明,苦皮藤素IV对钠通道具有迅速的浓度依赖性阻滞作用,使电流-电压关系(I-V)曲线上移。0.1、1和10 $\mu\text{mol/L}$ 苦皮藤素IV作用3 min后,分别使钠电流峰值(I_{NaMax})较给药前下降 $27.35\% \pm 4.05\%$ 、 $62.72\% \pm 2.81\%$ 和 $88.53\% \pm 5.56\%$ ($P < 0.05$),1和10 $\mu\text{mol/L}$ 苦皮藤素IV还使钠通道的激活电压和峰电压分别向正电位方向移动了10 mV和20 mV左右。同时比较研究了利多卡因对棉铃虫幼虫神经细胞钠通道的影响,利多卡因对钠通道也具有阻滞作用,但有效作用浓度明显高于苦皮藤素IV。1、70 mmol/L的利多卡因注射液作用3 min后,使 I_{NaMax} 较用药前下降 $21.21\% \pm 2.52\%$ 和 $95.63\% \pm 2.10\%$ ($P < 0.05$)。苦皮藤素IV对钠通道门控过程的影响与利多卡因等局部麻醉剂非常相似,因此,对钠通道的阻滞作用可能是其发挥麻醉作用的重要机制。

PATCH CLAMP STUDY ON THE ANESTHETICS MECHANISMS OF CELANGULIN IV

The effects of botanical insecticide celangulin IV on inward sodium current (I_{Na}) of the central neurons isolated from the thoracic and abdominal ganglia of cotton bollworm, *Helicoverpa armigera* (Hübner) were studied using whole-cell patch clamp technique. The recording results showed that celangulin IV reduced I_{Na} immediately in a concentration dependant manner and shifted up the current-voltage relation curve. Celangulin IV at 0.1, 1, 10 $\mu\text{mol/L}$ decreased peak I_{Na} (I_{NaMax}) at $27.35\% \pm 4.05\%$, $62.72\% \pm 2.81\%$, $88.53\% \pm 5.56\%$ respectively 3 minutes later when celangulin IV was added to the external solution. Furthermore, it revealed that celangulin IV at 1, 10 $\mu\text{mol/L}$ shifted the active potential (10 mV or more) and peak current potential (20 mV or more) to the positive direction. At the same time, the effects of local anesthetics lidocaine on sodium channel of the central neurons isolated from the thoracic and abdominal ganglia of cotton bollworm were studied comparatively. The results indicated that lidocaine inhibited I_{Na} with less potency than celangulin IV. Lidocaine at 1, 70 mmol/L decreased I_{NaMax} at $21.21\% \pm 2.05\%$ and $95.63\% \pm 2.10\%$ respectively. Taken together, the results suggested that effects of the celangulin IV on the gating behavior of sodium channels were similar to that of lidocaine. The electrophysiological results may partially reveal the anaesthetic mechanism of celangulin IV.

关键词

棉铃虫(*Helicoverpa armigera*); 钠通道(Sodium channel current); 苦皮藤素IV(Celangulin IV); 利多卡因(Lidocaine); 全细胞膜片钳(Patch clamp whole cell recording)