



Effects of emodin on activity of K_{ATP} channel and $[Ca^{2+}]_i$ in guinea pig taenia coli cells

Wen-Xiu Yang, Jun-Ying Li, Wen-Wei Hu, Xie-Qun Chen, Wen-Sheng Xu, Zheng-Gen Jin

Wen-Xiu Yang, Jun-Ying Li, Wen-Wei Hu, Xie-Qun Chen, Wen-Sheng Xu, Zheng-Gen Jin, Department of Biophysics, Nankai University, Tianjin 300071, China

Author contributions: All authors contributed equally to the work.

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Abstract

AIM: Emodin is a component of traditional Chinese drug rhubarb. We had reported that emodin could improve depolarization of cell membrane, shorten the period of membrane potential oscillation and enhance the amplitude index of the spontaneous minute rhythm contraction (MRC) in guinea pig taenia coli (PTC). Now, we have investigated the effects of emodin on activity of K_{ATP} channel and intracellular $[Ca^{2+}]_i$ in GPTC muscle cells.

METHODS: Experimental preparations isolated from GPTC were perfused by Krebs solution. The detected parameters of electrical and contractivity activities are: Membrane resting potential (RP); Oscillation period of membrane potential (POP); Frequency of spike potential (SPF); Frequency (1/CP), amplitude (CH) and amplitude index (CHI) of MRC. Using the Fura 2 fluorescence binded intracellular Ca^{2+} to determine $[Ca^{2+}]_i$ in dissolved cells suspension.

RESULTS: (1) Emodin enhanced the electrical and contractivity

activities in GPTC in dose-dependent manner. When emodin concentration increased, 1/pop increased and CH decreased, the changes of CHI appear to be bell curve. Control CHI value was 1.1 g/min, as emodin concentration was 20 $\mu\text{mol/L}$, the CHI had maximum value 2.4 g/min. (2) K_{ATP} channel opener cromakalim inhibited the enhancement action of emodin on electrical and contractive activities of cells. When emodin (20 $\mu\text{mol/L}$) rose CHI from 1.2 to 2.4 g/min, cromakalim (20 $\mu\text{mol/L}$) reduced CHI to 0.3 g/min. As the electrical and contractive activities were eliminated by cromakalim (20 $\mu\text{mol/L}$), emodin (20 $\mu\text{mol/L}$) could recover these activities. (3) When the cells had no contraction, K_{ATP} channel blocker glibenclamide (20 $\mu\text{mol/L}$), the MRC resulted in standard pattern. (4) The relationship between emodin concentration and intracellular $[Ca^{2+}]_i$: As emodin increased from 10^{-7} to 10^{-5} (mol/L), $[Ca^{2+}]_i$ increased from 110 to 330 nmol/L, later $[Ca^{2+}]_i$ decreased with emodin increased.

CONCLUSION: The basis of membrane potential oscillation and MRC is periodic change of activity of K_{ATP} channel. Action mechanism of emodin may be to inhibit the activity of K_{ATP} channel that cause membrane depolarization, improve Ca^{2+} channel opening and increase Ca^{2+} influx, then induce intracellular Ca^{2+} release and increase $[Ca^{2+}]_i$ so that enhance cellular contractive activities.

Key words: Emodin; K_{ATP} channel; $[Ca^{2+}]_i$; Guinea-pig taenia; Coli cells

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