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Effects of Ginsenosides on Cardiomyocytes and NF in Type 2 Diabetes Rats- κ B Expression

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Abstract: Objective: To explore the clinical medicinal value of ginsenosides. Methods: 24 male type 2 diabetes rats aged 7 weeks were taken as the research object, and the myocardial cell morphology, inflammatory factor content and NF in each group were observed by grouping them with different doses- κ B expression. Result: The swelling degree of cells in the CP+Rg50 group was alleviated most significantly, with a significant reduction in deep staining of the nucleus, a significant reduction in cell shrinkage, and a basic trend towards normal cell morphology. Meanwhile, compared to the control group, the CP+Rg50 and CP+Rg25 groups showed significant differences in IL-1 levels β/ IL-6, TNF- α It also significantly decreased horizontally ($P<0.05$); NF of CP+Rg25 Group and CP+Rg50 Group- κ The expression level of B protein was also lower than that of CPCG Group ($P=0.02$) and close to that of NCG Group ($P>0.05$). Conclusion: Ginsenoside Rg1 has significant effects in the treatment of cardiomyopathy and is worth promoting in clinical practice.

Keywords: Ginsenoside Rg1; Type 2 Diabetes Rats; Myocardial Cells; NF- κ B

1. Introduction

The main pharmacological active ingredients of ginsenosides include ginsenoside Rg1, ginsenoside RH2, Rg3, and ginsenoside G-Rg3. Among them, ginsenosides RH2, Rg3, and PDL1 have significant effects in the mechanism of action in gastric cancer, while Rg3 treatment can regulate the expression of matrix metalloproteinase-2 (MMP-2) and MMP-9 and inhibit the expression of epithelial mesenchymal transition (EMT) related transcription factors, which has a significant effect on inhibiting the migration and invasion activity of nasopharyngeal carcinoma (NPC) cells.

In addition, some studies have pointed out that ginsenoside Rg1 may also inhibit tumor cell proliferation and induce tumor cell apoptosis by regulating pathways and immune functions, possessing good anti-tumor ability and broad clinical application prospects. In order to further explore the effect of ginsenoside on cardiomyocytes, this paper will take type 2 diabetes rats as an example to study it and explore the transcription factor NF- κ The expression of B.

2. Materials and Methods

2.1 Research materials

Twenty four male type 2 diabetes rats aged 7 weeks were used in the experiment. These animals do not have specific pathogens and are kept in separate cages, each containing six mice. The environmental conditions, including temperature, relative humidity, and light/dark cycle, all comply with standard procedures. Domesticate the rats for a week and provide standard rat food and water at will. The program used in this experiment was approved by the Animal Ethics Committee of the School of Basic Medicine, Guangxi Medical University. In addition, strict adherence to the guidelines of the National Institutes of Health's "Guidelines for the Care and Use of Experimental Animals" (NIH Publication No. 8023, revised in 1978).

2.2 Experimental Plan

All animals were divided into the following groups: normal control group (NCG), model group (CPCG), low-dose ginsenoside group (CP+Rg25), and high-dose ginsenoside group (CP+Rg50). Rats in the NCG and CPCG groups were given 5% Tween 80 daily for 5 weeks. At the same time, rats in the Rg25+CP group and Rg50+CP group were given 25 and 50mg/kg of ginsenoside, respectively, for 5 weeks.

Starting from the second week of treatment, all rats, except for the NCG group, received weekly intraperitoneal injection of CP (100mg/kg) for 4 weeks. An overview of the experimental design is shown in Figure 1. The CP and Rg concentrations used in this study were based on early studies. At the end of the experiment, all rats were anesthetized with thiopental sodium and blood was collected directly through cardiac puncture. The serum obtained from whole blood after centrifugation is used to analyze the levels of cardiac natriuretic peptide in heart tissue.

After euthanasia, the rat heart tissue was dissected, washed with distilled water, and weighed. Afterwards, the heart tissue was homogenized in phosphate buffered saline (pH7.4) at 6000rpm at 4 ℃ for 30 minutes, and the supernatant collected after centrifugation was stored at -80 ℃ until further analysis.

2.3 Organizational analysis

H&E staining was performed on fixed heart tissue with 10% buffered monomerrin. The heart tissue is dehydrated in a graded alcohol solution and waxed with paraffin. The staining procedure follows the standard H&E staining scheme.

2.4 Detection of inflammatory factor content in myocardial tissue

Approximately 50mg of myocardial tissue was taken from each rat and prepared into a 10% homogenate at 3000r/min, centrifuged at 4 ℃ for 10 minutes. The supernatant was collected and detected for interleukin-1 in the supernatant using an ELISA kit β (IL-1 β)\ Interleukin-6 (IL-6) and tumor necrosis factor- α (TNF- α) Content. Measure the OD value using an enzyme-linked immunosorbent assay (Thermo Fisher Scientific China) at 450nm. To ensure quality, all the above experimental processes need to be repeated 3 times.

2.5 Statistical Analysis

Analyze the data using one-way AVONA and Newman Keuls post test using Graph Pad Prism (5th edition). The results are displayed as mean ± standard deviation. $P<0.05$ is statistically significant

3. Results

3.1 Comparison of cell morphology of myocardial tissue in each group

By using an optical microscope to observe the collected samples, the results are shown in Figure 1:

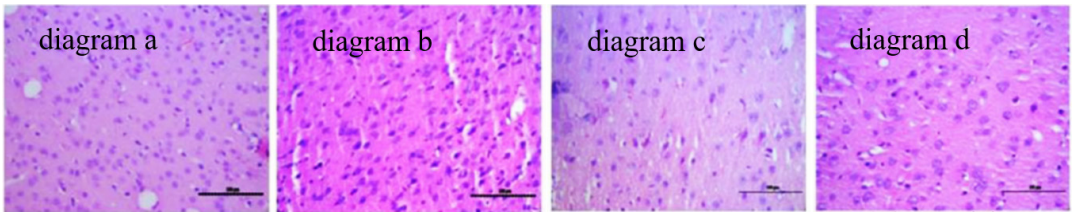

Figure 1 Comparison of the morphology of myocardial tissue cells in each group

As shown in the above figure, the morphology of myocardial tissue cells in the NCG group (Figure a) was normal, arranged neatly, with intact cell nuclear membranes and clearly visible nucleoli, without obvious nuclear pyknosis; In the CPCG group (Figure b), the cell volume of myocardial tissue in rats was significantly reduced, with obvious nuclear pyknosis and deep staining. Cell edema was evident, and there was significant cell infiltration in the intercellular space, with obvious necrotic cells visible; The edema status of myocardial tissue cells in the CP+Rg25 group (Figure c) and CP+Rg50 group (Figure d) of rats was improved compared to the CPCG group, and the edema status of cells showed varying degrees of reduction. Among them, the swelling degree of cells in the CP+Rg50 group was alleviated most significantly, with a significant reduction in nuclear staining, a significant reduction in cell shrinkage, and a basic trend towards normal cell morphology.

3.2 Comparison of inflammatory factor content in myocardial tissue of each group

As shown in Table 1, compared with the NCG group, the CPCG group, CP+Rg25 group, and CP+Rg50 group showed significant dif-

ferences in IL-1 β、 IL-6, TNF- α The levels were significantly elevated, and the differences were statistically significant (P<0.05).

Table 1 Comparison of inflammatory factor content in myocardial tissue of rats in each group

Group	IL-1β	IL-6	TNF-α
NCG Group(n=6)	0.64±0.17	13.78±2.45	4.36±0.09
CPCG Group(n=6)	7.98±0.28 ①	283.52±20.56 ①	86.24±3.51 ①
CP+Rg25 Group(n=6)	6.31±0.41 ①②	220.85±15.76 ①②	63.55±3.40 ①②
CP+Rg50 Group(n=6)	4.26±0.53 ①②③	114.39±15.12 ①②③	36.51±4.25 ①②③

Note: P<0.05, statistically significant. ① Compared to NCG Group, ② compared to CPCG Group, and ③ compared to CP+Rg25 Group.

Based on the above table, it can be seen that compared with the CPCG group, the CP+Rg25 group and the CP+Rg50 group have IL-1 β、 IL-6, TNF- α The level has significantly decreased. P<0.05 indicates statistical significance. Meanwhile, compared with the CP+Rg50 group and the CP+Rg25 group, in IL-1 β、 IL-6, TNF- α There is also a significant decrease in level. P<0.05 indicates statistical significance.

3.3 NF of myocardial tissue in each group- κ B expression

As shown in Figure 2, the NF of CPCG Group- κ The expression level of B protein is significantly higher than that of NCG Group, while the NF of CP+Rg25 Group and CP+Rg50 Group is significantly higher- κ The expression level of B protein was also lower than that of CPCG Group (P=0.02) and close to that of NCG Group (P>0.05).

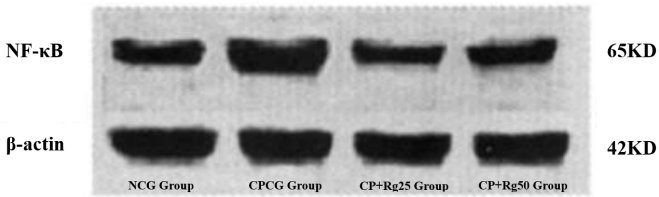

Figure 2 NF of myocardial tissue in each group- κ B expression

4. Conclusion

Ginsenoside, as a multi ion channel blocker, can reduce the self-discipline of damaged myocardium, reduce the formation and conduction of abnormal impulses, and play an anti arrhythmic role. This article takes rats as an example, and studies have shown that ginsenosides can alleviate cell damage caused by hypoxia and reoxygenation. The reason for this is the occurrence of myocardial ischemia-reperfusion injury, which is essentially caused by deficiency of qi and blood, deficiency of blood vessels, inability to nourish the myocardium, causing myocardial damage, chest pain, palpitations, and other symptoms. The research results of this article are similar to previous theories. Based on this, it is concluded that ginsenoside Rg1 has the effect of restoring qi and blood, promoting myocardial regulatory ability, maintaining normal blood and myocardial function, and reducing myocardial damage in clinical practice. Therefore, it is worth promoting in clinical practice.

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