

Research on effect of ginkgo aglucone flavone to Human body organs and immune function

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Abstract: Ginkgo aglucone flavone is a kind of effective natural antioxidant. Lots of researches show that ginkgo aglucone flavone has various biological activities and it is of great importance to antioxidant, anti-aging, free radical scavenging and immunoregulation. However, researches on effect of ginkgo aglucone flavone to immune function are rare so far. Thus, it is important to go into the effect of ginkgo aglucone flavone to immune function. We can find out more effective measurement that resist immunosuppression through research and provide referable science activity form and suggestion of sports nutrition supplements. It can guide people to improve habitus through supports and establish important basis for new area development of folium ginkgo extract. This paper aims to discuss the effect of ginkgo aglucone flavone to human body organs and immune function. Patients with ginkgo aglucone flavone indications are selected for experiment. Their peripheral blood T lymphocyte subsets and content of serum immunoglobulin is detected before and two weeks after drug use. The result shows that specific ratio of T lymphocyte subsets CD₃ and CD₄ and the content of serum IgG significantly increase after pharmacy of patients. It can be concluded that ginkgo aglucone flavone have acceleration on immune system function.

Keywords: Ginkgo aglucone flavone, human body organs, immune function; T lymphocyte subsets

INTRODUCTION

Lots of researches found that ginkgo aglucone flavone have various biological activities and have remarkable effect on antioxidant, anti-aging, free radical scavenging, anti-neoplastic, anti cancer, blood fat reducing, anti-coagulation, anti-inflammation, radio resistance and immune adjustment (Xiangzhong *et al.*, 2010). It is of great significance to discuss the effect and mechanism of ginkgo aglucone flavone on human body immune function according to these pharmacologic effects of ginkgo aglucone flavone.

Research shows that cause and development of many diseases are all related with free radical, such as skin aging, angiosclerosis, mitochondria abnormality, damage of brain tissue, canceration etc. Free radical in biological body can be divided into two kinds. One is endogenous free radicals related to oxygen metabolism, such as ·O₂·, ·OH, ROO· etc. The other is exogenous free radicals such as ·O₃·, ·NO₂ etc which come from polluted atmosphere and smog (Weiguo and Gang, 2010). Surplus free radical in the body will attack biomacromolecule such as fat, protein, nucleic acid, unsaturated acid, etc, cause crosslinking or rupture and generate hazardous substance. It will also affect the biofilm function and protein conformation and cell function loss, which will lead to degeneration or death of cells. Many substances that can scavenge and inhibit free radical exist in the human body, such as SOD, CAT, GSH-PX etc. They can scavenge surplus free radical and prevent lipid peroxidation to

maintain relative balance of generation and removal of free radical in human body. Mechanism of flavonoid compounds scavenging free radical is consistent with some synthetic antioxidant such as BHA and BHT. That is, reaction of phenolic hydroxyl and oxygen free radical generate semiquinone free radical with stable resonance to terminate chain reaction of free radical and effectively inhibit peroxidation. Besides direct scavenging of free radical, flavonoid compounds also can inhibit the generation of free radical by combination with oxidase in the body. Rebai Ben Ammar found that ginkgo aglucone flavone have strong capacity of scavenging free radical. And scavenging rate shows obvious rising trend with the increase of concentration of flavone (REDDP, 2006).

TC, TG, HDL, liver cholesterol and HTGC level are main indexes reflecting body lipid metabolism. Elevated blood fat is closely related to atherosclerosis, cardiovascular and cerebrovascular disease. However, ginkgo aglucone flavone can also reduce blood fat. Therefore, ginkgo aglucone flavone can inhibit atherosclerosis and cardiovascular and cerebrovascular disease. After feeding rat with fodder contain FG for four weeks, Dai Wei et al found that content of TC, TG, HTGC and liver cholesterol is significantly lower compare with control group (P<0.05). Wang Li et al cure nephrotic syndrome patients with hyperlipidemia by ginkgo leaves combined with Lescol (fluvastatin sodium capsules). And finally they found that it have a function of decrease TG, cholesterol and LDL as well as increase HDL (REBAI *et al.*, 2009).

Ginkgo aglucone flavone has effect of anticoagulation. Flavonoid compound can strongly inhibit blood

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coagulation factor. Research found that ginkgo flavonoid compound of different concentration has different extent on inhibiting platelet aggregation of rat induced by ADP. It can also inhibit the platelet aggregation of rabbit and sheep induced by 5- hydroxytryptamine and ADP (Li *et al.*, 2007). In addition, flavonoid compound in Ginkgo leaves can lower hydroxyproline metabolism of vascular endothelial cell, collagen and collagenous fiber in intine. It can prevent blood platelet agglutination, thrombosis and atherosclerosis. High-purity ginkgetin can promote microcirculation, dilute blood and inhibit platelet activating factor. Research on pharmacologic effect of Ginkgo biloba has been widely reported. However, the current researches focus on cardiovascular function and research on immune system function is rare (Wei *et al.*, 2003). We chose 13 cases of patients with ginkgo aglucone flavone treatment and measure immunity before and after medication.

METHODS AND MATERIALS

Case selection standard: patients with adaption disease of Ginkgo biloba leaf extract (cerebral artery and coronary artery blood supply deficiency, hypertension and peripheral vascular spasm); without immune system disease; age from 20 to 65.

Case source and general situation: all cases are from inpatients of our department from Oct. 2011 to Jan. 2012. There are 5 male and 8 female. The oldest is 65 years old and the youngest is 43 years old. Distribution range of disease entity is 2 cases of cerebral infarction, 10 cases of cerebral arteriosclerosis and 1 case of hypertension.

Experiment method: 200ml of Ginkgo biloba leaf extract injection (contain 100 mg of ginkgo aglucone flavone and produced by pharmacy department of first affiliated hospital from Guangxi Medical University). 1 times per

Table 1: T lymphocyte subsets ratio (%)

Before and after pharmacy	N	CD ₃	CD ₄	CD ₈
Before pharmacy	13	57.08±5.56	36.77±4.76	21.69±1.75
After pharmacy	13	62.69±3.59	41.00±3.83	21.23±1.42
P		<0.01	<0.01	<0.50

Table 1 shows that peripheral blood T lymphocyte CD₃ CD₃ and CD₄ CD₄ subsets obviously increased compared with that before treatment. Ratio of T lymphocyte CD₃ subsets increased 5.61% while that of CD₄ subsets increased 4.23%. Although CD₈ CD₈ decreased 0.46%, the change was not so obvious.

Table 2: Content of IgA, IgG and IgM in serum (pa/g.L⁻¹)

Before and after pharmacy	N	IgA	IgG	IgM
Before pharmacy	13	1.39±0.44	8.63±2.56	1.09±0.28
After pharmacy	13	1.61±0.52	11.56±3.80	1.27±0.51
P		>0.05	<0.05	>0.10

Table 2 shows that content of serum IgG had an obvious increase of 2.93(pa/g.L⁻¹ pa/g.L⁻¹) compared with that before medication. Content of IgA and IgM had an increase equal to or below 0.22(pa/g.L⁻¹) that was not obvious.

day of intravenous drip for 2 weeks. Serum immune globulin (Ig) and peripheral blood T lymphocyte subsets ratio should be measured for one time each 1 day before and after pharmacy. Medicine that can function on immune system was stooped during pharmacy.

Measure of T lymphocyte subsets: adopt method of APAAP (Wanming, 1991). 2ml of anticoagulation was took and centrifuged. Monocular cells were took and smeared. Then T lymphocyte monoclonal antibodies, APAAP compound, alkaline phosphatase substrate and hematoxylin were added. It was observed under the high power lens. We counted 100 monoculars and calculate rate of positive cells.

Measure of IgA, IgG and IgM in serum: adopt colors IgA, IgG and IgM single diffusion plate method. We added 0.3 ml of normal saline into 0.1 ml of blood and mixed it up. 10µl was took for measure of IgA and IgG and 20µl for measure of IgM. They were injected into plate hole of IgA, IgG and IgM. Diameter of precipitation ring was measured after a certain time. And content of IgA, IgG and IgM were calculated according to content table.

Sstatistical approach: t test method was adopted in all data (Jinsuo, 2006). Data was expressed as ±s.

RESULTS

T lymphocyte subsets ratio as shown in table 1 Content of IgA, IgG and IgM in serum as shown in table 2

Analysis

The ratio of T lymphocyte subsets and concent of IgA, IgG and IgM in the table show that: After Ginkgo biloba leaf extract injection intravenous drip on the patients of our department, T lymphocyte CD₃ CD₃ and CD₄ CD₄ subsets and serum IgG content increased obviously

compared with that before medication. However, the change of T lymphocyte CD₈ CD₈ subsets and IgM content was not obvious and within the normal range. CD₈ CD₈ is the symbol of mature T lymphocyte subsets. CD₄ CD₄ is the symbol of subservience (Inductivity) T lymphocyte (Th/Ti Th/Ti). These two kinds of cells all participate in immune response of specific cells. In addition, Th/Ti Th/Ti cells have a regulating effect on cellular immune response. Increase ratio of T lymphocyte CD₃ CD₃ and CD₄ CD₄ subsets illustrates that immune function of specific cells improve. Serum IgG is produced by B lymphocyte. Serum content of it is the highest. It is the main immune molecule participating in humor immune response directly. The increase of serum IgG illustrates that humor immune function improvement. Therefore, we can know that the Ginkgo aglucone flavone injection have an acceleration on immune function. It can effectively improve immune function of human body.

DISCUSSION

Modern pharmacological research found that ginkgo leaf have various effective active ingredient such as flavonoid, lactones etc and its pharmacologic effect is very complicated. We observed that ratio of T lymphocyte CD₃ CD₃ and CD₄ CD₄ subsets and content of serum IgG increased obviously. T lymphocyte CD₃ subsets improved from 57.08% ±5.56% **57.08%±5.56%** before medication to 62.69%±3.59% **62.69%±3.59%** after medication. T lymphocyte CD₄ subsets improved from 36.77%±4.76% **36.77%±4.76%** before medication to 41.00%±3.83% **41.00%±3.83%** after medication. Serum IgG content improved from (pa/g.L⁻¹) (pa/g.L⁻¹) to 11.56±3.80 **11.56±3.80**. CD₈ is the sign of mature T lymphocyte and CD₄ is the sign of subservience (inductivity) T lymphocyte (Th/Ti). These two kinds of cells all directly participate in specific cellular immune response and Th/Ti cells have excitation and regulation function on cellular immune response. Increase of T lymphocyte subsets CD₃ and CD₄ ratio illustrates that specific cellular immune function can strengthened. Serum IgG is produced by B lymphocyte and have the highest content of serum, which is the main immune molecule in direct participation in humor immune response. Increase of Serum IgG show that body humor immune function can be strengthened.

Ginkgo is the specific plant in China. Traditional Chinese medicine hold that ginkgo is good to heart and lung and have the function of dampness resolving and anti-diarrheal. It is applied to cure chest pain, cough, humid asthma, diarrhea etc in Clinical. W found that ginkgo leaf extract can strengthen body immune function. It hints that besides the confirmed function of cardiovascular expansion, bronchial dilation, antibiosis and anti-phlogosis, pharmacological basis of ginkgo leaf by traditional Chinese medicine is also related to its immunological enhancement (Matsushima and Morimoto, 2009).

CONCLUSION

Research on effect of ginkgo aglucone flavone on immunity provides referable scientific basis for immunity reinforcement. It can also guide people to improve physical fitness by relative drug and enhance life quality. In addition, it establishes important basis for the development of ginkgo extract on the new area (Yang et al., 2010).

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