高神大學醫學部 論文集 第2卷 第1號
The Journal of Kosin Medical College
Vol. 2, No. 1, March, 1986

THE EFFECT OF GINSENG EXTRACT ON BLOOD COMPONENTS IN RAT.

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= Abstract =

In this experiment, it was attempted to observe the possible effect of Korean ginseng on growth rate and blood components to make a contribution to revealing partially the physiological action of ginseng in orally long-term administered rat.

The following results were obtained;

1) The overall body weight and growth rate with the ginseng administered group showed no significant difference compare to the control group
2) The total blood serum protein of the ginseng administered group was increased, while serum albumin showed no difference
3) The alkaline phosphatase activity of the test group was significantly increased during the maturation period.
4) The triglyceride and total cholesterol level of the test group were slightly decreased while, HDL-cholesterol and phospholipid were increased.
5) The total lipid content of the test group was significantly decreased during the test period.
6) The hematological value showed no difference between the control and the test group.

From the above results, it was suggested that the use of ginseng as a food substance or medicine helps maintain health through stimulating enzymes related to the metabolism of lipid.

I. INTRODUCTION

Ginseng has been recognized as the most prized medicine among all herbal medicine. In recent years, there has been an increasing tendency to adult diseases, such as atherosclerosis, diabetics and obesity, probably due to the high-fat and high-cholesterol diet due to the improved living condition and enviromental factors. As a result, increasing number of people have turned to ginseng to counter this trend.

Ginseng has been known to have a tonic

effect and it is the general opinion of many researchers that ginseng has the effect of normalization of physical condition, that is, maintaining individual homeostasis.[1,2]

A number of published datas demonstrated the various biochemical and pharmacological effects of ginseng.

Popov[12] reported his clinical studies that administration of ginseng to a group of atherosclerosis patients with cholesterol level of 280 to 310% lowered the blood cholesterol level of patients down within in a normal level(below 225㎎/%).

Yamamoto[15] and his coworkers demonstrated that administration of ginseng powder and ginsenosides to hyperlipidemia rats and patients showed that the serum HDL-cholesterol level was significantly increased, while decreased total cholesterol, triglyceride, nonesterified free fatty acid and platelet adhesiveness.

Nahm[11] cytologically examined the effects of ginseng on the aorta, heart, coronary arteries and atherosclerosis of the liver of rabbits which suffered from hypercholesterolemia caused by long administration of cholesterol, thus suggesting that atherosclerosis-like change and sudanophilia were not caused by the administration of ginseng powder.

Joo and his coworkers[6] reported that ginseng saponin might prevent the formation of atheroma in the aorta tissue of prolonged cholesterol administered rabbits. In addition, the blood serum cholesterol level and cholesterol/phospholipid ratio were decreased in the ginseng treated group. They suggested that ginseng saponin might stimulate the enzyme releating to the metabolism of lipid including cholesterol, particulary to cholesterol transport, resulting in the delay of the rise of cholesterol level in blood, consequently the prevention of atheroma formation in such tissue as aorta.

It is still doubtful whether the entire effect of Saponin can be solely attributed to the components of Saponin A number of studies reveal the prescence and isolation of anti-cancer effective components, anti-oxidation and anti-diabetic substance from ginseng.

In connection with the above results, it was attempted in the present study to observe the possible effect of ginseng extract on blood components and to make a contribution to revealing partially the physiological action of ginseng extract in rat.

Ⅱ. MATERIALS AND METHODS

1. Preparation of ginseng extract powder.

The ginseng extract powder was obtained from red ginseng roots (6 years old) extracted with 70% ethanol at 70℃ for 72hours. The extract was then concentrated under the vaccum pressure and lyophilized with LABCONCO FREEZE DRYER.

2. Administration of ginseng extract.

Sprague-Dawley rats (male, 60~80g), fed a normal diets, were used as experimental animals. Two groups of 96 animals were established with each group being administered ginseng extract for 1 and 4 months. These groups were further divided into 4 subgroups, each consisting of 12 animals. One subgroup was given normal diet and established as control, Subgroup 1 was orally administered 10㎎/㎏ body weight/day. Subgroup 2 was given 50㎎/㎏ body weight/day and Subgroup 3 was administered 150㎎ ginseng extract/㎏ body weight/day.

3. Weight determination and blood analysis.

Each group was weighed once a week during the entire period of the experiment.

The animals to be sacrificed were not fed for the last 24hours, anesthetized with sodium thiopental. The blood was taken from the heart, and a portion of blood was immediately stabilized with EDTA in a test tube and used for blood count and hemoglobin level determination using ZBI Coulter-counter.

4. Reagents

Commercially available kit reagents (Iatron Co. Japan) were used for measuring total cholesterol, triglyceride, phospholipid and HDL-cholesterol. Gilford Chemical Autoanalyzer (Gilford system 3500) was used for determination of total protein, albumin and alkalinephosphatase Total lipid was measured using Med-Chem, Inc kit reagent.

Ⅲ. RESULTS AND DISCUSSION

It is still uncertain that ginseng is effective on body weight growth and basal metabolism. Han[4] and Kim[7] have shown that body weight and basal metabolism were not significantly changed by ginseng treatment compare to the control group. Contrary to above results, Kim[9] and Hwang[13] reported that body weight and basal metabolism were increased by the treatment with ginseng extract.

To verify the above results, it was examined the effect of ginseng extract on body weight and growth rate. As shown in figure 1, each test group showed a slight difference in body weight change during the test period, but no significant difference were observed. The overall weights of the 4-months administered group showed very little difference between the 4-subgroups. This result suggests that ginseng did not affect on body weight and growth rate

It was examined the effect of ginseng extract on total protein, albumin and alkaline phosphatase of blood serum in long-term administered rat. The total protein of blood serum was increased among the test animals, as shown in figure 2. The 1 month administered groups had levels similar to controls. Overall, the test animals showed a slight increase in the amount of protein present and this agree with the reports that ginseng stimulates protein synthesis.[4,11] The albumin level of both the test and the control was similar as shown in figure 3. However, alkaline phosphatase activity of the test groups after the 1 month ginseng extract administration was significantly increased as shown in figure 4.

The increase of enzyme activity was not related to be concentration of ginseng extract feeding. The alkaline phosphatase activity was age-dependent and the enzyme activity of the both groups was similar after the maturation period.

It is well-known fact that arteriosclerosis is caused by increased blood concentration of cholesterol and triglyceride. Pathogenesis of atherosclerosis which is the most closed associated type with lipid metabolism among three arteriosclerosis. Low density lipoprotein (LDL), rich in cholesterol ester, intruded into affected arterial wall, where acidic cholesterol-esterase splits cholesterol-ester and and free cholesterol is subjected to trapping by high density lipoprotein in serum, which transports cholesterol for further degradation to the liver

It was also examined the lipids of blood

serum after the ginseng extract administration. As shown in Figure 5, triglyceride level in test group was slightly decreased during the experimental period. Particulary, subgroup 3 showed a lower level than control group. The total serum cholesterol level of the 1 month administered group was similar to that of control group as shown in Figure 6. But, the total cholesterol level after the 4 month administered group was significantly decreased to that of control group. This result suggested that ginseng might work to delay in the rise of cholesterol level of the blood. It was also found that the HDL-cholesterol and phospholipid of the test group were increased during the experimental period as shown in Figure 7, 8. These results agreed with Yamamoto[15] and Joo.[7] It is interesting that the ratios of total cholesterol and triglyceride to phospholipid of the test group were lower than those of controls. It is well known that phospholipid plays an important role in the transport of lipids including cholesterol. Therefore, increase of phospholipid and HDL-cholesterol of blood serum by the ginseng administration might faciliate the transport and metabolism of cholesterol in the body. Furthermore, it appeared that total serum lipid content of ginseng administered group were significantly lower than that of control group as shown in Figure 9 suggesting that ginseng seemed to accelerate the hydrolysis of chylomicron probably via lipoprotein lipase action.

From the above results, it seemed that ginseng might stimulate the enzymes relating to the metabolism of lipid including cholesterol transport, resulting in the delay of cholesterol level rise in blood

It was further studied the variation of RBC, WBC, hemoglobin and hemotocrit value after

Table 1. Hematological values of orally administered rats with ginseng extract for 1 month.

Item / Dosage	RBC (10^{12}/L)	WBC (10^{9}/L)	Hct (%)	Hg (g/dl)
Control	6.86 ± 0.44	6.71 ± 1.69	48.3 ± 6.2	12.3 ± 1.1
Test 1	6.65 ± 0.38	6.75 ± 0.57	48.5 ± 1.7	12.4 ± 0.6
Test 2	6.50 ± 0.65	6.72 ± 1.02	43.8 ± 5.0	12.2 ±0.9
Test 3	6.79 ± 0.40	6.72 ± 0.69	44.0 ± 4.3	12.7 ± 0.4

Table 2. Hematological values of orally administered rats with ginseng extract for 4 months.

Item / Dosage	RBC (10^{12}/L)	WBC (10^{9}/L)	Hct (%)	Hg (g/dl)
Control	6.90 ± 0.70	7.21 ± 0.67	46.3 ± 2.9	15.0 ± 0.7
Test 1	6.41 ± 0.34	6.09 ± 0.46	46.3 ± 2.1	14.8 ± 0.6
Test 2	6.13 ± 0.29	6.72 ± 1.02	46.5 ± 2.4	14.7 ± 0.6
Test 3	6.16 ± 0.21	6.91 ± 0.02	42.8 ± 2.7	14.6 ± 0.4

T 1 : ginseng extract 10mg/Kg. body weight
T 2 : ginseng extract 50mg/Kg. body weight
T 3 : ginseng extract 150mg/Kg. body weight

the ginseng administration. As shown in Table 1 and 2, No difference was observed between the two groups. These results agree with a previous report by Kim[16] et al.

The above results again suggested that the use of ginseng as a food substance or medicine helps maintain health through stimulating metabolism and absorption especially with respect to lipids. Ginseng is safe and useful food substance and medicine that may helps prevent athereosclerosis and other disorder of old age

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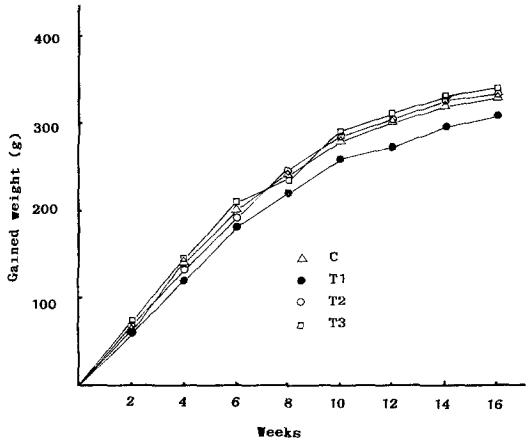

Fig. 1. The growth rate of orally administered rats with ginseng extract for 16 weeks

C : Control
T 1 : Ginseng extract 10㎎/㎏ body weight
T 2 : Ginseng extract 50㎎/㎏ body weight
T 3 : Ginseng extract 150㎎/㎏ body weight

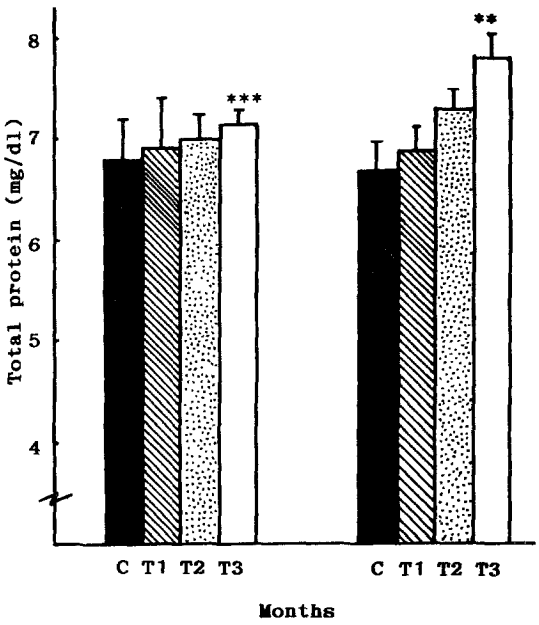

Fig. 2. The total protein of blood serum in orally administered rats with ginseng extract for 1 and 4 months.

C : Control
T 1 : Ginseng extract 10㎎/㎏ body weight
T 2 : Ginseng extract 50㎎/㎏ body weight
T 3 : Ginseng extract 150㎎/㎏ body weight
** : P < 0.01
*** : discard F < 0.05

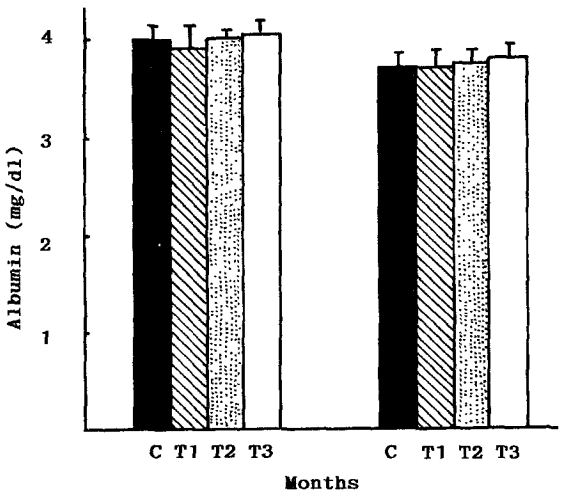

Fig. 3. The albumin of blood serum in orally administered rats with ginseng extract for 1 and 4 months

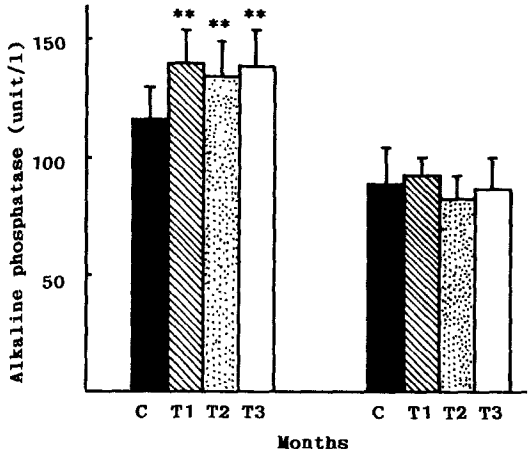

Fig. 4. The alkaline phosphatase activity of blood serum in orally administered rats with ginseng extract for 1 and 4 months.

** : P < 0.01

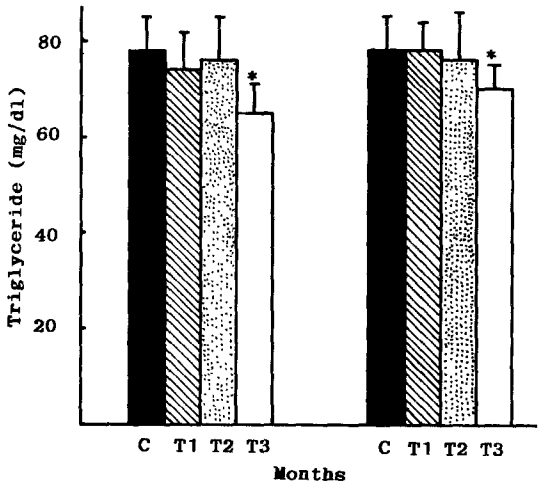

Fig. 5. The triglyceride of blood serum in orally administered rats with ginseng extract for 1 and 4 months.

* : P < 0.05

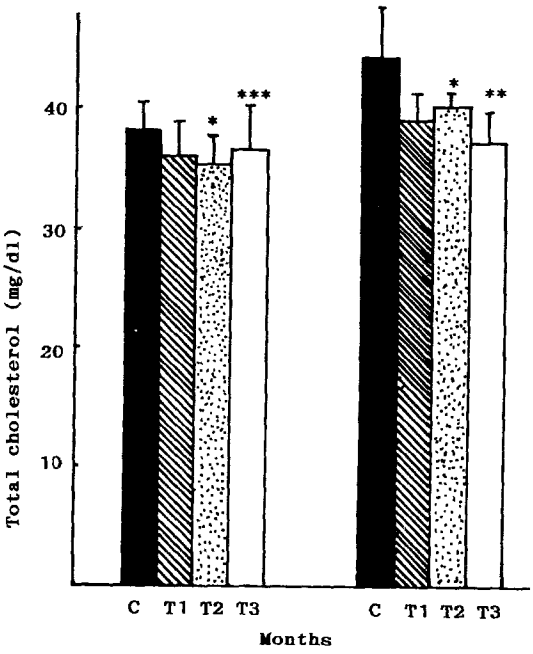

Fig. 6. The total cholesterol of blood serum in orally administered rats with ginseng extract for 1 and 4 months.

* : P < 0.05

** : P < 0.01

*** : discard F < 0.05

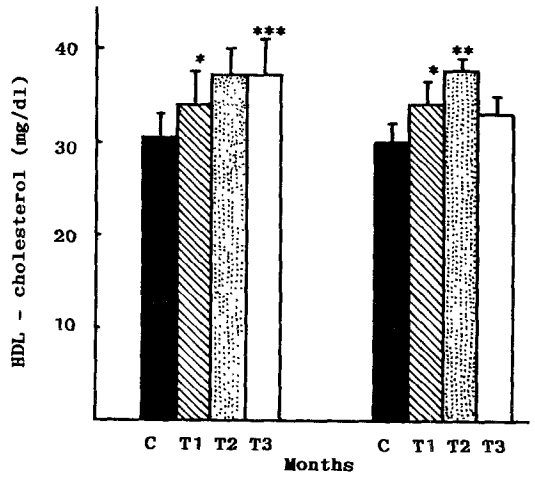

Fig. 7. The HDL-cholesterol of blood serum in orally administered rats with ginseng extract for 1 and 4 months

* : P < 0.05

** : P < 0.01

*** : discard F < 0.05

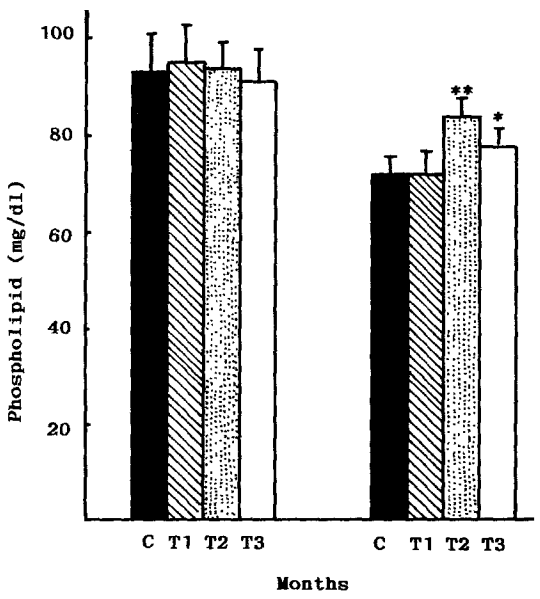

Fig. 8. The phospholipid of blood serum in orally administered rats with ginseng extract for 1 and 4 months

C : Control
T 1 : Ginseng extract 10mg/kg body weight
T 2 : Ginseng extract 50mg/kg body weight
T 3 : Ginseng extract 150mg/kg body weight
* : P < 0.05
** : P < 0.01

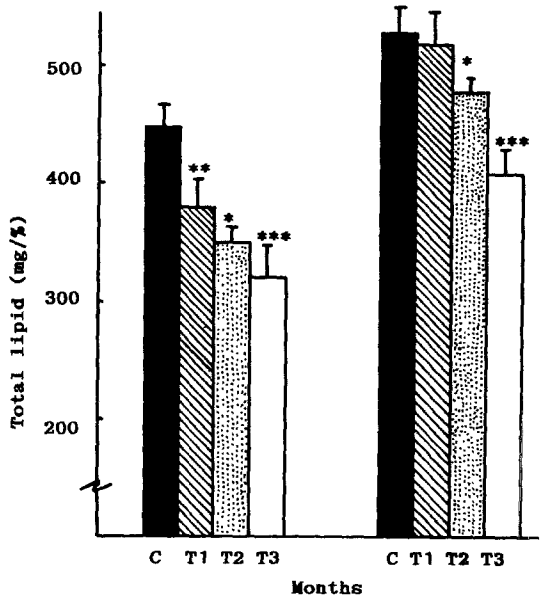

Fig. 9. The total lipid of blood serum in orally administered rats with ginseng extract for 1 and 4 months.

C : Control
T 1 : Ginseng extract 10mg/kg body weight
T 2 : Ginseng extract 50mg/kg body weight
T 3 : Ginseng extract 150mg/kg body weight
* : P < 0.05
** : P < 0.01
*** : discard F < 0.05