高麗人蔘學會誌
Korean J. Ginseng Sci. Vol. 1, No. 1, 59—78(1976)

Studies on the Antidotal Effect of *Panax ginseng*

The Therapeutic Effect of Ginseng on the Acute Alcoholism

Man Ryun Shin

Department of Pharmacology, College of Medicine, Korea University, Seoul 110, Korea

Abstract

In order to investigate the influences of Panax ginseng(white ginseng and red ginseng) on the anesthetic effect and toxic effect of alcohol, experimental studies had been carried out with albino rabbits, mongolian dogs and mice.

The anesthetic effect of alcohol was observed by measuring the induction time, anesthetic time, recovery time and duration from the beginning of induction to the recovery of anesthesia (total time), respectively, and toxic effect (LD_{50}) of alcohol was measured. In addition to these experiments, alcohol concentration in blood, blood sugar level, serum transaminase (GOT and GPT) activities and serum alkaline phosphatase activity were measured.

Also in order to study the clinical effects of alcohol in healthy students, code substitution, response time and muscle coordination were tested. The results were obtained as follows.

1. *In the rabbits and mongolian dogs, the induction time of anesthesia by the administration of alcohol was delayed by the pretreatment of ginseng but recovery time and total time of anesthesia were markedly shortened.*

2. *The blood alcohol concentration was decreased by the pretreatment of ginseng but not affected in mongolian dogs.*

3. *The blood sugar level, serum transaminase (GOT and GPT) activities and alkaline phoshatase activity in rabbits and dogs induced by the administration of alcohol were affected by the pretreatment of ginseng. Because those were included within normal ranges, the differences have no remarkable significance.*

4. *Liver alcohol dehydrogenase activity of rabbit was increased by the treatment of ginseng, especially it was markedly increased by the treatment of red ginseng.*

5. *The average lethal dose of alcohol to mice was increased by the pretreatment of ginseng, especially it was markedly increased by the pretreatment of red ginseng.*

6. *In the clinical experiments, the blood alcohol concentration induced by alcohol administration was not affected by the pretreatment of ginseng whereas the blood sugar level was increased.*

Blood alcohol concentration and blood sugar level were measured after three hours alcohol administration.

7. The response time of healthy students administered with alcohol was markedly shortened by the pretreatment of ginseng but the experiments on the code substitution and muscle coordination were not affected.

Panax ginseng C. A. Meyer has been used as an important folk medicine during past several thousand years in the oriental world.

Its chemical compositions and pharmacological activities have been studied with mordern scientific knowledges and instruments from the beginning of the twentieth century.

Recently, the seven pharmacological actions of ginseng were proposed by Chinese ginseng scientists[1]

1) 補氣救脫 : Body-building, tonic action and prompting the recovery of tiredness.
2) 益血復脈 : Enhancing blood productions and strengthening the pulse.
3) 養心安神 : Sedative action and effects on sympathetic nervous system.
4) 生津止渴 : Stimulating secretions and effect on thirst.
5) 補肺定喘 : Tonic effect on lung and asthma.
6) 健脾止瀉 : Strengthening stomach and gastro-intestinal tracts and anti-diarrheal actions.
7) 托毒合瘡 : Antidotal actions on poisoning and anti-inflammatory actions.

As the therapeutic effects of ginseng were described in the above, ginseng appears to give multi-effects on various symptoms, its exact mode of actions being unknown yet.

Oh[2], Hong[3] and Petkov[4] reported some effects of ginseng on central nerve system, and Park[5] and Moon[6] observed protective actions against physical and chemical stresses.

And certain components of the ginseng seemed to stimulate basic cellular metabolism especially carbohydrate metabolism[7].

In addition Saito[8,9] suggested that the ginseng suppressed the elevation of blood sugar level caused by adrenalin, and also effective on high blood sugar level caused by diuretin.

The works of Abe[10~12] and Kondo implied that such suppressive activity might be contained in alcoholic extract, but not in water portion of ginseng.

Imamura[13] and Kim[14] attempted to explain what mechanism would be involved in such suppressive actions of ginseng against high blood sugar level caused by adrenalin.

One of their explanations was that the saponin fractions in ginseng might play

a key role.

Furthermore Kang[15] found that ginseng stimulated glucose oxidation in liver.

Recently Petkov[16] confirmed that ginseng gave a suppresive action to high blood sugar level, that it showed synergistic action together with insulin and that large dose of ginseng itself also showed direct activity on blood sugar leval. Besides, another observation was added, especially, effective suppression on high blood sugar level caused by adrenalin[17].

Contrary to the above, Kondo[11] did not observe such suppressive action of the ginseng when it was administered hypodermically, and Hai-pen Lei[18] reported that small dose caused rather an increase in the blood sugar level.

Furthermore Cheong[19] reported the ginseng increased the blood sugar level of rabbit caused by excessive morphine and ephinephrine administration.

As all these results showed, it is too early to conclude the exact effect of ginseng on blood sugar level.

Johng[20], Kim[21] and Nahm[22] reported that when the dried powder or water extract of ginseng was given to rabbit, total cholesterol content in blood and liver was measured. They found that the content of cholesterol was reduced such and that action could prevent arteriosclerosis. Volatile oil and fatty acid portion of the ginseng extracts also brought some influences on cholesterol and triglyceride contents[23]. Cheong[24] reported that blood alcohol concentration was decreased rapidly in ginseng treated rabbits.

Several experiments of the ginseng effects on liver toxicity caused by carbon tera chloride, chloroform, and thioacetamide were reported by Yung[25], Lee[26] and Kim[27].

In these experiments, they observed that the administration of ginseng brought about lowering lethal rate, and reduction of blood serum glutamate-oxalate and glutamate-pyruvate transaminase (GOT and GPT) activities. Therefore an antidotal action of the ginseng was strongly suggested by the above experiments.

Alcohol has anesthesizing activity of central nervous system as other synthetic anesthetics and it also gives some effects on reticular system,

The anesthesia by alcohol appeared first at the cerebral cortex and 90% of alcohol was metabolized in body, especially, in liver, and some in kidney[28].

In the present report, the author wish to study the antidotal effect of ginseng on acute alcohol intoxication in rabbits.

We used Korean white ginseng and cooked red ginseng as materials and then measured the duration of anesthesia and level of transaminase (GOT, and GPT)

activity and clinical studies were made.

In addition, alcohol dehydrogenase(ADG) activity and alkaline phosphatase activity were also determined. Furthermore, LD_{50} of alcohol to mice was also measured.

Materials and Methods

For experimental animals, healthy rabbits of about 2.0 kg body weight, mice of 20g, and mongolian dogs of 6 kg were used and kept in consistent environmental condition during experiments. For clinical studies, eight healthy male college students were selected.

Nine rabbits per a group received orally either the gineng extracts or physiological saline, and 20 min later, 15 m*l*/kg of 25% alcohol were i.p. injected to the experimental group.

Twelve hours before the experiments seven dogs/group had received no food and then 10 ml/kg of physiological saline was orally administered. Then 20 min later, 10 m*l*/kg of alcohol was orally administered, and next 20 min later, 5 m*l*/kg of 30% alcohol was i.p. injected as for the controls. Then, 48 hrs. later, 10 m*l*/kg of the ginseng extracts were orally administered and same amount of alcohol as the control group was followed, then next 48 hrs. later, the red ginseng extracts 10 m*l*/kg was orally administered and same amount of alcohol as the control groups was administered.

Human samples received orally the ginseng extracts and the control groups received barley tea. Then 20 min later, every individuals drank "*So Ju*" (=Korean hard liquor) (420 ml~600 ml).

Next 3 hrs. later, blood samples were taken in order to measure the alcohol content and blood sugar.

And code substitution, response time, and muscle coordination were observed. And every one and two weeks later, 100 m*l* of white ginseng and red ginseng extract were given orally again together with 100 m*l* of alcohol respectively.

A) Effects on anesthesia by alcohol

After injection of ethanol, the induction time, anesthetic time and the total duration time were measured in rabbits and mongolian dogs.

B) Alcohol content in blood

Blood samples were taken from intravenous vein and Gibson and Blotner method[29] was employed to measure the content.

C) Blood sugar level

Blood samples were withdrawn from the vein and Somogyi method[30] was employed, using Spectronic 20.

D) Blood serum transaminase activity

Blood serum GOT and GPT were determined as a measure of transaminase activity.

Blood samples withdrawn from the vein were centrifuged in 3000 rpm for 15 min, then serum layer was seperated and Reitman-Frankel method was employed to measure the enzyme activity[31].

Blood samples which were already in hemolysis were not used for the experiments.

E) Hepatic alcohol dehydrogenase(ADG) activity

After rabbit received either ginseng extracts or saline, the rabbit liver was taken and was washed with 1.8 M KCl solution.

The sample was homogenized and centrifuged at 8.000×g for 5 min at 2°C in Beckmam J-21.

The supernatant was collected and centrifuged again at 3900×g for 60 min.

The supernatant was diluted with 4 times volume of 1.8 M KCl and 2 times of 0.01 M phosphate buffer(pH).

This crude cell preparation was employed as the enzyme source.

Bonnichsen method[32] and Chu[33] method were employed to measure the enzyme activity and reaction mixture is shown in the following table.

Table I. The composition of the reaction mixture of rabbit liver alcohol dehydrogenase

	Blank cell	Test cell
Ethanol	0.3 m*l*	0.3 m*l*
Wather	0.5 m*l*	—
Enzyme preparation	—	0.5 m*l*
NAD solution	1.0 m*l*	1.0 m*l*
Glycine buffer	5.0 m*l*	5.0 m*l*

F) Alkaline phosphatase activity

Crude enzyme was prepared in the same manner as that of transaminase experiment. King-Armstrong method[34] was employed to measure the enzyme activities.

G) LD_{50} of alcohol

Ten mice per group received alcohol, two marginal doses such as the amount of alcohol that makes all mice dead and the amount that makes all mice, alive were obtained. LD_{50} was calculated by using Behrens-Kaerber method[35].

As the reagents, absolute alcohol was purchased from Merck Co. and the extracts

of white and red ginsengs were prepared as follows. Hundred grams of red or white ginseng were sectioned into pieces and extracted with hot-boiling water for 6 hrs, then water was added to make 500 ml.

Results

A) Effects on Anesthesia

1. Control group

The induction time, anesthetic time, recovery time and total duration time were 10.1±2.3, 58.9±16.8, 259.7±28.1 and 328.6±33.6 min, respectively as shown in Table I.

The control group which received 30% alcohol showed the induction time, anesthetic time, recovery time, and total duration time as 14.8±0.92, 26.0±12.06, 191.8±13.22 and 232.5±16.00 min, respectively(Table II).

Table II. The influenec of *Panax ginseng* [White ginseng(W.G.) and Red ginseng(R.G.)] on the anesthetic effect of alcohol in rabbits.

Duration of anesthesia (min.) / Medication	Induction time		Anesthetic time		Recovery time		Total time	
	M±S.E.	Difference (%)	M±S.E.	Difference (%)	M±S.E.	Difference (%)	M±S.E.	Difference (%)
Saline+alcohol	10.1+2.3		58.9±16.8		259.7±28.1		328.6±33.6	
W.G.+alcohol	10.5+1.5	4.0	36.4±11.4	−38.2	172.8±27.5	−33.5 P<0.02	219.6±31.8	−33.2 P<0.05
R.G.+alcohol	16.6+2.8	64.4 P<0.05	28.6±10.7	−51.4	137.8±18.9	−46.9 P<0.001	183.0±14.2	−44.3 P<0.001

2. Test group received white ginseng extract

Healthy rabbits which received 20 ml/kg of ginseng extracts showed that their induction time, anesthetic time, recovery time were 10.5±1.5, 36.4±11.4, 172±27.5 and 219,6±3.8 min respectively.

Therefore, recovery time and total duration time appeared to be longer as 33.5% and 33.2% respectively than those of the control group(Table I).

In case of mongolian dogs which received the ginseng extracts with proper dose-schedule, the induction time, anesthetic time, recovery time and total duration time were 19.3±3.48, 8.7±3.76, 109.3±25.96 and 136.7±21.86 min, respectively.

There fore recovery and total duration times showed 43% and 41.2% reduction, respectively(Table II).

3. Test group pretreated with red ginseng extract

The rabbits which received 20 ml/kg red genseng extracts showed that their

induction time, recovery time, anesthetic time and total duration time were 16.6± 2.8, 28.6±10.7, 137.8±18.9 and 183.0±14.2 min, respectively.

Their anesthetic times appeared to increase 64.4% in comparison with that of the control, but recovery and total duration times were shortened in comparison with those of the control groups(Table I).

Healthy mongolian dogs which received 10 m*l*/kg of red ginseng extracts showed that induction time, anesthetic time, recovery time, and total duration time were 34.0±11.0 15.5±9.55, 144.0±44.0, 151.7±47.64 min, respectively.

Induction time of test group was extended somewhat, but anesthetic time, recovery time and total duration time were shortened.

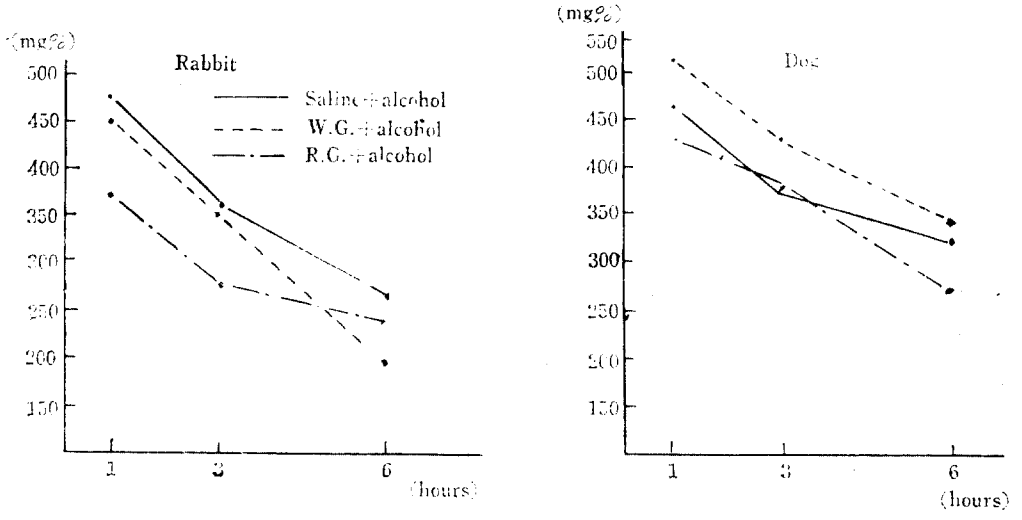

Fig. 1 : The effect of ***Panax ginseng***(W.G. and R.G.) on the blood alcohol concentration of rabbits and dogs administered with alcohol.

B) Alcohol Content in Blood

1. Control group

In case of rabbit as Fgure 1 shows, at every one, three, and six hour later blood samples were taken, and their alcohol contents appeared to be 485±15.09, 362.5± 54.94 and 264.5±19 mg%, respectively (Fig. 1).

In case of dogs, each alcohol contents at every one, three, six hour samples, were 460.5±50.78, 374.0±36.74, and 322.5±54.34 mg%, respectively(Fig. 1).

2. Test group which received with white ginseng extracts

The alcohol contents of rabbit which received the white ginseng extract appeared to be 450±40.61, 355.2±11.89 and 196.0±25.36 mg% at every one hour, three hour, and six hour time intervals, respectively.

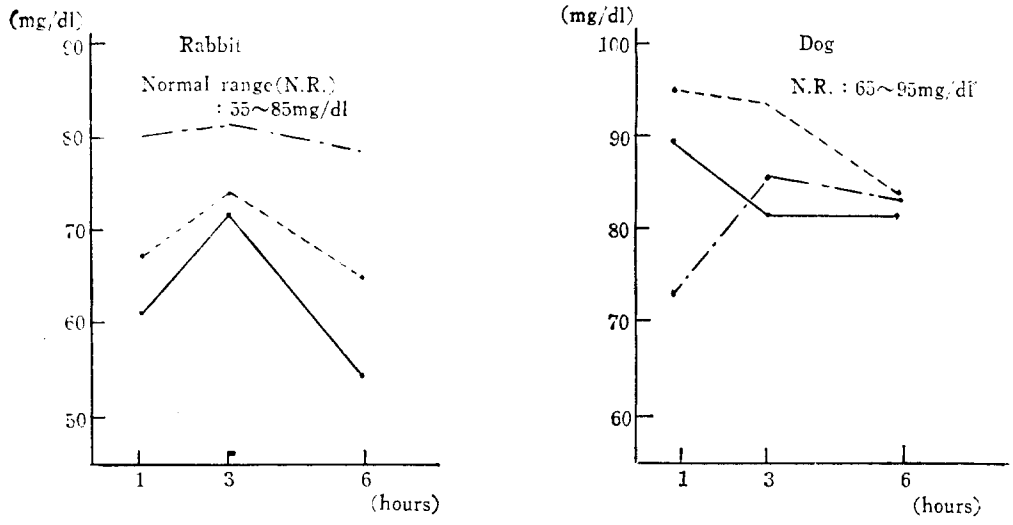

Fig. 2 : The effect of *Panax ginseng*(W.G. and R.G.) on the blood sugar concentration in rabbits and dogs administered with alcohol.

They tended to decrease in comparison with those of control groups.

The alcohol contents in blood of mongolian dogs were 521.3±42.52, 430.0±37, and 333.3±20.53 mg% at one hour, three hour and six hour time intervals, respectively.

3. Test group which received red ginseng extract

Blood alcohol contents of rabbits which received red ginseng extract were 373.2± 28.02, 277.2±21.73 and 236.3±28.23 mg% at one, three, and six hour time intervals, respectively.

Compared with control groups, 23.1%, 23.5% and 10.7% at each time interval were reduced(Fig. 1)

In case of the blood alcohol level of mongolian dogs, they appeared to be 424.7± 15.93, 37.17 and 264.7±32.26 mg at each time intervals.

These indicated no great changes in comparison with those of controls.

C) Blood Sugar Level

1. Control group

Rabbits were orally administered with 20 m*l*/kg of physiological saline, and 20 min later they were injected i.p. with 15 m*l*/kg of 25% alcohol.

And at every one, three, and six hour later, the blood sugar contents were measured.

As Figure 2 shows, the data were 60.8±13.76, 72.0±8.64, and 54.0±10.52 mg/dl at each specified time intervals. No significant changes appeared in this experiment.

The blool sugar contents of dogs in control group were 90±11.94, 82.0±9.45 and 82.0±8.24 mg/dl each specified time intervals(Fig. 2).

2. Test group which received white ginseng extracts

As Figure 2 shows, the blood sugar contents of rabbit in test group were 67.2± 6.06, 74±0.58, and 66±3.83 mg/d*l* each specified time intervals.

These values slightly exceeded those of the control groups, but they are considered to be normal(Fig. 2).

The blood sugar contents of dog at each specified time are shown in Fig. 2.

The data, 96.0±20.13, 94.3±15.32, and 85.3±16.22 mg/d*l* are also considered to be normal.

3. Test groups which received red ginseng extracts

As Figure 2 shows, the blood sugar levels of rabbit were 80.4±20, 81.3±9.99, and 79.4±5.12 mg/dl at each specified time intervals. They exceeded slightly control values, but are still normal (Fig. 2).

The blood sugar contents of dogs at each time intervals gave 73.3±1.33, 86.7± 12.72, and 84±10.07 mg/d*l*, respectively.

D) Blood Serum Transaminase Activity

a) Serum GOT activity

1) Control groups

GOT activities of rabbit at 3, 6, and 24 hours were 51.8±6.81, 70±15.9, and 72.4±12.56 units, respectively.

These value appeared to be greater than those of normal ones (without receiving alcohol)(Fig. 3).

The GOT activities of dogs at each specified times intervals were 49.6±4.6, 27.8±4.4, and 27.0±5.1 units. No significant alterations appeared(Fig. 3).

2) Test group which received white ginseng extracts

The GOT activities of rabbit group at three, six, twenty-four hours time intervals appeared to be 38.0±10.09, 51.1±6.05, and 50.2±4.64 units, respectively(Fig. 3).

These are slightly less than those of control groups. The GOT activities of dogs in test group were 36.0±3.8, 29.5±4.7, and 16.5±0.8 units.

These value also appeared to be slightly less than those of controls.

3) Test groups which received red ginseng extracts

GOT levels of rabbits in the test group at 3, 6, and 24 hours later appeared to be 50.8±13.16, 45.4±11.82, and 45.6±4.02 units, respectively(Fig. 3).

b) GPT activity in serum

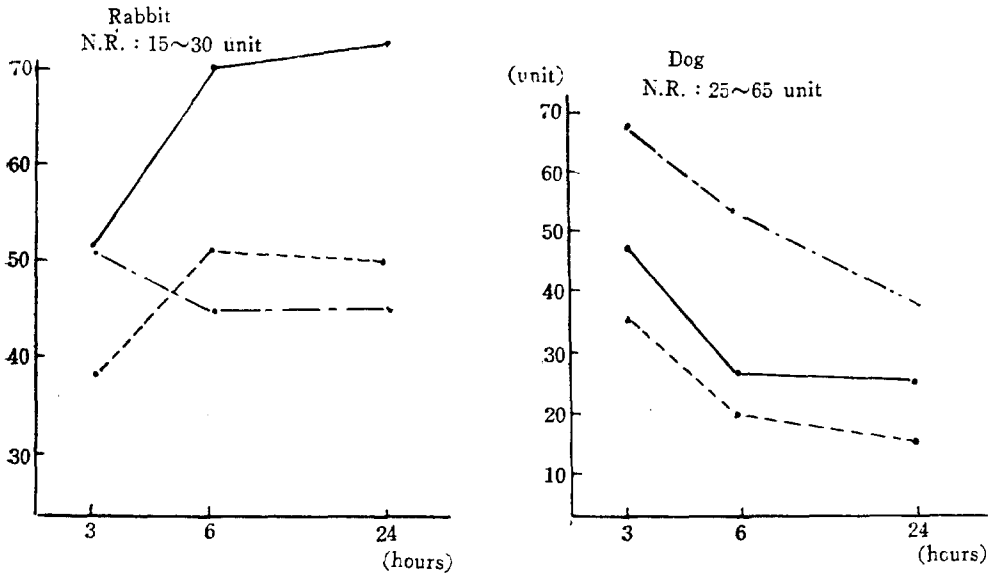

Fig. 3 : The effect of ***Panax ginseng***(W.G. and R.G.) on the serun glutamic oxaloacetic transaminase(S-GOT) activity in rabbits and dogs administered with alcohol.

1) Control groups

As it was shown in Figure 4, in rabbit serum, the enzyme activities were 55.2± 10.39, 51.0±3.49, and 66.6±17.11 units at 3, 6, 24 hour later, respectively.

The GPT levels in dog's serum were shown in Figure 4.

They were 24.7±2.01, 25.3±3.18 and 26.3±3.3 units.

These valuses are almost normal in comparison with those of dogs which received no alcohol.

2) Test group which received white ginseng extracts

GPT levels of rabbits in test group are shown in Fig. 4. They appeared to be 47.5±7.54, 38.0±5.63, and 53.4±5.53 units.

They showed lower values than those of controls.

GPT levels of dogs in test groups were shown as 38.0±2.5, 23.3±6.29, and 22.0±4.6 units at each specified time.

They tended to increase gradually in comparison with control value(Fig. 4).

3) Test group which received red ginseng extracts

Serum GPT levels of rabbits in test group at 3, 6, and 24 hours later appeared to be 49.6±11, 47.4±3.16, and 507±2.59 units, respectively. In comparison with the control values the decreasing tendency appeared(Fig. 4).

Serum GPT levels of dogs in test group were shown as 35.3±2.45, 38.0±3.06, and 28.3±2.03, units at each time intervals. They showed greater activities than

of controls.

E) Alcohol Dehydrogenase(ADG) Activity

1. Control groups

ADG levels in liver of rabbit were $(1.59\pm0.07)\times10^{-2}$ △ 0. D/min, as shown in Fig. 5.

2. Test group which received white ginseng extracts

The data are shown in Fig. 5. Liver alcohol dehydrogenaase activities appeared to be $(2.09\pm0.68)\times10^{-2}$△0. D./min. They were 31.45% greater than those of control groups.

3. Test group which received red ginseng extracts

As Fig. 5 shows, the ADG levels of liver of rabbits were $(2.58\times0.246)\times10^{-2}$ △0. D./min. They show 62.26% greater value than the control group.

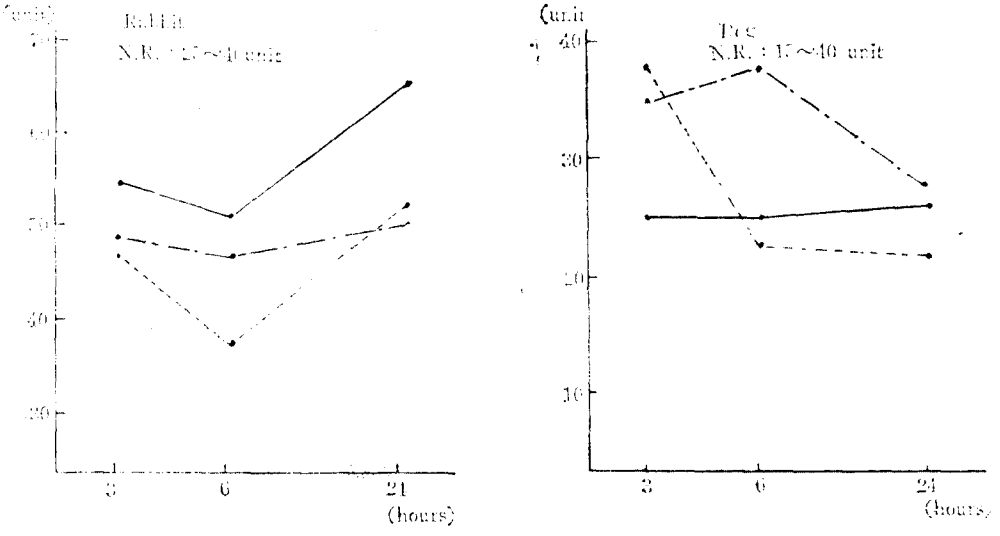

Fig. 4 : The effect of *Panax ginseng*(W.G. and R.G.) on the serum glutamic pyruvic transaminase(S-GPT) activity in rabbits and dogs administered with alcohol.

F) Serum Alkaline Phosphatase Activity

1. Control group

As the Figure 6 shows, the serum alkaline phosphtase level of rabbit control groups appeared to be 6.1±0.52, 4.1±0.91, and 4.1±0.88 units at 3, 6, 24 hours time intervals, respectively. They were not influenced by the administration of 25% alcohol.

The alkaline phosphatase level in dog's serum appeared to be 13.3±1.2, 13.5± 1.19 and 14.2±2.68 units at each specified time as shown in Figure 6.

2. Test group which received white ginseng extracts

As shown in Figure 6, they were 7.1±1.06, 7.7±1.34, and 5.5±0.99 at 3, 6, and 24 hours time intervals, respectively.

In comparison with control groups, they showed increases of 16.4%, 87.8% and 34.1% enzyme level.

The enzyme levels of mongolian dog's serum appeared to be 23.4±3.68, 21.3±3.18, and 18.0±0.5 units as shown in Fig. 6.

The alkaline phosphatase levels at 3 and 6 hours showed some significant increases.

3. Test groups which received red ginseng extracts

The serum alkaline phosphatase levels of rabbit are shown in Fig. 6.

The data showed the enzyme levels were 5.2±0.68, 4.5±0.94, 4.1±0.94, And 4.1±0.94, and 4.1±0.86 units, at 3, 6, and 24 hours later, respectively.

The enzyme levels of mongolian dogs appeared to be 15.0±2.2, 10.5±3.12 and 18.0±4.47 units as shown in Fig. 6.

No significant changes were observed in comparison with control groups.

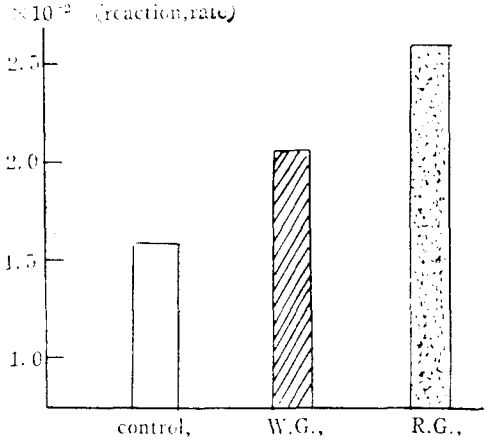

Fig. 5 : The effect of *Panax ginseng*(W.G. and R.G.) on the liver alcohol dehydrogenase activity in rabbits.

G) Effects on LD_{50}

1. Control groups

As the data were shown in Table III, LD_{50} was measured to be 63.3 mg/10 g when alcohol was injected i.p. into mice.

2. Test group which received white ginseng extracts

After 0.2 ml/10 g of extracts were orally administered to 120 mices, alcohol was injected i.p. 20 min later. LD_{50} appeared to be 76.25 mg/10 g. It showed some increase of lethal dose.

3. Test group which received red ginseng extracts

As the data were shown in Table III, it was 83.13 mg/10 g of LD_{50}.

LD_{50} value increased remarkably in this test group.

H) Clinical Studies with Human

1. Alcohol content in human blood

1) Control groups

Table III. The influence of ***Panax ginseng*** (W.G. and R.G.) on the anesthetic effect of alcohol in dogs.

Duration of anesthesia (min.) / Medication	Induction time		Anesthetic time		Recovery time		Total time	
	M±S.E.	Difference (%)	M±S.E.	Difference (%)	M±S.E.	Difference (%)	M±S.E.	Difference (%)
Saline+alcohol	14.8±0.92		26.0±12.06		191.8±13.22		232.5±16.00	
W.G.+alcohol	19.3±3.48	30.4	8.7±3.76	−66.5	109.3±25.96	−43.0 $P<0.02$	136.7±21.86	−41.2 $P<0.001$
R.G.+alcohol	34.0±11.00	129.7	15.5±9.55	−40.0	144.0±44.00	−24.9	151.7±47.64	−34.8

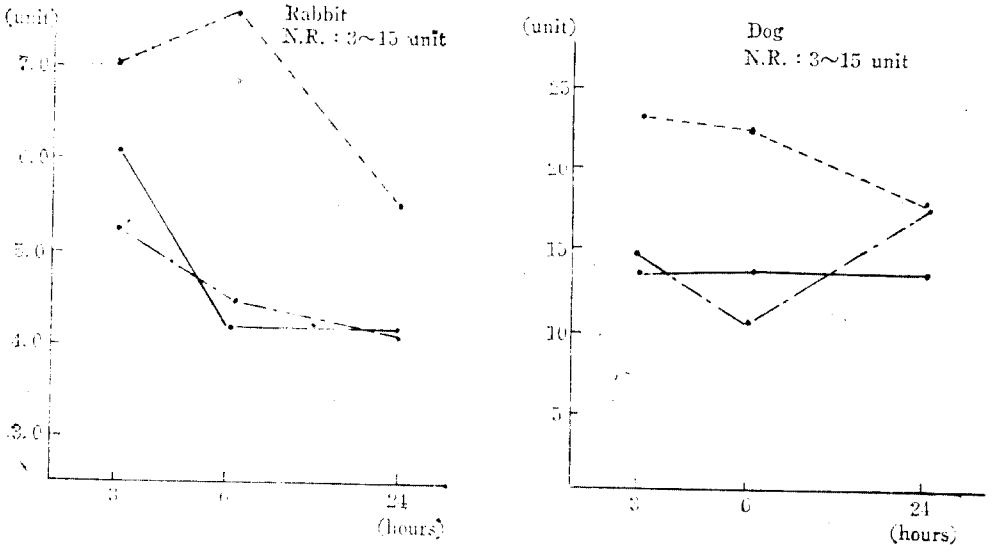

Fig. 6 : The effect of ***Panax ginseng***(W.G. and R.G.) on the serum alkaline phosphatase activity in rabbits and dogs administered with alcohol.

The control group received barley tea and then 20 min later, alcohol was orally administered.

After 3 hours the blood samples were withdrawn, then the alcohol contents were measured. The data were shown in Fig. 7. It appeared to be 197.±20.85 mg%.

2) Test group which received white ginseng extracts

One hundred milliliter of ginseng extracts were given to healthy male students

in test group, then alcohol contents were measured during next three hours. The data were shown in Fig. 7. It appeared to be 197±9.62 mg% and it showed no significant change.

3) Test group which received red ginseng extracts

Red ginseng extracts were given orally to healthy male students.

As the data were shown in Fig. 7, it appeared to be 179.4±7.98 mg% of alcohol content. The alcohol contents in this group decreased slightly.

2. Effect on blood sugar levels

1) Control groups

As Figure 7 showed, blood sugar contents are 55.2±3.20 mg/dl.

This indicated an almost same level of blood sugar as normal healthy person (without receiving alcohol).

2) Test group which received white ginseng extracts

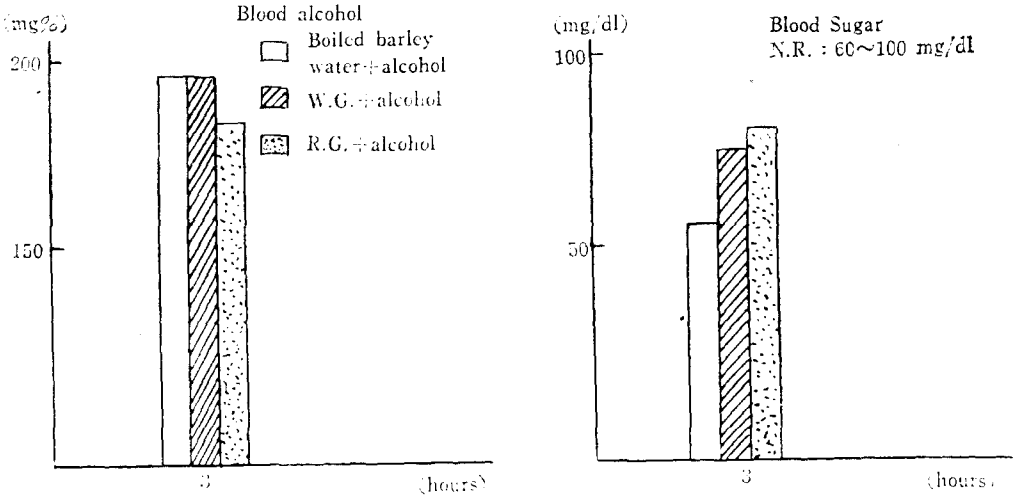

Fig. 7 : The effect of ***Panax ginseng***(W.G. and R.G.) on the blood alcohol and sugar concentration in healthy male students administered with alcohol.

As the data were shown in Fig. 7 it was 736±1.6 mg/dl, and did not exceed normal value of healthy person.

3) Test group which received red ginseng extracts

As the data were shown in Fig. 7, the blood level was 80.0±7.59mg/dl, and it increased about 44.9%, but it did not exceed the normal value.

3. Effect on code substituton

1) Control group

Barley tea was given to healthy male students, and then 90, and 180 min. later, code substitution was measured.

They appeared to be 173.36±24.42 and 138.82±14.78%, respectively, as shown in Fig. 8.

2) Test group which received white ginseng extracts

As Figure 8 showed, they gave 186.04±46.55 and 125±13.56%.

No significant changes were observed in comparison with the those of control groups.

3) Test group receivedred red ginseng extracts

The data were shown in Fig. 8.

The values 178.23±31.53 and 125.00±13.56% appeared to be aimost same as those of control groups.

4. Effects on response time

1) Control group

As the data were shown in Fig. 8. Their response time were 232.3±15.43 and 198.3±17.73% at 90 and 180 min. time intervals, respectively.

2) Test group which received white ginseng extracts

One hundred milliliter of ginseng extracts were given to test group, and then response time was measured. They showed 215.9±34.12 and 106.89±6.48% at each specified intervals. Each appeared to be shortened about 7.1% and 46.1%.

3) Test group which received red ginseng extracts

Experiments were performed in the same manner as the above. Each response time was 218.02±32.2 and 120.9±14.85% at specified intervals. They were shortened about 6.14 and 39.03%.

5. Effect on muscle coordination

1) Control group

Barley tea was given to each person, and then 90 and 180 min later, muscle coordination was measured.

The data as shown in Fig. 8 appeared to be 69.88±7.81 and 81.56±3.82%.

2) Test group which received white ginseng extracts

Each person in test group received 100m*l* of white ginseng extracts.

The data as shown in Fig. 8 were 60.55±10.36 and 86.51±8.72%.

There were no significant changes in comparison with control group.

3) Test group which received red ginseng extracts

Same amount of red ginseng extracts was given orally to each person.

As the data shown in Fig. 8, 65.00±11.59 and 86.46±12.43% were obtained. No significant changes were observed.

Summary

Since Garriques[35] has isolated panaquilon, one of saponins, from American ginseng(*Panax quinqefolium* L.), Hujitani[36] and Asahina[37] isolated various saponin components from *Panax ginseng* and determined their molecular formulas.

Then Kondo[38] isolated volatile panacen and non-vloatile panax acid from it. Furthermore, Shibata[39,40] purified crystalline sapogenin from ginseng and named it panaxadiol.

Panaxadiol has typical trimethyltetrahydropyrane ring at C_{17} position and belongs to dammarane tetracylic triterpene.

Although various components of ginseng have been elucidated chemically, their exact pharmacological actions have not been known at present.

Therefore, no one can say what very specific actions of ginseng would be.

Our group[25~27] has been interested in the antidotal action of ginseng to liver intoxication, especially, caused by acute alcoholism

In this report, we tested several effects of white and red ginsengs extracts on acute alcoholism.

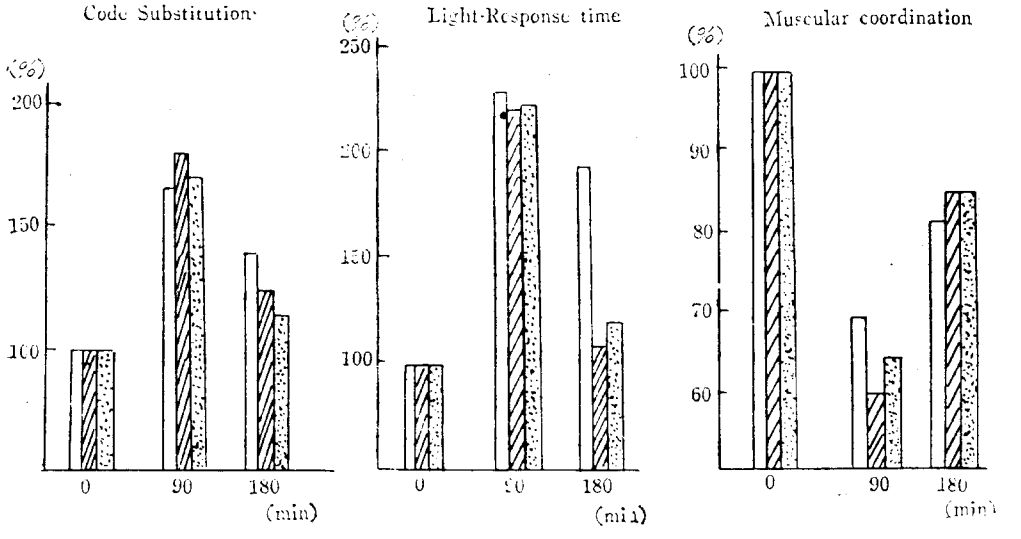

Fig. 8 : The influences of *Panax ginseng*(W.G. and R.G.) on the effects of alcohol to the CNS performance(code substitution), the light-response time and the muscular coordination tests in healthy male students.

White and red ginsengs delayed induction time of rabbits and dogs, and shortened their recovery time and total anesthetic duration time.

Both white and red ginsengs reduced the alcohol content in blood of rabbits and dogs.

Furthermore they did not significantly influence the levels of blood sugar, serum transaminase (GOT and GPT) and alkaline phosphatase activities.

Elevated alcohol dehydrogenase activities of rabbit liver by white ginseng and especially red ginseng did not give significant effect on alcohol content in blood of human, although blood sugar level was increased by them. Nonetheless, it did not seem to exceed the normal values.

Through clinical studies with human, white and red ginsengs were found to shorten the response time, but they gave slight change to code substitution and muscle coordination measurement.

Acknowledgment

This work was supported by the research grant of the Central Research Institute, Office of Monopoly, Seoul, Korea.

Literature Cited

1. Hong, S.A. and Cho, H.Y.: Pharmacological actions of ginseng. *Korean Ginseng Science Symposium*, pp. 113~136, Korean Soc. Pharmacognosy (1974).
2. Oh, J.S., Park, C.W. and Moon, D.Y.: Effects of panax ginseng on the contral nervous system. *Korean J. Pharmacol.* **5**, 23 (1969).
3. Hong, S.A., Oh, J.S., Park, C.W.. Chang, H.K. and Kim, E.C.: Effects of *Panax ginseng* on the conditioned avoidance response in the rats. *Korean J. Pharmacol.*, **6**, 69 (1970).
4. Petkov, W.: Pharmacodynamics of Panax Ginseng. *Arch. Ep. Pathol. Pharmakol.* **236**, 289 (1959).
5. Park, D.L.: Influence of *Panax ginseng* on X-rayirradiation and ts antagonistic action to nitromin. *Thesis Catholic Medical College* **5**, 201 (1962).
6. Moon, Y.B.: Influence of *Panax ginseng* and chlorpromazine on metrazol—and picrotoxin—convulsion. *Chonnam Med. J.*, **1**, 31 1964.
7. Lee, M.S.: Metabolic effects of ginseng. *Korean Choong Ang Med. J.*, **21**, 509 (1962).
8. Saito, S.H.: Effect of Korean ginseng on the experimental hyperglycemia. *Linshow Iyaku*, **8**, 822 (1916).
9. Saito, S.H.: Additional effect of Korean ginseng on the experimental hyperglycemia. *Keio J. Med.*, **2**, 149 (1922).
10. Abe, K.M. and Saito, S.H.: Active constituents of Korean ginseng. *Keio J. Med.*, **2**, 263 (1922).
11. Kondo, H.S.: The study on the hypoglycemic action of Korean ginseng (white ginseng). *Folia*

Pharmacol. Japonica, 5, 201 (1927).

12. H.S.: The study onthe hypothycemic action of Korean ginseng (redginseng). *Folia Pharmacol. Japonica*, 5, 389 (1927).
13. Imamura, T.M.: The influence of Korean ginseng glycosides on the adrenalineinduced glycogenolysis. *Keio J. Med.*, 3, 1017 (1923).
14. Kim, H.S.: The hypoglycemic effect of various constituents of Korean ginseng. *J. Chosen Med. Assoc.*, 22, 221 (1932).
15. Kang, S.S.: The action of Panax Gineng on the glucose oxidation ofthe rat liver in vitro *Seoul J. Medicine*, 3, 157 (1962).
16. Petkov, W.: Pharmacological studies of the drug Ginseng. *Arneimittel-Forsch.*, 9, 305 (1959).
17. Yamada, M.Y.: Pharmacological studies on Panax Ginseng, *Folia Pharmacol. Jap.*, 51, 390 (1955).
18. Hai-pen Lei and Chen-Kang Wang: Effect of ginseng on normal and alloxan diabetic dogs. *Chung Hua Nei Ko Tsa Chih*, 5, 861 (1957). [C.A. (1959)]
19. Cheong, D.K.: The influence of ginseng, reserpine, and chlorpromazine on epinephrine — induced and morphine— induced hyperglycemia. *Korean J. Pharmacol.*, 1, 17 (1965).
20. Johng, H.W.: Effect of parax ginseng, platycodon grandflorum, and INH on lipid metabolism of rabbit during lang term cholestered administration. *Korean J. Biochem.*, 1, 25 (1964).
21. Kim, H.C.: Influence of panax ginseng and niacin on the lipid metabolism of rabbit. *Korean J. Medicine*, 5, 21 (1962).
22. Nahm, C.C.: The experimental studies on the influence of ginseng to the atherosclerosis in rabbits. *Korean J. Int. Med.*, 4, 231 (1961).
23. Choi, T.K. and Hong, S.A.: The effects of the essential oil fraction and the fattyacid fraction of panax ginseng on the lipid metabolism. *Korean J. Pharmacol.*, 4, 17 (1968).
24. Cheong, T.G., Chun, Y.S., Pack, B.S. and Shin, M.Y. (R.): The effect of several medicines and colored light on the alcohol concentration inblood. *Korean Choong Ang Med. J.*, 1, 437 (1961).
25. Yun, H.B. and Shin, M.R.: Effects of ginseng extract on the CCl_4 toxicity. *Woo Sok Univ. Med. J.*, 5, 209 (1968).
26. Lee, H.S. and Shin M.R.: Effects of alcohol and ginseng on the chloroform toxicity. *Woo Sok Univ. Med. J.*, 6, 143 (1969).
27. Kim, Y.M. and Shin, M.R.: Effects of ginseng extract on the thioacetamide toxicity. *Woo Sok Univ. Med. J.*, 6, 166 (1969).
28. Textbook of Pharmacology (Korea), pp. 47~49, 4th Ed., 1974.
29. Gibson and Blotner: *J. Biol. Chem.*, 126, 551 (1938).
30. Nelson, N.: A Photometric adaptation of the Somogyi method for the determination of glucose. *J. Biol. Chem.*, 153, 375 (1944).
31. Reitman, S. and Frankel, S.: A colorimetric method for the determination of serum glutamic pyruvic transaminase *Am. J. Clin. Path.*, 28, 56 (1957).
32. Bonnichsen,R.K., and Theorell H.: Acia Chem. Scand. 5, 110(1951): H. Theorell and B Chance, *ibid.* 5, 1127 (1951).
33. Joo, C.N., Yoo H.S., Lee, S.J. and Lee, H.S.: Biochemical studies on ginseng saponins (I). The effect of ginseng on several dehydrogenases *in vitro*. *Korean Biochem, J.*, 6, 177 (1973).
34. King, E.J. and Armstrong, A.R.: A convenient method for determining serum bile phosphatase

activity. *Canada, Med. Assoc. J.*, **31**, 376 (1934).

35. Iketa, Y.O.: Behrens-Kaeaber's method. *Yakubutsu Chishirho Shu*, p. 220, (1955).
36. Hujitani, Y.H.: Studies on Korean ginseng and Unshu ginseng. *Kyoto J. Med.*, **2**, 43 (1905).
37. Asahina, Y.H. and Tanaka,B.T.: Active ingredients of panax ginseng *J. Pharmaceut. Soc. Japan*, **292**, 549 (1906).
38. Kondo, H.S. and Tanaka, G.I.: Active Ingrediente of Korean ginseng. *J. Pharmaceut. Soc. Japan* **401**, 779 (1915).
39. Shibata, S. Tanaka, O., Sado, M., and Tsuchima, S.: Genuine sapogenin of ginseng. *Tetrahedron Lett.* **12**, 795 (1963).
40. Shibata, S. The Fujitg, M., Itokawa, H., Tangka, O., and Ishii, T.: Constituents of Japaneseand Chinese crude drugs. XI. Panaxadiol, a sapogenin of ginseng roots. *Chem. Pharm. Bull.*; **11**, 579 (1963).
41. Henley, K.S., Wiggins, H.S.and Pollard, H.M.: Alcoholand liver glutamic pyruvic htransaminase. *J. Lab. & Clin. Med.*, **48**, 816 (1956).
42. Lynch, M.J., Raphael, S.S., Mellor, L.D., Spare, P.D., and Inwood, M.J.H. Acid and alkaline phospha tase. Med. hab. *Technicol. Clin. Pathol.*, p. 307, 2nd Ed., W.B. Saunders Co., (1969).

〈Received 29 April 1976〉

인삼의 해독작용에 관한 연구

급성 알코올 중독에 대한 인삼의 치료 효과

申 萬 鍊
고려대학교 의과대학 약리학교실

초 록

알코올 마취작용 및 독작용에 미치는 인삼(백삼 및 홍삼)의 영향을 보기위하여 다음과 같은 실험을 시행하였다. 실험동물로는 백색 가토, 마우스, 및 잡견을 사용하였고, 백색 가토 및 잡견에 대한 알코올의 마취작용을 관찰하기 위하여 마취의 유도시간, 마취시간, 회복시간과 마취의 유도로부터 완전회복까지의 전시간을 각각 계정하였으며, 마우스에 대한 알코올의 독작용(LD_{50})을 측정하였다. 아울러 혈중 알코올 농도, 혈당량, 혈청 transaminase(GOT 및 GDT)활성도 및 혈청 alkaline phosphatase활성도를 각각 측정하였다. 그리고 건강한 대학생에 대한 임상실험으로는 code substitution, response time 및 muscle coordination을 각각 관찰하였다. 실험결과로는

1. 인삼 전처치로 알코올 마취의 유도시간은 지연되었고, 회복시간과 마취가 시작하여 회복될때 까지의 전시간은 현저히 단축되었다.

2. 혈중 알코올 농도는 인삼 전처치로 백색 가토에 있어서는 감소되었으나. 잡견에서는 별 영향이 없었다.

3. 인삼 전처치로 혈당량, 혈청transaminase(GOT 및 GDT)활성도 및 혈청 alkaline phosphatase활성도는 다소 변동이 있었으나, 각각 정상 범위내에서의 변동이였기 때문에 의의있는 변화라고 할 수 없다.

4. 가토 간내 알코올 dehydrogenase활성도는 인삼 투여로 상승하였는데 특히 홍삼 투여로 더욱 현저하였다.

5. 마우스에 대한 알코올의 LD_{50}은 인삼 전처치로 증가되었는데 홍삼 전처치로 더욱 현저히 증가되었다.

6. 학생에 대한 임상 실험에서는 알코올 투여후 3시간에 측정하였는데 혈중 알코올 농도는 인삼 전처치로 변동이 없었으나 혈당량은 증가되었다.

7. 인삼 전처치로 알코올에 의한 response time은 현저히 단축되었으나 code substitution이나 muscle coordination에는 영향이 없었다.