# Effect of Spirulina Compound Tablet on Serum Lipids in Hyperlipidemic Mice*

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**ABSTRACT　OBJECTIVE:** To study the effect of Spirulina Compound Tablet( FST) on the level of serum lipids in hyperlipidemic mice . **METHODS:** The experimental hyperlipidemic mice were divided into four groups . Among them ,two groups were treated with FST 1 .5g/ kg ,3g/ kg respectively by ig administration ,and one group was given lipanthyl 0 .05g/ kg by ig administration as the positive drug control ,another group was received physiological saline by ig administration as the hyperlipidemic control . The treatment were consecutively carried out for 14 days . Then the serum lipids of each group were determined with automatic biochemistry analysor . **RESULTS:** Compared with the hyperlipidemic control group ,it was found that FST could significantly decrease the level of total serum cholesterol( TC) ,triglyceride( TG) ,and low density lipoprotein-cholesterol( LDL-C) ,as well as remarkably increase the content of serum high density lipoprotein-cholesterol( HDL-C) and the value of HDL-C/ TC in the hyperlipidemic mice . Furthermore ,the results also showed that FST could obviously raise the concentration of the serum apolipoproteinAI( apoAI) and reduce the concentration of apolipoproteinB( apoB) ( Whereas FST 1 .5g/ kg had no significant effect on apoB) . **CONCLUSION:** FST could remarkably decrease the content of serum lipids and regulate the apolipoprotein in the hyperlipidemic mice .

**KEY WORDS**　Spirulina Compound Tablet( FST) ,hyperlipidemia ,hypolipidemic effect

# 复方螺旋藻片对高血脂症小鼠血脂的影响

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摘要　目的:观察复方螺旋藻片( FST) 对高脂血症小鼠血脂的影响。方法:用 FST 1 .5 mg/ kg ,3g/ kg 分别灌胃给予高脂血症小鼠,连续 14d 后,眼眶取血测血脂。结果:与高脂血症模型对照组相比,FST 高、低剂量能显著降低血清 TC、TG 和 LDL-C 水平,明显升高血清 HDL-C 水平与 HDL-C/ TC 比值。同时 FST 还能升高血清 apoAI 并降低 apoB( 但 FST 1 .5g/ kg 对 apoB 无明显影响) 。结论:FST 能明显降低高脂血症小鼠血脂水平,并对载脂蛋白有一定的调节作用。

关键词　复方螺旋藻片( FST) ;高脂血症;降血脂

Spirulin Compound Tablet( FST) is a new type of spirulina compound dosage that was researched and manufactured by Dali medical college . Our previous studies have showed that FST possessed the effect of anti-oxidation ,anti-aging[1] ,and the effect of hypoglycemic action[2] . In order to further investigate the pharmaceutical features of FST ,this paper studied the effect of FST on serum lipid content in the experimental hyperlipidemic mice .

## 1　Materials

**1 .1**　Reagents　Cholesterol( Ch) and sodium cholic acids were from sigma Co . Methylthioxidomiding was the production of Pharmaceutical Factory of Wujing County . Lipanthyl was from the Laboratrie Funier , France . The reagent kits for tie measurement of serum total cholesterol( TC) ,triglyceride( TG) and the high density lipoprotein-cholesterol ( HDL-C) was purchased from Dongou Biotechnology Co . The reagent kit for the measurement of low-density lipoprotein-cholesterol ( LDL-C) was from Zhongsheng High-Biotechnology Co . , Beijing . The kits to assay apolipoproteinAI ( apoAI) and apolipoproteinB( apoB) were purchased from the Beihai Biotechnology Co . ,Shanghai . Other chemicals were AR grade .

**1 .2**　Drug　Spirulina Compound Tablet( FST) was provided by FST Research Group , Dali Medical College( Batch NO:98090) .

**1 .3**　Mice　Kunming mice , male , weighing 18 ~ 22g , were supplied by Laboratory of Animal , Dali Medical College .

## 2　Methods

**2 .1**　Preparation of fatty emulsion solution　10g of cholesterol was dissolved in 20g of pig oil ,then add 2g of sodium cholic acids ,and 1g of methylthioxidomiding ,as well as 20 ml of Tween-80 and 20 ml of propanediol .sbi until if nas completely mixed up . keep the solution under 4 ℃ . Before using ,heat it to 37 ℃ .

**2 .2**　Preparation and treatment of the hyperlipidemic mice　50 mice were randomly divided into five groups : normal control group ,

* Project supported by science of Education Committee , Yunnan Province . No9703329 . Zuo Shaoyuan , associate of biochemistry , master of medicine

hyperlipidemic control group, and FST high and low dose groups, as well as Lipanthyl positive drug group. Before experiment, all the mice were fed with standard food for 5 days to adapt to the environment. Then except for the normal control group, the other four groups were given fatty emulsion of 20 ml/kg in the morning (about 8 to 9 o, clock). On the same day of the afternoon (about 6 to 7 o, clock), FST high and low dose groups were treated with FST 3g/kg and 1.5g/kg respectively, and the Lipanthyl positive drug control group was received Lipanthly 0.05g/kg. The normal control group and the hyperlipidemic control group were given physiological saline (NS). The fatty emulsion, the drugs and the NS were daily given by ig administration for 14 days. After the last time of treatment, all the mice were fasted for 12 hours. Then the retrobulbar blood was taken and separated the serum from the blood. The serum lipids content of each mouse were determined with the Automatic Biochemistry Analysor according to the instruction of reagent kits.

**2.3** Statistice The experimental data were expressed as mean ± standard deviation ($x \pm s$), and analyzed by the one-way analysis of variance (ANOVA) significance test.

## 3 Results

**3.1** Effect of FST on the level of serum lipids in hyperlipidemic mice The results was seen table 1. Compared with the normal control group, the hyperlipidemic control group obviously appeared the typical disorder of lipid metabolism. The level of serum TC, TG, and LDL-C increased remarkably ($P < 0.01$), and the level of serum HDL-C, the value of HDL-C/TC dropped sharply ($P < 0.01$). Whereas consecutive administration of FST for 14 days could significantly reduce the level of serum TC, TG and LDL-C, as well as increase the level of serum HDL-C and the value of HDL-C/TC.

**Table 1** Effect of FST on the level of serum lipids in hyperlipidemic mice/ $x \pm s$, $n = 10$, mmol·L$^{-1}$

| group | dose/g·kg$^{-1}$ | TC | TG | HDL-C | LDL-C | HDL-C/TC |
|---|---|---|---|---|---|---|
| normal control | - | 2.38 ± 0.52 | 0.76 ± 0.22 | 1.65 ± 0.31 | 0.64 ± 0.18 | 0.71 ± 0.16 |
| hyperlipidemic control | - | 5.26 ± 0.74 *1 | 2.35 ± 0.38 *1 | 1.06 ± 0.41 *1 | 3.12 ± 0.64 *1 | 0.22 ± 0.12 *1 |
| FST | 1.5 | 3.54 ± 0.82 *2 | 1.87 ± 0.41 *2 | 1.42 ± 0.38 *3 | 2.16 ± 0.56 *3 | 0.41 ± 0.18 *2 |
| | 3.0 | 3.12 ± 0.78 *2 | 1.67 ± 0.36 *2 | 1.63 ± 0.51 *2 | 1.67 ± 0.61 *2 | 0.54 ± 0.15 *2 |
| Lipanthyl | 0.05 | 3.38 ± 0.75 *2 | 1.38 ± 0.27 *2 | 1.64 ± 0.53 *2 | 1.52 ± 0.53 *2 | 0.51 ± 0.32 *2 |

Note: Compared wiht the normal control group, *1 $P < 0.01$, *4 $P < 0.05$; Compared with the hyperlipidemic control group (the following talbe is same), *2 $P < 0.01$, *3 $P < 0.05$

**3.2** Effect of FST on the level of serum lipoproteinAI (apoAI) and lipoproteinB (apoB) The results (table 2) indicated that FST could raise the level of apoAI and decrease the level of apoB. But FST 1.5g/kg had no significant effect on apoB ($P > 0.05$).

**Table 2** Effect of FST on the level of serum liporoteinAI and lipoproteinB in hyperlipidemic mice/ $x \pm s$, $n = 10$, g·L$^{-1}$

| group | dose/g·kg$^{-1}$ | apoAI | apoB |
|---|---|---|---|
| normal control | - | 1.01 ± 0.12 | 0.48 ± 0.03 |
| hyperlipidemic control | - | 0.78 ± 0.14 *1 | 0.56 ± 0.07 *4 |
| FST | 1.5 | 0.86 ± 0.16 *3 | 0.54 ± 0.06 |
| | 3.0 | 0.95 ± 0.15 *2 | 0.49 ± 0.04 *3 |
| Lipanthyl | 0.05 | 0.92 ± 0.13 *2 | 0.53 ± 0.08 |

## 4 Discussion

The Epidemiological studies showed that the chronic presence of excessive amount of cholesterol (Ch) and TG in blood plasma was one of the most risk factors to develop atherosclerosis (AS). On the other hand, most of the Ch contained in the blood plasma was present in LDL-C, Since LDL-C was formed in the plasma during very low density lipoprotein (VLDL) catabolism, therefore, LDL-C functionel as the main form of transferring endogenous Ch to the periphery tissues. Hence, the elevated level of blood plasma LDL-C has the positive correelation with the development of AS. On the contrary, HDL-C has the positive positive correlation with the development of AS. On the contrary, HDL-C has the positive correlation with the development of AS. On the contrary, HDL-C can transfer the Ch from the periphery tissues to the liver and then the Ch can be excreted out of the body. Thus, HDL-C had the effect of protection against AS. However, the processes of transport the Ch by HDL-C required the catalysis of lecithin cholesterol acyl transferase (LCAT). The present studies proved that apoAI was the essential activator to the LCAT, so high concentration of apoAI would be beneficial to the HDL-C to clear up the Ch from the periphery tissues. Consequently, the AS might be slowed down to further progress and the pathological changes may be alleviated.

In this study, it was found that FST could remarkably antagonize the disorder of lipids metabolism in experimental hyperlipidemic mice, and could significantly decrease the level of serum TC, TG and LDL-C, as well as obviously elevate the content of serum HDL-C and raise the value of HDL-C/TC in the mice. In addition, the results also showed that FST could increase the concentration of serum apoAI and reduce the aopB (FST 3g/kg). These results demonstrated that FST may not only decrease the serum lipids level, but also regulate the apolipoprotein metabolism. It is suggested that FST could have significantly preventive and therapeutic effects on the hyperlipidemia and the AS. As for the mechanism of regulating lipids metabolism of the FST and its effective constitutes still need further investigation.

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收稿日期 :2000 - 05 - 09