Effect of *Cortex Lycii Radicis Ethanol-Extract* on the Hypoglycemic and Hypolipidemic In Type 2 Diabetic Rats

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Abstract: To observe effect of *cortex lycii radicis ethanol-extract* on the hypoglycemic and hypolipidemic in T2DM rats. T2DM rat modelinduced by intravenous injection small dose of streptozotocin (STZ) and feeding high fat-high glucose diet .The rats were randomly divided into blank control group, model control group, *cortex lycii radicis ethanol-extract* groups of high dose, medium dose and low dose, positive drug rosiglitazone group. Seven weeks after medication, to observe influence of *cortex lycii radicis ethanol-extract* on rat weight and the content in fasting blood glucose (FBG), serum insulin(INS), total cholesterol(TC), triglycerides(TG) and low density lipoprotein cholesterol (LDL-C). Compared blank control group with the other groups, there were no significant differences in various indicators of be detected(P>0.05). Compared with the model group, *cortex lycii radicis ethanol-extract* can reduced body weight, FBG, INS, TC, TG and LDL-C, increased INS of T2DM rats, the differences were significant (P<0.01or 0.05).*Cortex lycii radicis ethanol-extract* can lowers blood glucose and regulate blood lipid metabolism to some extent.

Introduction

Cortex lycii radicis, alias were wolfberry bark, which was dry root bark of Lycium chinensis. It main producing area were Shanxi, Henan, Zhejiang, Jiangsu, and so on. Taste sweet and potency cool. Attributed to lung, liver and kidney. It's function was clearing deficient heat, purte the white and cooling blood. Clinically for treatment some diseases, such as osteopyrexia sweats, feirekechuan, hematemesis, bleeding from five sense organs or subcutaneous tissue, bloody stranguria, hypertension, carbuncle swollen, malignant sores, and so on. Modern pharmacological studied shown that *lycii radicis* has a variety of effects such hypoglycemic[1], lower the blood pressure and blood fat[2], antibacterial and antiviral[3], antipyretic-analgesic[4], immunologic enhancement[5] etc. Therefore, the drug has a potential advantage in the treatment of diabetes.The aim of this study is through to observe the effect of content of *cortex lycii radicis ethanol-extract* on T2DM rat weight, FBG, INS, TC, TG and LDL-C, to further clarify its pharmacological effect on T2DM,which provide theoretical basis for the PCM prevention and treatment of diabetes.

Materials and methods

Animals. A total of 70 SPF SD male rats, and their body weight were 220 ± 20 g, whom were conventional breed in barrier environment, eating and drinking with free state. Feed are common feed and high fat-high sugar diet.

Reagents and instruments. The preparation process of *cortex lycii radicis alcohol-extrac*:take 500g cortex lycii powder which be soaked about 24h in 80% alcohol, connected the circulating cool water, reflux extraction at 78℃ for 1h, filter liquid and extracting twice, combined filtrate and the

filtrate be vacuum concentration by rotary evaporation apparatus at 55℃, the concentration of the crude drug is 3g·mL^{-1}, in accordance with the different doses to dilute the reserve with distilled water, respectively[1,6].

Streptozotocin, rosiglitazone, glucose, blood glucose meter, triglyceride assay kit, total cholesterol assay kit, low density lipoprotein ELISA kit, glycosylated serum protein assay kit, insulin radioimmuno assay kit, and so on.

Modeling and packet administration. 70 healthy rats were fed with suitability one week after, whom were weighed and randomized groups. There were 10 rats in the blank control group and be fed with common feed; the remaining 60 rats were injected STZ from tail vein at a dose of 30mg/kg for one time, STZ contains citric acid and sodium citrate buffer solution (PH4.4) and the ratio was 1:1.32. Rats were not prohibit water but fasted for 12h before injecte the STZ, after that, whom be feed with high fat-high sugar diet. After the rats be fed for three weeks, take the blood from tail vein to measured the random FBG, after interval 2 days, 60 rats were fasting for 8h, take blood form after the ball and isolated serum to measure FBG and INS. The success criteria of T2DM model rats is the blood glucose level ≧10 mmol·L^{-1}[7]. After testing, a total of 58 rats were produced model with successfully. Screened from 50 rats, randomly divided into model group, *cortex lycii radicis ethanol-extract* groups of high dose, medium dose and low dose, rosiglitazone group, 10 rats in each group.The blood sugar of blank control group rats were normal.

Initiation of administration after the model was made with successfully, blank control group and model control group be given saline at a dose of 10 mL/(kg·d) with lavage, positive control group be given rosiglitazone at a dose of 10 mL/(kg·d)with lavage, *cortex lycii radicis ethanol -extract* high dose group (high alcohol group), *cortex lycii radicis ethanol-extract* medium dose group (medium alcohol group), *cortex lycii radicis ethanol-extract* low dose group (low alcohol group) rat be given *cortex lycii radicis ethanol-extract* at a dose of 20 mL/(kg·d),10 mL/(kg·d), 5 mL/(kg·d) with lavage respectively. Drug treatment period for 7 weeks, one time a day, during the time, the rats in each group without death. Rats in each group all be fasting can not help but water 12h before administration of the experiment and after the last administration, take blood form after the ball with limosis in the morning, after administration, all rats were killed. The blood was placed in Eppendorf which preparation beforehand and storagef or 4h at 4℃, which were put into the low temperature centrifuge with 4000 revolutions per minute and work for 15m, separate out the supernatant, which be packed and preservated into -20℃environment for detection and analysis.

Detection indicators. All the indicators were detected before and after administration. First, body weights of the rats. Second, the values of FBG concentration were measured by using the Sino blood glucose meter. Third, follow the instructions to detect the INS content. According to the enzyme assay to detect the TG and TC of serum. By using SUR method to detect the LDL-C.

Statistical Analysis. Using SPSS 13.0 software for statistical analysis of the obtained data, the results of indicators were expressed by $\bar{x}\pm s$, significance test using the t test and ANOVA. With $P<0.05$ was considered statistically significant and $P<0.01$ as statistically significant difference.

Results

Weight and the content in FBG and INS effects of *cortex lycii radicis ethanol-extract* on T2DM rats. Weight: before administration, the values of each group were all higher than those in blank group, the differences were significant ($P<0.05$). FBG: before administration, the values of each group were all higher than those in blank group, the differences were significant ($P<0.01$). After administration: the values of each group were all higher than those in blank group, however, only the values of model group and rosiglitazone group were higher than those in blank group, the differences were significant ($P<0.05$ or $P<0.01$), the values of high, medium, low alcohol group and rosiglitazone group were lower than those in model group ($P<0.05$ or $P<0.01$). INS: Before

administration, the values of each group were all lower than those in blank group, only the value of model group was lower than that in blank group, the differences was significant (P<0.01); compared with the model group, the values of high, medium, low alcohol group and rosiglitazone group were significantly higher, the differences were significant (P<0.01). After administration, the value of model group was lower than that in blank group, the difference was significant (P<0.01); the values of high, medium, low alcohol group and rosiglitazone group were all higher than those in the model group, the differences were significant (P<0.01). Shown in table 1.

Table 1 Weight and the content in FBG and INS effects of *cortex lycii radicis ethanol-extract* on T2DM rats ($\bar{x}$±S)

Groups	n	Weight /g		FBG/mmol·L^{-1}		INS/ mU·L^{-1}	
		Before administration	After administration	Before administration	After administration	Before administration	After administration
Blank control group	10	301±17	408±21	8.41±1.2	8.73±1.3	257.6±123.3	263.7±105.6
Model control group	10	382±30[a]	454±29	20.12±2.75[b]	17.22±2.43[b]	136.2±31.4[b]	141.3±21.5[b]
Rosiglitazone group	10	359±26[a]	448±23	17.85±2.66[b]	12.52±3.31[a,c]	251.7±46.5[d]	247.3±52.3[d]
Low alcohol group	10	371±22[a]	422±21	18.77±2.49[b]	10.19±3.10[d]	225.4±21.6[d]	275.5±85.7[d]
Medium alcohol group	10	365±20[a]	461±27	19.23±3.08[b]	11.71±3.21[d]	236.5±48.2[d]	282.4±76.1[d]
High alcohol group	10	374±25[a]	467±30	18.98±2.97[b]	11.68±3.17[d]	233.1±55.3[d]	280.8±65.4[d]

Note: compared with the blank control group, [a]P<0.05, [b]P<0.01; compared with the model control group, [c]P<0.05, [d]P<0.01; compared with the rosiglitazone group, [e]P<0.05, [f]P<0.01(Table 2 as the same as table 1).

The content inTC,TG and LDL-C effects of *cortex lycii radicis ethanol-extract* on T2DM rats. TC: After administration, the value of model group was higher than that in blank group, the difference was significant (P<0.05); the values of high, medium , low alcohol group were all lower than those in model group, the differences were significant (P<0.01). TG: Before administration, the values of each group were all higher than those in blank group, the differences were significant (P<0.01).After administration: the values of model group and rosiglitazone group were higher than those in blank group, the differences were significant (P <0.05 or 0.01); the values of high, medium, low alcohol group were all lower than those in model group and rosiglitazone group, the differences were significant(P<0.01or 0.05). LDL-C: Before administration, the values of each group were all higher than those in blank group, the differences were significant (P<0.01or 0.05); the values of high, medium, low alcohol group were all lower than those in model group, the differences were significant(P<0.01or 0.05). After administration: the value of model group was higher than that in blank group, the differences were significant (P<0.01); the values of high, medium, low alcohol group and rosiglitazone group were all lower than those in model group, the differences were significant (P<0.01). Shown in table2.

Table 2 The content inTC,TG and LDL-C effects of *cortex lycii radicis ethanol-extract* on T2DM rats ($\bar{x}\pm S$)

Groups	n	TC/mmol·L^{-1}		TG/mmol·L^{-1}		LDL-C/mmol·L^{-1}	
		Before administration administration	After administration	Before administration	After administration	Before administration	After administration
blank control group	10	2.51±0.12	2.49±0.13	1.03 ±0.11	1.81±0.10	0.35±0.12	0.37±0.15
model control group	10	3.17±0.11	3.25±0.17[a]	3.85±0.33[b]	3.26±0.29[b]	0.92±0.31[b]	1.16±0.27[b]
rosiglitazone group	10	2.44±0.51	2.62±0.38	3.63±0.60[b]	2.77±0.34[a]	0.72±0.33[b]	0.51±0.21[d]
low alcohol group	10	2.23±0.20	2.19±0.15[d]	3.76±0.25[b]	1.68±0.37[d,e]	0.55±0.11[a,d]	0.56±0.17[d]
medium alcohol group	10	2.30±0.43	2.27±0.31[d]	3.45±0.31[b]	1.57±0.23[d,e]	0.59±0.26[a,d]	0.57±0.22[d]
high alcohol group	10	2.51±0.55	2.36±0.40[d]	3.59±0.52[b]	1.83±0.40[d,f]	0.61±0.18[a,c]	0.50±0.29[d]

Discussion

T2DM is a metabolic disorders which main feature are elevated blood glucose levels and insulin resistance. Now, it is believed that the it's pathogenesis is mainly due to the dysfunction of pancreatic beta cell, which lead to are insulin resistance and insulin secretion less, the insulin secretion defects play a key role in the development of diabetes, it is the main reason of causing T2DM.Therefore, how to protect the pancreatic beta cell is the key research direction for prevention and treatment diabetes [6,8].

Cortex lycii radicis is a kind of drug which commonly be used for the clinical treatment of diabetes and it's main components are alkaloids, organic acids and lipids, peptides, anthraquinone, diamide, steroids, glycosides, taurine, vanillic acid ,and so on[9]. Existing studies have found that it's functions include stimulating the pancreatic beta cell to secrete more insulin[10], reduce the damage to the morphological structure of pancreatic beta cells[5], lowering blood sugar[11], lowering blood fat and improving immune function[12], and so on. And also found that the main components of lowering blood sugar are organic acids and alkaloids[1,13,14].

The experimental results show that *cortex lycii radicis ethanol-extract* can reduce the weight of experiment rats, but it compared with the rats in the model group, the difference is not obvious; it can effectively reduce the FBG, compared with high, medium, alcohol group, low alcohol group had better effect, but there was no significant difference; it can increase the content of INS, low alcohol group had better effect. Compared with model group,TC,TG and LDL-C contents in the high, medium and low alcohol group were all significantly decreased, but the largest decline in the first and second indicator in low alcohol group, better effect of LDL-C content decreased in high alcohol group. But *cortex lycii radicis ethanol-extract* dose-response relationship of liquid is not obvious, different doses of *cortex lycii radicis* in different aspects demonstrates the superiority.

The experiment results show that the *cortex lycii radicis ethanol-extract* can effectively reduce the damage of STZ on the secretion of pancreatic beta cells in rats, protect and restore the function of pancreatic beta cells, effectively improve the status of insulin resistance and insulin secretion less, so as to play a role in lowering blood glucose, regulating blood lipid metabolism, which opened up

a new way to find new drugs for lowering blood glucose. Ascertain *cortex lycii radicis ethanol -extract* how to affect the molecular target of pancreatic beta cells, which will become the further research direction in this field.

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