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USE OF DIETARY SUPPLEMENTS IN THE TREATMENT OF EXPERIMENTAL DIABETES

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Abstract

An experimental diabetes model was modeled using alloxan. Once the model was satisfied, it was treated using As-GAM and Shifo natural biologically active food supplement (NBAFS). Effects on blood lipid spectrum, glucose, AlT, AsT, and total protein indicators were studied and compared in diabetic rats and treated groups.

Positive indicators were achieved in the groups given Shifo and As-GAM NBAFSs prepared from plants growing in the territory of Uzbekistan.

Keywords: Diabetes, As-GAM, Healing, metformin, biologically active supplements, cholesterol, triacylglycerides, alloxan, glucose, insulin.

Purpose of work: Healing and As-GAM biologically active nutritional supplements effects on alloxan-induced diabetes in rats and biochemical parameters in blood consists of learning.

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Introduction

Diabetes is a dynamic and continuous process that requires new treatments and new knowledge. The patient's active participation in the treatment process makes it difficult to manage the treatment process[4].

Analysis of disease statistics, the number of patients in 2019 showed an increase to 425 million. It is estimated that the number of patients will increase to 700 million by 2045 [5]. According to the World Health Organization, 4.7% of the population in 1980, and 8.5% of the population by 2014 had diabetes [19]. Diabetes affects 9% of the adult population worldwide[2]. That is, one out of every 11 people has diabetes. 90% of them have type 2 diabetes [3].

In the treatment of diabetes mellitus, attention is paid to the following biomarkers: the amount of glucose in the blood at meals, arterial pressure, glycosylated hemoglobin, the patient's body mass. Complications of the disease: retinopathy, cataract, visual dysfunction, fatty hepatosis, ketoacidosis, hyperosmolar coma [WHO, 2019] . Insulin resistance begins first in muscle cells. Due to hyperglycemia in the blood, lipid storage increases in adipocytes that have not yet developed insulin resistance. That is why obesity is observed at first. Testosterone synthesis decreases during the development of type 2 diabetes in men[6;7;8;9]. Chronic hyperglycemia causes inflammatory processes, neuropathy, nephropathy, hearing impairment, Alzheimer's, hypercholesterolemia[11].

A decrease in the activity of the enzyme glucose 6-phosphate dehydrogenase causes insulin resistance[12]. Clinical observations have proven that the thickness of the basement membrane increases by 20-30%, causing albumin secretion [13]. The transfer of albumin into the intercellular fluid causes mesangial expansion. This condition is 2-3 times more common in diabetics than in non-diabetics[14].

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During the Covid-19 pandemic, blood glucose levels have increased dramatically. The main reason for this was the increase in the concentration of inflammatory mediators and cytokines. It has been concluded that the virus causes diabetes because it binds to ASE2 (Angiotensin-forming enzyme). Under the influence of glucocorticoids, gluconeogenesis developed and insulin resistance of various cells increased[1].

Various plant substances contain bioflavonoids, which are known for their powerful antioxidant properties. Their use in diabetes has been proven effective in a number of experimental and clinical studies[10]. For example, in experiments, it was found that compared to the case where 500 mg/day metformin was used alone, the case where 500 mg/day metformin+bitter gourd was used had an 8.33 times better effect on blood glucose [15]. When lemongrass is used in diabetes, blood cholesterol levels, arterial pressure, and C - reactive protein are reduced. But increased the amount of high-density lipoproteins. Turmeric significantly reduced body mass[19].

56% of patients treated with herbal medicines had better diabetes treatment results. 63.2% of patients noted that treatment with plants is of high quality and a safe way[16;17]. In Saudi Arabia, 66% of doctors ask patients about herbal treatment and warn about the side effects of synthetic drugs[18].

It can be seen that the use of various herbal preparations and food supplements for the treatment of diabetes and prevention of complications of the disease gives effective results.

Purpose of work:

Healing and As-GAM biologically active nutritional supplements effects on alloxan-induced diabetes in rats and biochemical parameters in blood consists of learning.

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Examples:

1. Shifo is a biologically active food supplement , with a unique smell, in a state that seems to be crushed for experience.
2. As-GAM is a biologically active food additive, with a unique smell, in the form of three herbs.

Research materials and method

The experiments were carried out on healthy, male white laboratory rats with a body weight of 180 ± 20 g, which were quarantined for 10-14 days . The animals are the following five: Group I – negative control (healthy); II group-pharmacopoeia drug alloxan + metformin; Group III (alloxan + Shifo NBAFS); IV group (alloxan +As-GAM NBAFS); Group V consists of groups of animals in which the positive control (alloxan +dis.water)is included. The diabetes model was induced by a single intraperitoneal injection of alloxan at a dose of 130 mg/kg body weight. Animals were fasted for 24 s to induce diabetes. During the experiment, the amount of glucose in the blood of the animals was measured. Diabetic animals were selected for the experiment and infusions of the researched drugs Shifo NBAFS - 100 mg/kg, As-GAM NBAFS - 100 mg/kg and comparative drug metformin at a dose of 50 mg/kg were administered for treatment for 14 days. Shifo and As-GAM biologically active food additives were measured in doses of 100 mg/kg and injected into the stomach of rats using a special probe after boiling for 5 minutes and cooling at room temperature. The rats of the positive control group were given an equal volume of distilled water for 14 days. On the 15th day of the study, blood was taken from rats in all groups, and the amount of enzymes such as total protein (TP, g/l), glucose (mmol/l), alanine-, aspartate-aminotransferases (ALT, AST, mmol/l), total cholesterol (TX, mmol/l),

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triglycerides (TG, mmol/l), high- and low-density lipoproteins (HDL, LDL, mmol/l), glucose , and other biochemical indicators were compared to positive control group rats. Biochemical indicators were determined using CYPRESS DIAGNOSTICS (Belgium) test kits.

The results of the study were statistically processed using the Microsoft Excel program to determine the average value (M) and the average error (m); differences - $p<0.05$ were considered statistically significant. According to the Student's t-test, statistically significant changes were obtained at the level of $p<0.05$.

Research results obtained. In the alloxan model of diabetes in animals, after treatment of the experimental groups for 14 days, the amount of some biochemical indicators in their blood serum was studied and presented in the following table.

Effect of Shifo and As-GAM biologically active food additives on serum biochemical indicators of rats in alloxan diabetes model, (M±m; n=5)

Indicators	Groups				
	Intact control ,	alloxan + metformin	Alloxan + healing 100 mg/kg	Alloxan +As-GAM 100 mg/kg	Positive control (alcohol + water)
Total protein, g / l	69.0±3.2	62.5±1.7	67.9±5.7	63.5±3.1	60.8±1.4*
glucose, mmol /l	4.4±0.5	5.3±0.2* r=0.04	4.67±0.4* r=0.02	5.47±0.2	6.8±0.7
ALT, mmol /l	70±7.9	108.5±9.0	84±6.5* r=0.01	94.9±9.3	112.5±6.5
AST, mmol /l	67±7.4	100.5±9.1	82.3±6.2 tons.	87.5±7.1	102.5±8.2
Total cholesterol	1.42±0.15	1.62±0.7	1.60±0.17	1.62±0.35	2.5±0.24
Triglyceride	1.06±0.1	1.7±0.1*** R-0.002	1.11±0.14** r-0.008	1.3±0.18*** r-0.003	2.7±0.15
HDL	1.07±0.04	1.05±0.08*** r-0.001	1.07±0.07* R-0.04	1.06±0.05*** r-0.002	0.9±0.05
LDL	1.05±0.02	1.25±0.07* R-0.01	1.22±0.07* R-0.03	1.28±0.06* R-0.01	1.53±0.04

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* r < 0.05; ** r<0.01; *** r<0.005 - statistically significant differences compared to the control group;

Discussions

The results of the study showed that in the alloxan diabetes model, the total protein in the serum of animals in each group was 69.0±3.2 g/l in the negative control group and 60.8±1.4 g/l in the positive control group . and decreased with a statistically significant difference when comparing the negative control group with the positive control group (* r<0.05). In the experimental groups, i.e., in the group of animals in which 100 mg/kg doses of biologically active compounds of Shifo, As-GAM and therapeutic 50 mg/kg dose of metformin were administered, these indicators were 67.9±5.7, respectively; 63.5±3.1 and 62.5±1.7 g/l, tending to increase compared to the positive control but not statistically significant. The amount of glucose in the positive control group was 6.8±0.7 mmol/l. Glucose content in Shifo dietary supplement and metformin drug was 4.67±0.4 and 5.3±0.2 mmol/l, respectively, and reached statistically significant differences from the positive control (r<0.05; r<0.05). As-GAM biologically active food supplement showed glucose content of 5.47±0.2 mmol/l, which tended to decrease from the positive control group, but no statistical difference was observed. When the ALT level was studied in the experimental groups, it was 1.6 times higher than the negative control group, showing 112.5±6.5 mmol/l in the untreated group. In the group of animals treated with a dose of 100 mg/kg, the level of ALT was 84±6.5 mmol/l, which was statistically significantly reduced compared to the positive control group (r<0.05). In the group of animals treated with As-GAM and metformin, it was 94.9±9.3 and 108.5±9.1 mmol/l, respectively, which was lower than the positive control, but no statistical differences were observed.

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When the amount of AST was studied, at 100 mg/kg doses of Shifo and As-GAM biologically active compounds were 82.3±6.2 and 87.5±7.1 mmol/l compared to the positive control (102.5±8.2 mmol/l) decreased, but no statistically significant differences were noted. In the group of rats administered a 50 mg/kg dose of metformin pharmacopoeia drug, the AST level was 100.5±9.1 mmol/l, showing a result close to the values of the positive control group. The amount of total cholesterol was 2.5±0.24 mmol/l in the positive control and 1.60±0.17 mmol/l in the Shifo biological food supplement, and the differences between the groups were clearly observed. As-GAM and Metformin drug in the blood serum of rats, the amount of total cholesterol is 1.62±0.35, respectively; It was 1.62±0.35 mmol/l and decreased compared to the positive control group, but no statistical differences were observed. The amount of triglycerides was 2.7±0.15 mmol/l in the positive control group, 1.11±0.14 in the group of animals treated with Shifo, As-GAM and metformin, respectively; 1.3±0.18 and 1.7±0.1 mmol/l, and statistically significant differences were noted in reducing the amount of triglycerides compared to the positive control ($r<0.01$; $r<0.005$; $r<0.005$). When the amount of HDL was studied in the studies, its amount decreased to 0.9±0.05 mmol/l in animals of the untreated diabetes group, in the case of Shifo As-GAM biologically active compounds and metformin drug, these indicators were 1.07±0.07, respectively; 1.06±0.05 and 1.05±0.08 mmol/l, compared to the positive control, statistically significant differences were achieved in all study groups ($r<0.01$; $r<0.005$; $r<0.005$). When the amount of LDL was studied in the experimental groups, the amount of positive control group was 1.53±0.04 mmol/l in the blood serum of rats, which was higher than the negative control group (1.05±0.02). In the case of Shifo As-GAM biologically active compounds and metformin drug, these indicators are 1.22±0.07, respectively;

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1.28±0.06 and 1.25±0.07 mmol/l, compared with the positive control, statistically significant differences were achieved in all research groups (r<0.05; r<0.05; r<0 .05).

Summary

The conclusion from the obtained experimental results is that when studying the effects of Shifo, As-GAM at doses of 100 mg/kg, as well as the comparative drug metformin pharmacopoeia drug at doses of 50 mg/kg, induced by alloxan, the total protein content increased compared to the untreated group. tended to increase toward the healthy animal group, but there were no statistically significant differences between groups. Glucose and ALT levels decreased from the positive control to statistical significance only in Shifo biological supplement, while in As-GAM and metformin their levels decreased, but did not show statistically significant results. AST and total cholesterol levels were highest in the positive control and tended to decrease in the remaining experimental groups, but were statistically significant. In the group of animals treated with healing, As-GAM and metformin drugs, triglycerides, HDL, and LDL decreased with statistically significant differences from the positive control group. The conclusion is that it can be seen that these research drugs improved the biochemical changes in the blood serum of diabetic animals. In further studies, it will be possible to extend the duration of treatment and to study biochemical parameters in the blood.

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