THE EFFECT OF A CAVERGAL ON THE PARAMETERS OF CARBOHYDRATE AND LIPID METABOLISM IN RABBITS WITH METABOLIC SYNDROME.

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THE EFFECT OF A CAVERGAL ON THE PARAMETERS OF CARBOHYDRATE AND LIPID METABOLISM IN RABBITS WITH METABOLIC SYNDROME.
Khidoyatova M.R.1, Inoyatova F.H.2, Aripov A.N.1

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Chop etildi: 2018 y, sentyabr
Калит сўзлар: метаболик синдром, тажериба, кавергал.

АННОТАЦИЯ
Максад: экспериментал метаболик синдромли қуёнларда кавергални углеводлар ва липидлар алмашинувига таъсири анъиқлаш. Материал ва усуллар: эксперимент 18 та қуёнда ўтказилди. Метаболик синдром модели Каримов Х.Я. ва авторлар тавсиясига кўра амалга оширилди. Кавергални ёқдиробидаги канд миқдорида таъсири охирилди. Натижа: кавергал билан даволанган қуёнларнинг қонида триглицеридлар ва жуда кам липопротеинлар лордан кўра камайиш кузатилди. Дори воситаси қон зардобидаги канд миқдорида ҳам фойдали таъсири кўрсатди. Кавергал милдронатга нисбатан кучлироқ гиполипидемик таъсирига эгалик аниқланди.

Хулоса: кавергал углевод ҳам липидлар алмашинувига ижобий таъсири килади.
Objective: The purpose of the study was to study the effect of kavergal on the parameters of carbohydrate and lipid metabolism in rabbits with a metabolic syndrome. Material and methods. Experiments were performed on 18 rabbits. The model of metabolic syndrome was reproduced according to H.Ya.Karimov's recommendations. In the course of treatment a significant decrease in the level of TG, VHDL and glucose of blood in rabbits treated with kavergal. In contrast to meldonate, kavergal showed a stronger lipid-lowering effect. Conclusion: The results of the study indicate a favorable effect of the kavergal both on the lipid spectrum of the blood and on the degree of hyperglycemia.

Changes in the morphology of structures and heart geometry in patients with metabolic syndrome (MS) are intermediate mechanisms on the way to more severe cardiac function impairment [3]. Therefore, experimental models of MS, which make it possible to trace the development of the disease in dynamics, are of great interest.

There are a number of ways to simulate metabolic disturbances that are conditionally adequate to MS, since only individual MS components are reproduced in the experimental animal [1,3,4,7,8]. And, finally, the object of modeling is not convenient for experimental studies, because, firstly, MS is a consequence of rather long metabolic disorders that arise in the body, and secondly, to study the dynamics of the disease and evaluate the effectiveness of treatment, it is necessary to use the same to animals [2,6,8].

The purpose of this study was to study the effect of kavergal on the parameters of carbohydrate, lipid metabolism in rabbits with experimental MS. Material and methods. The experiments were performed on 18 male rabbits weighing from 1600 to 2100 g. The MS model was reproduced according to the recommendations of Karimov Kh. Ya et al. (2006). This method is protected by the patent of the Republic of Uzbekistan [2]. All animals were kept separately, in close cells, in order to create hypodynamia. There was a 5% solution of sugar in the animal's bowl, and the crystalline cholesterol was mixed daily in the dose of 250 mg / kg of body weight. In a day, animals were injected subcutaneously with insulin in a dose of 0.1 units. / 100 g.
Simulation of MS lasted 30 days. During the whole experiment, every week all animals were weighed and the stomach volume was measured. A month later, on the background of further modeling, MS animals were divided into 3 equal groups. Rabbits of the 1st group injected a calaban dissolved in distilled water, orally at a dose of 50 mg / kg body weight, daily, for 30 days, the 2nd group received a mildronate (Grindex, Latvia) at a dose of 50 mg / kg body weight body. In the 3-group, the MC simulation was continued without experimental therapy. The animals that were under ether anesthesia were slaughtered by decapitation on the 60th day of the experiment. In all animals, initially, on the 30th, 45th and 60th days of the experiment, the lipid spectrum, the level of glucose and insulin in the blood serum were studied.

The body mass index of animals was calculated by the formula: \( M / W \), where \( M \) is the mass of the body in r, \( W \) is the waist in cm. The weight gain was calculated from the formula: \( M_1 - M_2 \), where \( M_1 \) is the initial weight in g, \( M_2 \) is the body weight per day of the study in g.

The content of blood glucose was determined on the RANDOX biochemical analyzer (Ireland) using special kits and the program.

The lipid spectrum of blood serum (cholesterol, TG) was also determined on an automatic biochemical analyzer RANDOX (Ireland) using special sets and programs. The content of cholesterol in HDL was determined in the serum after precipitation of LDL cholesterol and very low density lipoproteins with heparin in the presence of \( \text{Mn}^{2+} \) ions.

The LDL level was calculated according to the formula of Friedwald et al.: General Cholesterol - (HDL-C + HD VLDL)

The content of insulin in the blood was determined on the ELISA enzyme immunoassay using special Monobind reagents.

All digital data was subjected to statistical processing on a Pentium-III computer using a software package. The reliability of the differences (P) of the data was
calculated using the t-Student test. Differences were considered significant at $P < 0.05$.

**Results of the study.**

The results of the study, which characterize the mass and growth indices, are presented in Tab. 1. Thus, the weight of untreated animals (group 1) by the end of the study significantly exceeded the index of the remaining animals of groups 2 and 3 (treated with a cavern and a mildronate). The revealed difference was more than 40.0 and 30.1%, respectively.

Table 1. Change in mass and waist in the study groups

<table>
<thead>
<tr>
<th>Criteria</th>
<th>after MS modeling</th>
<th>after 1 month of experimental therapy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 Group (untreated)</td>
<td>2 Group (kavergal)</td>
</tr>
<tr>
<td>The weight, kg</td>
<td>2,32±0,1</td>
<td>2,2±0,13</td>
</tr>
<tr>
<td>Waist, sm</td>
<td>35,8±2,9</td>
<td>38±1,14</td>
</tr>
</tbody>
</table>

Note: * $p < 0.05$ compared with untreated group.

The waist size of rabbits with MS increased until the end of the experiment, in contrast to the treated animals (see Table 1) and exceeded similar values by 25.8% in the group with the curved and 23% in rabbits treated with mildronate. Even more pronounced differences between the groups we found in studying the lipid spectrum of blood serum (Table 2). In the course of treatment, a significant decrease in the level of TG and VLDL of blood in rabbits in the 2nd group was found to be 43.7% ($p<0.05$) compared with before treatment. In group 3, these indicators decreased by 27%, respectively. This difference in values when comparing the results in the groups turned out to be reliable ($p<0.05$). The concentration of cholesterol at the end of the study in animals with MC was 3.6 times and 1.8 times higher than in the 2nd and 3rd group of subjects (see Table 2).
The data obtained on the serum lipid content of untreated rabbits indicate that the average indices of atherogenic lipid fractions continued to increase throughout the study, and the level of HDL cholesterides tended to slightly increase (see Table 2).

<table>
<thead>
<tr>
<th>Criteria</th>
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<th>after 1 month of experimental therapy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 Group</td>
<td>2 Group</td>
</tr>
<tr>
<td>Hol, mg/dl</td>
<td>159,1±27,04</td>
<td>160,3±22,1</td>
</tr>
<tr>
<td>TG, mg/dl</td>
<td>142,8±33,7</td>
<td>140±31,7</td>
</tr>
<tr>
<td>HDL, mg/dl</td>
<td>15,6±5,6</td>
<td>15,3±6,12</td>
</tr>
<tr>
<td>LDL, mg/dl</td>
<td>114,9±24,7</td>
<td>117±21,3</td>
</tr>
<tr>
<td>VLDL, mg/dl</td>
<td>28,5±6,7</td>
<td>28±6,3</td>
</tr>
<tr>
<td>Glucosa, mmol/l</td>
<td>6,98±0,24</td>
<td>7,7±0,42</td>
</tr>
</tbody>
</table>

Note: * p <0.05 compared with untreated group, ** p <0.05 compared to pre-treatment

In the study of carbohydrate metabolism, the most favorable effect of cavergal on the serum glucose level was found (Table 2). The indicator decreased by 22.1%, compared with the level of glucose before treatment (p <0.05). After 1 month in animals without experimental therapy, there was an increase in serum.
glucose by 13.1%. That was 24.1% and 21.5% higher than in groups 2 and 3, respectively.

A similar picture was observed in the level of hyperinsulinemia (GI). Thus, the content of insulin in animals of groups 2 and 3 was reduced by 29.5 and 27.3% compared to its level before treatment, respectively. At the same time, if in rabbits of the 2 group it did not differ much from the norm, in the rabbits of group 3 it was still higher than the norm by 31.4%.

Conclusions

Thus, the results of the study indicate a favorable effect of the cavergal both on the lipid spectrum of the blood and on the degree of hyperglycemia, GI. In contrast to mildronate, cavergal showed a stronger lipid-lowering effect, namely, a decrease in cholesterol, TG, LDL. Despite the fact that the points of application of both drugs are different [5], they still affect the degree of IR, which is reliably expressed in the cavergal. Perhaps it is indirectly associated with its pronounced antioxidant, antihypoxic and hypolipidemic properties.

References:

