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The effectiveness of dihydroquercetin in experimental hyperglycemia

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Summary

The use of dihydroquercetin against the background of experimental hyperglycemia causes a decrease in blood glucose, a decrease in the level of the lipid peroxidation reaction and an increase in the content of vitamin E in the peripheral blood and lung tissue, and also leads to a positive dynamics of structural changes in the pancreatic islets.

Key words: **pancreatic islets, gi perglycemia, lipid peroxidation, dihydroc vercetin.**

Currently, diabetes mellitus (DM) occupies one of the leading places in the structure of morbidity. Given that this pathology is accompanied by a large number of complications, the problems of prevention and treatment of DM are of particular importance [2, 3, 9]. It is believed that the main role in this disease is played by hyperglycemia, against the background of which lipid peroxidation reactions (LPO) are activated, and their products are the main ones in the development of pathology. Although significant progress has been made in the field of diabetes treatment, there are no fewer unresolved problems, and in this regard, there is a need for a comprehensive correction of pathogenetic factors [4, 10]. The current tactics of managing patients by strict control of blood glucose levels does not lead to the desired result, often it is not possible to avoid the development of complications, so there is a need to influence different links.

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Effect of the application of digidroqvertsetin on experimental hyperglycemia

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Summary

The application of digidroqertsetin at the background of experimental hyperglycemia causes reduction in blood glucose, decrease of the level of the reaction of peroxide oxidation of lipids and increase in the content of vitamin E in the peripheral blood and the tissue of lung, and also it leads to the positive dynamics of structural changes in the islets of the pancreas.

Key words: **the islets of the pancreas, hyperglycemia, the peroxide oxidation of lipids, digidroqertsetin.**

pathological process by reducing the level of react
LPO [5, 7, 8]. Of great importance is the use of antioxidant drugs, namely bioflavonoids, which are natural defenders against "oxidative stress". According to its chemical properties, dihydroquercetin is an active

an antioxidant, i.e., a substance that binds free radicals and deprives them of their damaging effect [6, 10].

The aim of this work was to study the effect of dihydroquercetin on free radical lipid oxidation and the morphology of the endocrine apparatus of the pancreas in experimental hyperglycemia.

Materials and methods

The work was performed on 50 white male rats aged 6-7 months, weighing 220-280 g. Intact animals comprised 1 group. In groups 2 and 3, experimental hyperglycemia was induced for 8 weeks. by daily intake of glucose: in the morning orally at a dose of 1.2 g and in the evening parenterally (intraperitoneally) by administering its solution at a dose of 600 mg/100 g of weight. Animals of the 3rd group were given daily dihydroquercetin at a dose of 2.5 mg/100 g of weight. All animals were kept simultaneously in the same vivarium. The slaughter was carried out by dislocation of the cervical vertebrae under thiopental anesthesia. The pancreas was fixed in 10% neutral formalin, paraffin sections were made, followed by staining with hematoxylin-eosin, glycosaminoglycans were detected with alcine blue 8 GX according to Steedman (1950) with control processing of sections in a solution of testicular hyaluronidase, neutral polysaccharides - PAS-reaction according to Mac -Manus (1954) with control treatment of sections with alpha-amylase, B-insulocytes - aldehyde fuchsin according to Gable (1955). Pancreatic islets were studied on semi-thin and ultra-thin sections. Processing of the material for transmission microscopy was carried out according to the method of JJ Coalson, V.T.
Winteret al. (1986). Activity on CHIC - put
telnye substances and glycosaminoglycans - it was estimated
after appropriate coloring, semi-quantitatively in conventional units (points). The signifi cance of differences between the series was compared using the nonparametric Rosenbaum Q test. On preparations stained with heme
toxin-eosin, in the field of view, a count was made
the number of islets, as well as the number of cells in the islet, which made it possible to divide them into groups: small, medium and large. The level of glucose in peripheral blood was determined from 8.00 to 8.30 (on an empty stomach) by the glucose oxidase method on the One Touch Basic™ Plus device. The intensity of the LPO reaction and the level of antioxidant protection were assessed in the blood and lung tissue in terms of indicators: lipid hydroperoxides (HP) were determined by the L.A. Romanova, I.D. Steel (1977) modified by E.A. Borodina et al. (1992), the content of vitamin E was determined by the method of R.Zh. Kiselevich, S.I. Squarco (1972)

diene conjugates (DC) - by the method of I.D. Steel (1972).

Results and discussions

During the experiment, it was found that after 4 weeks. experiment in animals of the 2nd group, the level of glucose increased to 5.9±0.59 mmol/l (in intact animals it was 3.1±0.24 mmol/l). In rats of the 3rd group, the amount of glucose during this period was 4.48±0.41 mmol/l. Further study showed a significant increase in glucose levels after 8 weeks. in animals of group 2 to 6.4±0.53 mmol/l compared with group 3, where this figure was 5.2±0.14 mmol/l.

Hyperglycemia can disrupt the balance of free radical oxidation in the body as a
your decrease in the activity of protective mechanisms, so
and as a result of excessive activation of LPO. Under conditions of carbohydrate metabolism pathology, high glycemic values provoke excessive formation of free radicals and have a cytotoxic effect [1, 5]. If, with the development of persistent hyperglycemia, we noted an increase in the indicators of diene conjugates and hydroperoxides in the peripheral blood and lung tissue against the background of a decrease in the level of vitamin E, then with the use of dihydroquercetin, the dynamics of changes was noted, indicating the approach of these indicators (table).

Indicators of blood and lung tissue in intact and experimental animals

group of animals	Blood indicators		
	Serum		
	DC (nmol/ml) HP	(nmol/ml)	Vitamin E (µg/ml)
Intact	18.6±0.38	21.7±0.42	32.5±0.57
hyperglycemia	81.6±1.04	26.8±1.12	27.8±0.62
Hyperglycemia + dihydroquercetin	68.8±2.03*	28.4±1.4	30.8±0.43*
	lung tissue		
Intact	53.18±0.33	21.1±0.54	42.6±1.08
hyperglycemia	77.4±1.45	35.9±2.1	40.3±0.97
Hyperglycemia + dihydroquercetin	59.8±1.19*	34.8±1.72	45.9±0.41*

Note. * — p<0.01 compared with the indicators of this series and a number of animals with hyperglycemia.

Despite the positive dynamics of the LPO reaction,
in the tissues of the lung continued to be elevated
activity of oxidative processes, which can be judged by the level of the obtained indicators. It is likely that lipid oxidation products are released from the lung into the general circulation. important role in limiting
the intensity of oxidative processes is precisely the activation of the antioxidant defense system.

A morphological study of the pancreas of animals with experimental hyperglycemia showed a significant increase in the number of small islets consisting of single B-insulocytes. This probably indicates the process of new formation of islets from the epithelium of the excretory ducts [3, 5]. The number of large islets decreases, and in their composition, most cells have signs of vacuolization and clarification of the cytoplasm, as well as dystrophically altered nuclei. The number of secretory granules in B cells decreases, their structure changes, the width of the electronically transparent rim between the membrane and the osmiophilic content increases, the density of which varies. A few granules in B cells are more often distributed throughout the cytoplasm or concentrated at one of the poles of the cell [4].

The thickness of the capsule of the islets increases, and the reaction to PAS-positive substances significantly increases in it. In the perivascular zone, there are bundles of multidirectional collagen fibers, here the amount of neutral polysaccharides increases and a moderate activation of the reaction to glycosaminoglycans is revealed. As a result of an increase in underoxidized products, destructive changes increase in the connective tissue of the islets, as evidenced by increased fibrillogenesis and accumulation of PAS-positive substances, which undoubtedly leads to impaired blood supply.

nia in the islets. Animals treated with dihydroquercetin against the background of hyperglycemia showed a significant increase in the number of both small and large islets. Moreover, most of the large islets consisted of 150.3 ± 10.8 cells. (with hyperglycemia their number is 95.1±11.3). The degree of vacuolization and dystrophic changes in B-cells of the islets is less pronounced than in animals of the 2nd group. At the same time, the islets contain a significant number of B-insulocytes with an increased number of granules, most of which have the usual osmiophilicity. The structure of the endocrinocytes that make up the islets indicates that these cells are in a state of increased functional activity. In the connective tissue layers of the islets and their capsule, the content of glycosaminoglycans increases and the level of reaction to PAS-positive substances significantly decreases, especially in the wall of blood vessels. Thus, a drug with antioxidant properties, under conditions of oxidative stress, on the one hand, has a protective effect, preventing the development of structural changes and related consequences, on the other hand.

sides - prevents excessive stress on the system
those providing compensatory reactions.

findings

1. The introduction of large doses of glucose leads to the development of persistent hyperglycemia, as well as to an increase in the level of lipid peroxidation reactions and structural changes in the pancreatic islets.

2. The use of dihydroquercetin against the background of hypergli kemia causes a decrease in blood glucose levels,
a decrease in the concentration of vitamin E and a decrease in diene conjugates in peripheral blood and lung tissues, as well as an increase in the number of functionally active B cells in the pancreatic islets.

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Morphological and functional features of the manifestations of the liver cytolytic syndrome in the dynamics of the post-compression period of the syndrome of prolonged compression

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In recent decades, in Russia, as well as throughout the world, there has been a tendency towards an increase in the number of emergencies (natural, man-made, social, and other disasters), accompanied by a significant number of human victims [5]. Along with acute renal failure, liver dysfunction plays an important role in the pathogenesis of long term compression syndrome (SDS) [3, 5, 6]. Since one of the main pathogenetic factors of DFS is toxemia [7], a large load falls on the liver, on its detoxifying function, which was the reason for studying the functional state of this organ of central homeostasis. L.M. Nebolsina [8] points to the early involvement of the liver in the pathological process in the syndrome of prolonged compression.

The purpose of the study was to reveal the morphological and biochemical features of the manifestations of cytolytic th syndrome in different periods of the experimental long-term compression syndrome.

Materials and methods

The material was experimental animals - 85 male Wistar rats weighing 180-200 g at the age of 5-6 months. The syndrome of prolonged compression of moderate severity was modeled [7]. The sampling of the material was carried out under ether anesthesia in accordance with international requirements for the humane treatment of animals. Intact rats made up 1 group; rats with prolonged compression syndrome of moderate severity — group 2. The studies were carried out on days 1, 3, 7, and 14 after decompression. Serum, blood plasma and lymph were examined. For the quantitative determination of free fatty acids, malonic dialdehyde, blood AST, reagent kits Novohol (JSC Vector-Best), Biosub TG (Biocon, Germany) were used. The method for the determination of fatty acid esters under the influence of hydroxylamine was converted into hydroxamic acid, which forms colored salts with iron compounds, which were photometrically measured. The determination of MDA was carried out in accordance with the generally accepted procedure. The concentration of lipid peroxidation products was expressed in nanomoles per liter, taking the molar extinction coefficient equal to **1.56×105 ×M-1×cm-1** [2]. For the purpose of light optical microscopy, sections 5-6 μm thick were prepared on a sledge microtome, stained with Mayer's hematoxylin and