

Pathophysiological analysis of the effect of GA-40 and the antioxidant ionol on liver biochemical parameters in acute hemic hypoxia in the study of rat liver fragments using the vegetative resonance test "IMEDIS-

TEST + "

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The aim of the study was to conduct a pathophysiological analysis of the effect of GA40 and the antioxidant ionol on the biochemical parameters of rat liver in acute hemic hypoxia using the vegetative resonance test "IMEDIS-TEST +".

In experiments on 24 sexually mature white male rats with acute hemic hypoxia of moderate severity (administration of 1% sodium nitrite solution subcutaneously at a dose of 50 mg / kg once), the protective effect of GA-40 was studied [4, 5] (injected intramuscularly at a dose of 2 µg / kg body weight) and antioxidant ionol (injected intraperitoneally at a dose of 120 mg / kg body weight) using the vegetative resonance test "IMEDIS-TEST +" [1, 2, 3]. The GA-40 preparation and the antioxidant ionol in acute hemic hypoxia increased the content in the liver: copper, iron, methionine, arginine, oxygen, interleukin-10, protein, the content of nonessential and essential amino acids, ATP. The GA-40 preparation and the antioxidant ionol in acute hemic hypoxia reduced the content in the liver: angiotensin 2, histamine, serotonin, ammonia, lactic and pyruvic acids, acetone, hydrogen peroxide, interleukin-8, tumor necrosis factor - alpha, the level of hypoxanthine, xanthine, uric acid, calcium, the degree of catabolism and acidity at the level of the central veins of the hepatic lobules (Table 1). It should be noted that the GA40 preparation, in comparison with ionol, more effectively reduced the content of serotonin, lactic and pyruvic acids, hydrogen peroxide, xanthine and uric acid. In addition, the GA-40 preparation, in comparison with ionol, more effectively increased the content of oxygen, protein, nonessential amino acids, and ATP in the liver. hydrogen peroxide, xanthine and uric acid. In addition, the GA-40 preparation, in comparison with ionol, more effectively increased the content of oxygen, protein, nonessential amino acids, and ATP in the liver. hydrogen peroxide, xanthine and uric acid. In addition, the GA-40 preparation, in comparison with ionol, more effectively increased the content of oxygen, protein, nonessential amino acids, and ATP in the liver.

Table 1
Effect of GA-40 and antioxidant ionol on liver biochemical parameters in rats with moderate acute hemic hypoxia after 2 hours after administration of sodium nitrite in the study of liver fragments in rats with using VRT "IMEDIS TEST +" ($\bar{x} \pm Sx$)

Indicators	Hemic hypoxia (n = 8)	Hemic hypoxia + GA-40 (n = 8)	Hemic hypoxia + ionol (n = 8)
Cu ++, conventional units	6.5 0.19	12.1 0.29 p <0.001	12.1 0.35 p <0.001
Fe ++, conventional units	10.2 0.45	12.6 0.18 p <0.001	13.8 0.29 p <0.001 p1 < 0.02
Angiotensin 2, conventional units	16.6 0.42	14.5 0.46 p <0.001	13.7 0.41 p <0.001
Histamine, conventional units	17.5 0.33	12.7 0.45 p <0.001	13.6 0.18 p <0.001
Serotonin, conventional units	14.5 0.26	5.1 0.22 p <0.001	11.6 0.49 p <0.001 p1 < 0.001
Methionine, conventional units	10.2 0.36	12.0 0.26 p <0.01	11.7 0.25 p <0.01
Arginine, conventional unit	9.2 0.61	12.6 0.18 p <0.001	13.2 0.36 p <0.001

Ammonia, conventional units	5.6 0.26	2.0 0.00 p <0.001	2.0 0.26 p <0.001
Dairy acid, conventional units	16.6 0.41	12.1 0.29 p <0.001	14.1 0.29 p <0.001 p1 < 0.001
Pyruvic acid, conventional units	16.6 0.62	12.8 0.29 p <0.001	15.0 0.32 p <0.05 p1 < 0.001
Acetone, conventional units	8.2 0.45	5.2 0.31 p <0.001	5.7 0.41 p <0.01
Peroxide hydrogen, conventional units	20.3 0.26	15.5 0.18 p <0.001	19.3 0.18 p <0.01 p1 < 0.001
Oxygen, conventional units	7,7 0.41	13.2 0.31 p <0.001	10.1 0.44 p <0.01 p1 < 0.001
IL-8, conventional units	15.8 0.22	13.1 0.44 p <0.001	12.6 0.26 p <0.001
IL-10, standard unit	5.5 0.18	10.0 0.32 p <0.001	10.6 0.26 p <0.001
TNF α , arb.	16.6 0.41	14.6 0.32 p <0.01	14.6 0.18 p <0.001
Protein, conventional units	5.5 0.18	8.7 0.16 p <0.001	6.8 0.29 p <0.01 p1 < 0.001
Amino acids are not replaceable, conventional units	5.3 0.18	8.8 0.29 p <0.001	8.7 0.31 p <0.001
Amino acids replaceable, conventional units	5.6 0.18	9.6 0.18 p <0.001	6.6 0.26 p <0.01 p1 < 0.001
ATP, conventional units	10.75 0.25	14.8 0.29 p <0.001	13.3 0.32 p <0.01 p1 < 0.001
Hypoxanthine, conventional units	18.5 0.26	11.8 0.29 p <0.001	12.8 0.51 p <0.001
Xanthine, conventional unit	17.5 0.18	11.6 0.18 p <0.001	14.7 0.45 p <0.001 p1 < 0.001
Uric acid, conventional units	17.5 0.42	12.3 0.18 p <0.001	13.3 0.37 p <0.05 p1 < 0.001
Ca ++, conventional units	15.8 0.22	12.2 0.31 p <0.001	11.6 0.26 p <0.001
Central veins (catabolism), us.units	3.6 0.18	2.21 0.16 p <0.001	2.6 0.26 p <0.01
Central veins (acidity), us.units	4.5 0.18	3.5 0.18 p <0.01	3.3 0.18 p <0.001

p - reliability of differences in comparison with hemic hypoxia;

Rone - reliability of differences in comparison with hemic hypoxia during treatment with GA-40;

n is the number of observations.

The protective effect of GA-40 is due to its ability to induce harmony between the processes (sympathicus - catabolism - acidity) or (parasympathicus - anabolism - alkalinity), as a result of which the antioxidant and cytoprotective properties of this drug on liver cells were revealed. The increase in the copper content in the liver against the background of the use of the GA-40 preparation is explained by the increase in the copper-containing antioxidant protein - ceruloplasmin, the increase in the iron content is due to the improvement of the processes of iron deposition in the liver. An increase in the level of methionine indicates an increase in the protective reserves of the liver aimed at preventing the development of fatty infiltration of this organ. An increase in the level of arginine and a decrease in the content of angiotensin 2 indicate an increase in the protective processes in the liver due to a decrease in the vasoconstrictor effect of angiotensin 2 and an increase in the vasodilatory effect of nitric oxide (II). Decreased levels of serotonin, histamine, interleukin-8, tumor necrosis factor-alpha and an increase in the anti-inflammatory cytokine interleukin-10 indicate anti-inflammatory effect of GA-40 and ionol. The decrease in the level of ammonia is due to the activation of the ornithine cycle of urea synthesis under the influence of the studied drugs. A decrease in the level of pyruvic, lactic acids and acetone indicates the property of these drugs regarding the correction of metabolic acidosis, which was also effective at the level of the third functional zone of the hepatic lobules, which was accompanied by a decrease in the degree of acidity in the central veins. An increase in protein content, levels of nonessential and essential amino acids, as well as a decrease in the degree of catabolism at the level of central veins, indicates an increase in protein-synthetic liver function under the influence of GA-40 and ionol. An increase in the level of ATP against the background of the use of these drugs indicates an improvement in the energy potential of the liver. One of the antioxidant effects of these drugs is due to the inhibition of the xanthine oxidase pathway of lipid peroxidation activation, as indicated by a decrease in the level of hypoxanthine, xanthine, and uric acid. A decrease in the calcium content in the liver is due to the suppression of calcium mechanisms of cell damage with a decrease in the degree of calcium ions entering the cytoplasm, since the concentration of calcium ions in the extracellular space is normally 5000-10000 times higher than in the cytoplasm.

Conclusions:

1. With the help of the vegetative resonance test "IMEDIS-TEST +" it is shown the protective effect of GA-40 and ionol in acute hemic hypoxia, which was characterized by antioxidant, cytoprotective effects, a decrease in the degree of acidosis, an increase in the antitoxic and protein-synthetic functions of the liver, and anti-inflammatory effects.

2. The preparation GA-40 in comparison with ionol in acute hemic hypoxia is more effectively reduced the content of serotonin, lactic and pyruvic acids, hydrogen peroxide, xanthine, uric acid and more effectively increased the content of oxygen, protein, nonessential amino acids, and ATP in rat liver.

The prospect of scientific research consists in the further use of the vegetative resonance test "IMEDIS-TEST +" for in vivo assessment of the protective effect of GA-40 in experimental animals with liver and kidney diseases.

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