STUDYING THE RELATIONSHIP BIOCHEMICAL INDICATORS OF LIVER AND BLOOD OF EXPERIMENTAL ANIMALS UNDER THE INFLUENCE OF GENETICALLY MODIFIED SOYA

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Resume: *This is aeticle, aAccording to the results obtained during the study, the relationship between changes in the biochemical parameters of the liver and blood of experimental animals under the influence of genetically modified soybeans compared to the experiment was determined.*

Keywords: *genetically modified soy, liver, blood, biochemistry, experiment.*

INTRODUCTION

It is known that genetically modified organisms (GMO) are plant or animal organisms whose genotype has been modified into an organism in an unnatural way using genetic engineering. These plants are used to solve the problems of resistance to herbicides, pests, diseases, salinity, high and low temperatures, increasing yields, organic pollution of the environment, purification from heavy metals, ensuring the synthesis of compounds identified in the plant organism [1,6,9,12,14,17].

In this case, various new properties are introduced into the body, and the quality of the product is changed. The issues of their use are solved by ensuring the synthesis of certain compounds in plants [3,5,10,13,15].

To date, 140 different plant genes have been modified. A characteristic feature of GM-plants is resistance to pests and herbicides. For example, potatoes containing the earth bacteria gene that kills the Colorado potato beetle; drought-resistant wheat with the scorpion gene; tomatoes with the sea flounder gene; and soybeans with the bacterial gene have been cultivated [2,4,7,8,11,17].

Purpose of the work comparative study of the relationship between changes in biochemical parameters of the liver and blood of experimental animals under the influence of genetically modified soybeans

Materials and methods For the purpose of conducting experimental studies, 90 male white outbred rats weighing 160-180 g were taken.

Discussion of the obtained results: In the experiment, researchers studied the amount of biochemical indicators in the blood of laboratory animals that consumed GM products and their changes [Nuraliev N.A. et al., 2017; Sobirova D.R., 2018]. However, the obtained results were compared only with intact laboratory animals, the comparison group was not included, and a comparative analysis with liver morphological parameters was not conducted. As a result, the fact that the GM-product that influenced biochemical indicators was not proven in a comparative aspect, and the obtained data were only stated. The lack

of comparison with the morphological parameters of the liver did not reveal the mechanism of the origin of the signs of the pathological process.

Taking the above into account, a comparative assessment of the biochemical parameters of the blood of laboratory animals that consumed GM-soy and non-GM-soy was carried out, and a comparative analysis with the obtained morphological parameters was conducted.

It was established that the indicators of AST and ALT (liver enzymes) in the blood of laboratory animals that consumed GM-soy (main group) were significantly ($P<0.05$) higher than the same parameters obtained from the blood of laboratory animals belonging to the control and comparison groups (Table 1).

Table 1

Comparative parameters of liver enzyme indicators in the blood of white outbred rats that consumed and did not consume GM-soy

Groups	Liver enzymes	
	AST, E/L	ALT, E/L
Reference indicators	40-58	56-70
Control group, n=30	65.0±1.72	76.20±2.19
Comparison group, n=30	94.0±2.06* ↑	85.70±3.25* ↑
Main group, n=30	326.20±6.34* ^ ↑	117.0±3.89* ^↑

Note: * - reliability of differences relative to the control group; ^ - sign of reliability of the difference between the main group and the comparison group; ↑ - direction of change of indicators.

If AST in the control group was 65.0±1.72 U/l (within the reference values), then in the comparison group this indicator increased reliably by 1.45 times ($P<0.05$), and in the main group this parameter increased sharply, reliably by 5.02 times ($P<0.001$). The difference between the indicators is clearly visible.

Similar results were obtained for ALT, if in the blood of laboratory animals of the control group it was 76.20±2.19 U/L (within the reference parameters), then in the comparison group this parameter increased significantly by 1.12 times ($P<0.05$), and in the main group the degree of increase of this indicator increased significantly by 1.54 times ($P<0.001$).

The data obtained for both indicators differ significantly from each other due to the formation of functional strain due to the negative effect of GM-soy on the liver, as a result of which the parameters of liver enzymes significantly exceeded not only the reference values, but also the parameters of the control group. The presence of a significant difference between the indicators of white outbred rats of the comparison group and the main group indicates that the source of the negative impact is not soybeans, but its GM variant.

In addition to liver enzymes, other biochemical blood parameters were also determined, and the results were analyzed (Table 2).

The obtained results showed that the detected levels of urea, glucose, residual nitrogen, and albumin in the control group were within the reference values. Despite the

fact that when analyzing the indicators of the comparison and main groups, a tendency towards an increase or decrease in the parameters was observed, all the obtained results did not differ significantly from each other.

Table 2

Comparative parameters of biochemical blood parameters of white outbred rats that consumed and did not consume GM-soy.

Groups	Urea, 7.1-8.3 mmol/l	Glucose, 4.2-4.4 mmol/l	Residual nitrogen, 14.3-28.6 mmol/l	Albumin, 35-50 g/l
Control group, n=30	4.46±2.1	6.62±0.47	22.1±1.2	32.58±1.0
Comparison group, n=30	5.33±2.5 ₹	6.59±0.81 ₹	22.21±2.3 ₹	33.0±1.4 ₹
Main group, n=30	4.57±2.8 ₹	7.58±0.94 ₹	22.13±2.4 ₹	31.48±2.1 ₹

It can be seen that the consumption of GM-soy, as well as the morphological changes associated with it, manifested as signs of pathological processes in the liver and pancreas, did not significantly affect these blood parameters. Considering that there is a tendency towards a decrease in albumin, it can be concluded that long-term exposure may have an impact on these indicators.

Along with the biochemical parameters of the blood of laboratory animals involved in the above studies, the concentrations of creatinine, total protein, total, bound, and unbound bilirubin in the blood were also determined (Table 3).

All obtained figures were studied by reference indicators and intergroup comparisons, mainly by comparing the parameters of the comparison and main groups of laboratory animals with the indicators of the control group.

Table 3

Comparative parameters of biochemical parameters in the blood of experimental animals

Group	Creatinin, 0.47-0.49 mg/dl	Total protein, 69 g/l	Total bilirubin, 1.7-3.2 mg/dl	Binding bilirubin, 0-5.1 mm/l	Unbound bilirubin, 15.0 mm/l
NG, n=30.	37.86±2.65	59.40±1.33	1.58±0.81	0.56±0.16	1.02±0.14
TG, n=30.	44.82±2.18* ↑	61.5±1.48	2.24±1.35 ≈	1.08±0.22* ↑	1.16±0.15
AG, n=30.	50.43±2.76* ↑	57.63±1.21 ↓	3.20±1.42 √	1.86±0.26* ↑	1.34±0.18* ↑

Note: CG - control group; TG - comparison group; AG - main group; * - sign of reliable difference compared to the control group; ↑ - direction of change.

In the main group, a significant increase in the level of creatinine ($P<0.05$) was observed in combination with a tendency towards a decrease in total protein, an increase in the level of conjugated and unconjugated bilirubin was revealed in the absence of

significant changes in total bilirubin (P<0.05). However, the absence of significant changes in these indicators showed no correlation with morphological changes in the liver and pancreas.

Considering that this circumstance was revealed against the background of pathological conditions in the histological structure of the liver of laboratory animals from a morphological point of view, it was proven that they have a state of not only structural, but also functional tension in the liver.

Among the identified biochemical indicators, the decrease in total protein in the blood of white outbred rats of the main group (fed GM-soy) compared to the control and comparison groups was explained by a decrease in its synthesis in the liver.

Conclusion: Thus, of the biochemical parameters of the blood of laboratory animals that consumed GM-soy, the indicators of AST, ALT, glucose, creatinine, total bilirubin, conjugated and free bilirubin were significantly higher than the parameters of the control and comparison groups. Against the background of a significant absence of changes in urea, residual nitrogen, the content of albumin and total protein decreased significantly.

Considering that this situation was observed against the background of the detection of pathological conditions in the histological structure of the liver, it was proven that there is not only structural, but also functional tension in the liver.

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