

FORMATION OF DIFFUSE DYSTROPHIC CHANGES IN THE LIVER DUE TO THE CONSUMPTION OF GEN-MODIFIED SOY

**Avozmetov Jasurbek Egamberganovich
Bobojonov Rustam**

Urgench State Medical Institute

Annotation: *The widespread use of genetically modified products requires a thorough study of their long-term effects on the body. The purpose of the study is to identify and assess the morphological features of diffuse dystrophic changes in liver tissue that develop as a result of the consumption of genetically modified soybeans. The experiment was conducted on white outbred rats, and the histological structure of liver tissue, cellular changes, and their relationship with biochemical indicators were analyzed. The results of the study showed that genetically modified soy leads to the development of fatty dystrophy, vacuolization, cell edema, and microcirculatory disorders in hepatocytes.*

Keywords: *gen-modified soy, liver, diffuse dystrophy, hepatocyte, morphology, experimental research.*

INPUT

In recent decades, food products based on genetically modified organisms have been widely used on a global scale [1,8,14,22]. Among such products, genetically modified soybeans are one of the most consumed plant products.

Although soy products are distinguished by high nutritional value, richness in protein and fats, there is a growing number of scientific data that their genetically modified forms can cause various pathological processes in the body [5,10,18].

The liver is the main metabolic and detoxification organ of the body and is the first to respond to toxic factors from the external environment [3,7,13,19]. Therefore, the potential negative effect of genetically modified products is most likely to manifest itself primarily in the structural and functional state of liver tissue [2,11,17,21].

Diffuse dystrophic processes are a pathological condition with impaired cellular metabolism, affecting a wide area of the liver parenchyma, often developing against the background of chronic toxic effects [6,12,15].

Determining the mechanisms by which the consumption of genetically modified soybeans leads to such processes is of practical and theoretical importance [4,9,16,20].

Materials and methods

The study used 90 white outbred male rats weighing 160-180 g. The animals were divided into three groups:

- Control group (n=30) - fed with a standard diet;
- Experimental group I (n=30) - gene-modified soybeans were added to the diet;
- Experimental group II (n=30) - genetically modified soybeans were given for a longer period of time.

At the end of the experiment, the animals were decapitated in compliance with ethical norms.

The liver tissue was macroscopically assessed and fixed according to the standard method for histological examination.

Histological sections were stained with hematoxylin-eosin stain. Microscopically, the state of hepatocytes, cytoplasmic changes, the degree of vacuolization, fat droplets, and microcirculatory changes were assessed.

Biochemical analyses were performed by determining the levels of ALT and AST in the blood.

The results were expressed in the form of a mean \pm standard deviation, statistical significance was assessed at the level of $p < 0.05$.

Results

Changes in histological structure of liver

In the animals of the control group, the liver parenchyma had a normal structure, hepatocytes were polygonal in shape, nuclei were clearly contoured, and the cytoplasm was uniformly stained.

In animals fed genetically modified soybeans, diffuse dystrophic changes were detected in the liver tissue.

Cytoplasmic edema and vacuolization were observed in a large number of hepatocytes.

Signs of fatty dystrophy prevailed in some areas, and fat droplets were clearly visualized in the cytoplasm of hepatocytes.

Quantitative analysis of morphological indicators

According to the results of morphometric assessment, the proportion of dystrophically altered hepatocytes in the control group was $6.3 \pm 1.1\%$, while in the experimental group I this indicator increased to $28.7 \pm 2.4\%$, and in the experimental group II to $41.5 \pm 3.2\%$.

Table 1. Proportion of dystrophic changes in hepatocytes (%)

Group	Fraction of dystrophic hepatocytes
Control	6.3 ± 1.1
Experiment I	$28.7 \pm 2.4^*$
Experiment II	$41.5 \pm 3.2^*$

* $p < 0.05$ - significant difference compared to the control group

Relationship with biochemical parameters

The level of ALT and AST in the blood was significantly increased in animals that consumed genetically modified soybeans.

The ALT level in the control group averaged 42.6 ± 3.1 IU/l, while in the experimental groups it reached 68.4 ± 4.2 IU/l and 82.1 ± 5.6 IU/l, respectively.

Diagram analysis (Table 1) showed that an increase in the level of liver enzymes is directly related to the degree of dystrophic changes.

Discussion

The results of the study show that genetically modified soy disrupts metabolic processes in liver tissue and causes the development of diffuse dystrophic changes.

The identified fatty dystrophy and vacuolization in hepatocytes may be associated with impaired intracellular metabolism and mitochondrial dysfunction.

An increase in biochemical parameters is accompanied by morphological lesions, confirming damage to the membranes of liver cells.

These cases indicate the hepatotoxic potential of genetically modified soybeans and are consistent with the data presented in the literature.

Conclusion

The consumption of genetically modified soy leads to the development of diffuse dystrophic changes in the liver parenchyma in white outbred rats.

These changes are manifested by fatty dystrophy of hepatocytes, vacuolization, and cellular edema, the severity of which increases with increasing consumption time.

Morphological disorders are directly related to an increase in the level of liver enzymes in the blood, which confirms the hepatotoxic effect of genetically modified soybeans.

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