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THE IMPORTANCE OF MORPHOLOGICAL CRITERIA OF THE LIVER AND PANCREAS IN ASSESSING THE MEDICAL AND BIOLOGICAL RISK OF GEN-MODIFIED PRODUCTS.

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Annotation

The widespread use of genetically modified products in the food industry requires the development of accurate, reliable, and practical criteria for assessing their level of safety for the body. This study is aimed at determining the criteria for assessing the medical and biological risk of the product based on the analysis of morphological changes developing in the liver and pancreas as a result of consuming genetically modified soybeans. The experiments were conducted on white outbred rats, and a comprehensive assessment of morphological and biochemical indicators was carried out. The obtained results showed that the structural changes detected in the liver and pancreas can be the main prognostic criterion for assessing the degree of negative effects of genetically modified products on the body.

Keywords

gen-modified products, medical and biological risk, liver, pancreas, morphological criteria, prognosis.

Input

The rapid development of modern food technologies has led to the widespread introduction of genetically modified products[2,11,17,21]. Although these products play an important role in solving food security problems, the level of their safety for the human and animal body remains a controversial issue[3,7,13,19,23].

When assessing the risk of genetically modified products, short-term toxicological or biochemical indicators are often relied upon[1,8,14,22,24]. However, such an approach does not fully reflect the long-term and latent negative impacts of the product[5,10,18]. Therefore, the assessment of morphological changes occurring in the most sensitive organs of the body is of great importance in determining the medical and biological risk of genetically modified products[6,12,15,25,26,27].

The liver and pancreas are the central links in metabolic processes and are the organs that are the first to respond to changes in the composition of the

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diet[4,9,16,20,28,29]. Structural changes detected in these organs can serve as a basis for assessing the degree of influence of genetically modified products on the body.

Materials and methods

The study was conducted on 90 white outbred male rats weighing 160-180 g. The animals were divided into control and two experimental groups. In the experimental groups, genetically modified soybeans were added to the diet at different times.

At the end of the experiment, the liver and pancreas were assessed macroscopically and histologically. Dystrophic, degenerative, hypertrophic, and microcirculatory changes were detected in the tissues of the liver and glands, and a morphometric analysis was conducted.

Blood ALT and AST indicators were determined and compared with morphological changes. The obtained results were processed using statistical methods and were assessed as reliable at a level of $p<0.05$.

Results

Morphological changes in liver and pancreas

In animals of the control group, the histological structure of the liver and pancreas was within the physiological norm. In the experimental groups, diffuse dystrophic changes in the liver parenchyma, vacuolization of hepatocytes, fatty dystrophy, and microcirculatory disorders were detected.

In the pancreas, signs of hypertrophy, hyperplasia of acinar cells, secretory overload, and edema of the stroma were observed. These changes were more pronounced in animals that consumed genetically modified soybeans for a long time.

Risk assessment based on morphological criteria

Based on morphometric analysis, the following criteria were identified for assessing the medical and biological risk of genetically modified products:

Table 1. Morphological criteria for assessing the risk of genetically modified products

Indicator	Low risk	Moderate risk	High risk
Fraction of dystrophic hepatocytes	<10%	10-30%	>30%
Relative mass of liver	Norm	+10-20%	>20%
ALT/AST increase	Norm	1.2-1.5 times	>1.5 times
Pancreatic hypertrophy	No	Average	Clearly
Microcirculatory disorders	No	Restricted	Diffuse

According to the study results, the consumption of genetically modified soybeans in the experimental groups corresponded to the category "**high risk**" for most of these criteria.

Discussion

The obtained results indicate that when assessing the medical and biological risk of genetically modified products, it is not necessary to limit oneself to biochemical tests. Morphological changes detected in the liver and pancreas can serve as a reliable criterion for determining the degree of the product's impact on the body and its potential risk.

Assessment based on morphological criteria allows for the identification of latent and long-term adverse effects of the product. This approach has practical significance in the system of the sanitary and epidemiological service and food security.

Conclusion

The consumption of genetically modified soy leads to the development of pronounced morphological changes in the liver and pancreas in white outbred rats. These changes can be considered as the main prognostic criterion for assessing the degree of product impact on the body. A balanced analysis of morphological and biochemical indicators allows for a reliable assessment of the medical and biological risk of genetically modified products and substantiates the need for widespread implementation of this approach in the practical healthcare system.

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