

Food Safety of Genetically Modified Organisms

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Abstract: The safety of genetically modified food has always been a hot issue of concern. This article mainly introduces the safety evaluation principles of genetically modified food and the main content of food safety. Toxicological evaluation, allergenicity evaluation and nutritional evaluation are the most important content of genetically modified food safety. The safety evaluation of genetically modified foods is very strict, and genetically modified foods that have been approved for the market after safety evaluation can be eaten with confidence.

1. Introduction

Genetic engineering, born in the 1970s, has become one of the most dynamic frontier fields in life sciences. Using genetic engineering, the gene fragments of any organism can be transformed into the imported organisms as needed, so as to obtain ideal new products that humans need, such as genetically modified foods. Foods that use genetically modified grains as food directly or use them as raw materials to produce and process are called “genetically modified foods”. The emergence of genetically modified food has solved the global food shortage problem, but its safety has become a topic of controversy. Therefore, the safety of genetically modified food still needs more detailed investigation and assessment. In view of the above, the author has conducted a large number of investigations based on the existing knowledge of the safety assessment of genetically modified foods in recent years, in order to objectively evaluate the safety of genetically modified foods, maximize the advantages of genetically modified foods, and better benefit mankind^[1]

2. Disadvantages of Genetically Modified Food

2.1 Unpredictable Security

Genetically modified foods have caused a sensational effect because they have changed the natural properties of foods that are eaten daily and have less acute poisoning. However, under the current technology and short time constraints, it is impossible to accurately determine whether each genetically modified food is Safety. Therefore, the edible safety of genetically modified food is unknown. Once genetically modified food is grown on a large scale, it may cause unpredictable damage to humans and nature.

2.2 Potential Harm to the Ecological Environment

Genetically modified crops destroy the original ecological structure and biological chain, leading to the unnatural elimination of original varieties, and then affecting the diversity of species. According to the data, the cultivation of genetically modified oilseed rape is relatively widespread in Canada. While enjoying the huge benefits of genetically modified oilseed rape, people find that the land where genetically modified oilseed rape is not grown is full of herbicide-tolerant genetically modified oilseed rape. Its removal will affect the growth of other crops. However, because the vitality of this genetically modified rapeseed is very tenacious, the removal work is not simple. Like super weeds, once produced, it will cause great harm to the ecological environment.

2.3 Possibly Harmful to Human Safety

The harm of genetically modified products to the human body is only a speculation, and genetically modified foods have not undergone long-term safety research. At this stage, some scientists have analyzed the possible effects of genetically modified food on the human body as follows: It can cause allergic reactions in humans. People who are allergic to a food sometimes become allergic to a food that they were not allergic to before. The reason is that This kind of food contains proteins that cause allergies. At the same time, toxin by-products that are unfavorable to humans will be produced. Unforeseen biological mutations in genetically modified crops will increase the original toxin levels and produce new toxins or by-products.

2.4 Gene Pollution Caused by Biology

Compared with general pollution, genetically modified pollution has its particularity. Genetic contamination is neither visible nor predictable. The transferred genes may be transferred to non-oral organisms, which may cause genetic pollution. In the process of planting genetically modified crops, whether the transferred marker genes and foreign genes will enter the food chain through transfer or inheritance, and will they be transferred to the parasitic microorganisms in the intestines of humans and animals after being eaten by humans and animals to produce resistant microorganisms, or The ecological crisis caused by pollen transfer into close relatives in nature is unknown.

2.5 Harm to Local Biodiversity

Plants in nature are different from genetically modified crops, which are improved varieties obtained by recombining genes through human selection of superior genes. Therefore, they have a stronger survival advantage compared to plants in nature. Under the effect of natural selection, genetically modified plants have greater advantages in adapting to the local environment and occupying a larger living space. As a result, some original species have lost their living space or cannot adapt to the changes in the ecological environment brought about by genetically modified crops. Eliminated by nature, thus endangering regional biodiversity.

3. Toxicity Safety Assessment of Genetically Modified Food

According to needs, the current food safety evaluation generally needs to carry out toxicity safety evaluations such as amino acid sequence comparison with known toxic proteins, acute oral toxicity tests of foreign proteins, and subchronic toxicology tests of whole foods.

Sequence of the foreign protein with the internationally used protein database to see if it has homology with known toxins and anti-nutritional factors, and exclude the possibility of introducing toxins and anti-nutritional factors into the transgene Possibility. China has promulgated standards

for comparing the amino acid sequence of genetically modified foreign proteins with known toxic proteins and anti-nutritional factors, which should be referred to when conducting relevant evaluations.

Select the acute oral toxicity test of rats and mice, mainly for the target substance (usually protein) expressed by the transgene. In the safety evaluation of the transgene, the limit method is usually used, that is, once or once within 24 hours. The maximum dose is given by gavage for multiple times. China requires 5000mg/kg body weight. The acute toxicity evaluation of food in the United States also requires 5000mg/kg body weight. DECD evaluates the acute toxicity of chemicals based on the acute toxicity test. LDS. To obtain the classification of the test substance, my country's food toxicology divides the acute oral toxicity into 5 levels, extremely toxic, highly toxic, moderately toxic, low-toxic and practically non-toxic. Concerning the acute toxicity evaluation of genetically modified foreign proteins Method, China has promulgated relevant standards, which need to be referred to and implemented in relevant safety evaluations^[2].

Subchronic toxicology test can reflect the medium and long-term nutritional and toxicological effects of genetically modified food on organisms, so it is one of the important evaluation methods for the edible safety evaluation of genetically modified food. Rats are usually used and animals that have just been weaned. The life span of a rat is generally 2 years. For a rat, 90 days is 1/8 of its life span, which is equivalent to 10 years of a human life span. Weaning started for 90 days, covering sensitive stages such as juvenile, adolescent, sexual maturity, and adulthood. In terms of evaluation method, under the premise of not affecting the nutritional balance of the animal's diet, genetically modified food is incorporated into the animal feed according to a certain proportion (usually three dose groups of high, medium and low), and the animals are allowed to eat freely for 90 days.

4. Evaluation of Allergenicity of Genetically Modified Food

It is reported that about 3.5-5% of the population and 8% of children have an allergic reaction to a certain ingredient in food. Food allergies have always been an important issue in food safety. Allergic reactions are mainly caused by people's pathological immune response to certain substances in food, especially proteins. Most of them are mediated by immunoglobulin. In mild cases, skin rashes will occur. Vomiting, diarrhea, severe cases can be life-threatening. Because of the introduction of new genes in genetically modified foods, new proteins will be produced, which may be substances that people have never been in contact with, and may cause people to have allergic reactions to foods that are not allergic to the original. Therefore, whether genetically modified food is allergenic has always been a key issue in safety evaluation.

4.1 Amino Acid Sequence Similarity Comparison

Compare the amino acid sequence of the foreign protein with the amino acid sequence of the allergen in the database. If the two contain the same amino acid in 80 reading frames greater than or equal to 35%, or contain 8 consecutive identical amino acids, it is considered The target protein has a similar sequence to the known allergen. my country has promulgated informatics standards for comparing the similarity between genetically modified foreign proteins and known allergens, which need to be referenced and implemented when conducting relevant evaluations.

4.2 Serum Screening Test

The serum of allergic people will contain IgE antibodies against specific allergens, and these antibodies will react with related allergens. The so-called serum screening is to use human serum that is allergic to food to detect foreign proteins to see if a binding reaction can occur. If the target

gene is derived from human allergic food, it needs to pass a specific IgE antibody binding test, and select human serum allergic to the allergic species for detection. If the target gene is not derived from a human allergic species, a targeted IgE antibody binding test is required to select human serum from allergic foods that are homologous or close to the species for detection. Enzyme-linked immunosorbent assay and western blotting are common methods for detecting allergens. For accurate and reliable results, a certain number of allergic human serum should be selected, and the concentration of specific IgE antibodies in the serum should be as high as possible, generally greater than 3.5 kIU/L. my country has promulgated the standards for the screening of transgenic foreign protein serum. It should be referred to and implemented in the relevant evaluation.

5. Conclusion

In summary, the safety evaluation of genetically modified crops is very strict. In addition, with the development of new technologies, this process will continue to be improved. Therefore, genetically modified foods currently on the market have undergone rigorous safety assessments. Once a genetically modified crop is found to have unsafe factors, it will not enter the market. So far, there has not been a safety test for a food such as genetically modified food. Analysis, I believe that with the continuous deepening of research, people can more safely enjoy the food brought by genetically modified technology.

References

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