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GENETIC ENGINEERING: PAST AND PRESENT

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Abstract
Genetic engineering is more than a science. It is a technological combination of different sciences: genetics, biology, chemistry, virology, chemical engineering and so on. It is a powerful tool for creating new genetic combinations, different from those existing in nature, by making changes in DNA and RNA. New genetic combinations are created in order to improve the usual set, to give a living object properties and qualities that are not inherent to it. A recombinant DNA molecule has the shape of a ring, it contains genes that constitute the object of genetic manipulation and a vector-fragment of DNA that ensures the reproduction of DNA rivers and synthesis of the final products of the genetic system activity-proteins [3,4,5].

Keywords: Genetic engineering, DNA, RNA, molecular structure, genetic combinations.

Introduction

The prerequisites for the formation of genetic engineering began to be laid in the 19th century. At that time, the world was already aware of Mendel's laws of heredity. In 1869, I. Misher discovered the existence of DNA; in 1910, Professor T. Morgan discovered that genes are located linearly on chromosomes and form linkage groups. And already in 1953, the most important discovery was made - J. Watson and F. Crick established the molecular structure of DNA.

By the early 60‘s scientists had studied the properties of the genetic code, and by the end of the 60’s its universality had been confirmed experimentally. It was during that period that active development of genetics was established, the objects of which were viruses and plasmids. Methods of isolation of highly purified preparations of intact DNA molecules, plasmids and viruses were developed. DNA of viruses and plasmids was introduced into cells in a biologically active form, ensuring its replication and expression of corresponding genes. In the 70s, a number of enzymes catalysing DNA transformation reactions were discovered. Still, the birth date of genetic engineering is considered to be 1972, when P. Berg, S. Cohen, H. Boyer and their research team

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at Stanford University created the first recombinant DNA containing DNA fragments of a virus and a bacteriophage [7,8,9].

Today, genetic engineering is used in many areas. For example, a branch of the pharmaceutical industry called the DNA industry, which is one of the modern branches of biotechnology, was formed on the basis of genetic engineering. Human insulin (Humulin) produced by recombinant DNA is used in medicine. Genetic engineering has had a huge impact on the development of various molecular genetic methods in a short period of time and has allowed significant advances in the knowledge of the genetic apparatus [4,5,6].

The number of genetically modified products today is already in the hundreds and thousands. Despite this fact, their sale is limited or banned in many countries. European countries are very wary of GMOs, while the USA is much more loyal, as it was there that companies producing GMO products first appeared. Earlier in our articles we have already talked about the benefits and harms of GMOs, so we will not dwell on it in detail now. Here is a list of the most popular GMO products in the world, on which many genetic experiments have been conducted: corn, cotton, soya, tomatoes, potatoes, courgette, rice, tobacco, beetroot. What qualities have these products acquired after genetic modification? For example, a tomato now has the superpower of being stored in a cold room for several months in a semi-ripe state, and after being placed at room temperature, ripening to normal within a day. For industry and commerce this is a very convenient quality. Tomatoes can be brought from distant countries, stored in warehouses, and then already on the shelves of shops they turn into juicy ripe tomatoes [15 16].

Even with the help of genetic engineering, it has become possible to increase the amount of vitamins and useful substances in a product. For example, it is possible to enrich rice with vitamin A and grow it in regions where people have a massive shortage of this element. It is also possible to provide cereal crops with greater resistance to climatic conditions. For example, to reduce the need for water to grow rye in drought conditions, or to make them more frost-tolerant and grow them in northern regions [12,13,14].

By genetically modifying plants, it is possible to reduce the intensity of pesticide treatment of fields. For example, in the early 2000s, the gene of the earth bacterium Bacillus thuringiensis was introduced into the maize genome. This gene provides a high level of protection for the plant, after which it no longer needs additional treatment. Science has gone even further. GMO plants have been given the properties of medicines. For example, Indian scientists have created a banana with analgin and a salad that produces immunity against hepatitis B [7,8,9,10,11].

In the 21st century the ecological problem is very acute, which is now also being tried to be solved by genetic engineering. Special varieties of plants with the function of soil purification have been created. They absorb zinc, nickel, cobalt and other dangerous substances from soils contaminated with industrial waste [4,5,6].

Genetic engineering has also touched animals. It all started with the world-famous Dolly the sheep, which was cloned in 1996 by transplanting a somatic cell nucleus into the cytoplasm of an egg cell. Nowadays, scientists from South Korea have managed to breed a species of cat that glows red in the dark. For what purpose this is done, one can only speculate [1,2,3]

Genetics is a field in which many controversial issues remain. In the USA, there was an intention to establish genetic testing of citizens to detect an extra chromosome, which allegedly indicated a

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predisposition to crime. This idea met with a backlash. And some American firms required applicants to provide information about relatives with cancer, and then rejected those who had such relatives. Cloning in general has sparked heated public debate around the world [7,8,9].

It is clear that genetic engineering, if abuses are avoided, can be beneficial. Many diseases, especially those associated with viruses, are rooted in the nature of the genome, and there is nothing unnatural about finding new ways to fight them. In fact, where traditional therapies are weak, it is genetic engineering that can solve the problem. But its time has not yet come; we are only at the beginning of the journey to recognise and validate this new and advanced field of medicine [5,6,7,8,9].

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