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ГЕНЕТИЧЕСКАЯ ИНЖЕНЕРИЯ И ИНДУСТРИЯ ГЕНЕТИЧЕСКИ МОДИФИЦИРОВАННЫХ ПРОДУКТОВ ПИТАНИЯ

GENETIC ENGINEERING AND GENETICALLY MODIFIED FOOD INDUSTRY

Genetically modified organisms (GMOs) are plants, animals or microorganisms that have been genetically engineered with DNA from bacteria, viruses or other plants and animals. The goal is to add one or more new traits that are not already found in that organism.

During the latter stages of the 20th century, man harnessed the power of the atom and soon realized the power of genes. Genetic engineering is going to become a mainstream part of our lives sooner or later. It may be one of the greatest breakthroughs in recent history alongside the discovery of the atom and space flight.

With a help of modern technologies and researches in genetic engineering it became possible to provide direct mutations to grant organism useful features. For example, if we want our plant to be rich in a certain vitamin, we can insert the genes, required for the synthesis of this vitamin (such was done with "golden rice", rich in vitamin A).

Many of the technologies, which are used by genetic engineers to create genetically modified organisms, occur in nature. For example, Ti-plasmid genetic equipment, which engineers use to transduce required genetic material to plants, was initially taken from the natural Agrobacterium. Agrobacterium use this plasmid to introduce the desired genes to plants.

The stages of genetically modified organism's creation are as follows:

1. First, find an organism that naturally contains the desired trait.
2. The DNA is extracted from that organism.
3. The one desired gene must be located and copied from thousands of genes that were extracted. This is called gene cloning.
4. The gene may be modified slightly to work in a more desirable way once inside the recipient organism.
5. The new gene(s), called a transgene, is delivered into cells of the recipient organism. This is called transformation. The most common transformation technique uses bacteria that genetic engineer plants with its own DNA. The transgene is inserted into the bacteria, which then delivers it into cells of the organism being engineered. Another technique, called the gene gun method, shoots microscopic gold particles coated with copies of the transgene into cells of the recipient organism. With either technique, genetic engineers have no control over where or if the transgene inserts into the genome. As a result, it takes hundreds of attempts to achieve just a few transgenic organisms.
6. Once a transgenic organism has been created, traditional breeding and selection is used to improve the characteristics of the final product. So genetic engineering does not eliminate the need for traditional breeding. It is simply a way to add new traits to the genetic pool.

The process of genetic engineering involves splicing area of a chromosome – a gene, which controls a certain characteristic of the body. The enzyme endonuclease is used to split a DNA sequence and excretion of gene from the rest of the chromosome. For example, this gene may be programmed to produce an antiviral protein. It is removed and can be placed into bacteria, where it is sealed into the DNA chain using ligase. When the chromosome is once again sealed, the bacteria is now effectively re-programmed to replicate this new antiviral protein. The bacteria can continue to live a healthy life, though genetic engineering and human intervention has actively

manipulated what the bacteria actually is. No doubt there are advantages and disadvantages, and this whole subject area will become more prominent over time.

Genetic modification technology is the only technology to be regulated from its inception, before any mishaps had occurred. Researchers, who developed the technology, set up a series of voluntary regulations in 1974 which have generally become officially incorporated by governments throughout the world. Genetically modified crops have been extensively tested in hundreds of thousands of field tests. Foods from these crops have to pass much more rigorous regulations than from conventionally bred crops.

Genetically modified food has quietly become second nature in the USA. Experts say 60% to 70% of processed foods on US grocery shelves have genetically modified ingredients. The most common genetically modified foods are soybeans, maize, cotton, and rapeseed oil. That means many foods made in the US containing field corn or high-fructose corn syrup (such as many breakfast cereals, snack foods, and the last soda you drank); foods made with soybeans (including some baby foods); and foods made with cottonseed and canola oils could likely have genetically modified ingredients. These ingredients appear frequently in animal feed as well.

In the USA regulation for genetically modified foods falls under three jurisdictions: The FDA, EPA, and USDA. But industry experts say the green light on market approval is left mostly to the companies creating the technology.

Despite differing opinions on genetically modified food safety, most experts agree on one point: the regulation system is flawed. Currently, food companies aren't required by law to label foods containing genetically modified ingredients, so it's no surprise that most people don't know they've eaten them.

Genetic modification technology isn’t one hundred percent safe - nothing is - but it has a very effective record.

In mass media sources sometimes appear reports that genetically modified organisms pose hazard to life. For example, work of the French biologist Seralini made a lot of noise. He was feeding rats with a genetically modified corn and defined higher cancerous growth rate. But Seralini made a lot of methodical mistakes in his

work and fully ignored statistical analysis. But when such an analysis was realized, it became clear that the differences that were given for the effect of genetically modified corn do not go beyond the random variability. There was also made one paradoxical conclusion. Genetically modified corn increased the lifetime of male rats. In response for a numerous critics, Seralini only casually mentioned this problem, saying that "the statistics do not tell the truth, but it helps to understand the results".

As N. Kuchuk, the director of the Institute of Cell Biology and Genetic Engineering, said: “Anxiety of the genetic engineering is evoked by ignorance, a fear of the unknown. Moreover, it’s wrong to pile up all genetically modified products. Human insulin, interferon, growth hormone are produced by genetic engineering, but no one will ever try to prohibit them”.

Most of scientists and the scientific community as a whole don’t share the view of genetically modified product’s harmful effect, which is clearly follows by the context of the available scientific publications and statements of the major scientific and health organizations. Genetically modified products, which are available on the international market today, have been tested and hardly pose a risk to the human health.

The USA is the largest producer of genetically modified crops and more than a dozen of countries around the world have latched on to the technology, including Argentina, Brazil, Canada, China, Australia, India and Mexico.

In July, 2014 Russia will allow nurture and realization of transgenic plants on its territory. The main advantage is from 20 to 34% economy, which depends on the crop variety.

Russia is lagged behind in domain of genetic modification technologies from the leading countries for 16 years. There are no appropriate genetically modified seeds, laboratories, technical equipment and specialists. Russia will have to buy all the above-listed abroad, primarily in the USA, which has a rich experience in this production.

The GMO market is greatly monopolized. Multibillion industry of GMO production is controlled by five chief players: American company – “Monsanto”,

Americo-Swiss – “DuPont”, Swiss – “Syngenta”, German – “Bayer” and “BASF”. Those companies control more than 90% of the whole industry. Strong regulation measures in biotechnology lead to the fact that small new biotech companies cannot break through and compete with giants. At best, giant companies simply purchase these small companies.

Number of GM varieties has already exceeded one thousand. Creating a new species is worth about 3 billion US dollars. Such a work can only be afforded by large trans-national corporations.

The share of genetically modified products from the world's total production: soy – 80%, corn – 70%, potatoes – 70%, rice – 50%, sugar beet – 30%.

The sown area of “Monsanto” occupies 114 hectares, of which 53 hectares are located in other countries. Since 1996 its sown area increased in 100 times. Opponents of the largest “Monsanto” company accused it in some kind of a genetic piracy as transgenic seeds are protected by copyright. Another know-how of “Monsanto” is the so-called terminator technologies, preventing the emergence of second-generation seeds, which puts the country importing their products into a complete dependence on deliveries.

In Russia 40 million hectares of arable ground, which does not require the use of special technologies to reap a rich harvest, aren’t exploited. We may become the largest supplier of organic products to the European market, where they prefer to eat organic food. At the same time, we should not ignore this new genetic engineering trend, as there is a risk to be left behind on the sideline of the scientific and technical progress.

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