Genetically modified organisms

A genetically modified organism (**GMO**) is an organism whose original genetic material (DNA, RNA) has been intentionally altered by the method of genetic engineering. Changes can be achieved by deactivating a specific gen or by incorporating genes from another organism. At first, foreign genes were transferred only to bacteria and yeast, later also to the cells of higher organisms, mainly mammals and angiosperms. **Transgenosis** is the process of inserting a foreign gene. We therefore refer to GMOs as transgenic.

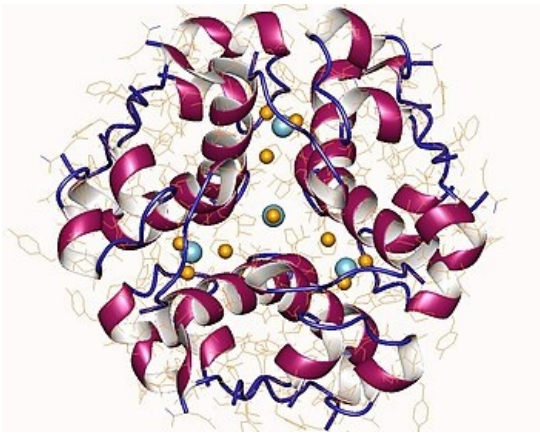
Genetic modifications are carried out to improve the characteristics of a given organism and are still the subject of much debate. While traditional breeding allows only individuals of the same or closely related species to be crossed, genetic engineering allows the transfer of genes between species very distant organisms. In this way, the so-called natural reproductive barrier can be overcome and contribute to the creation of new genes.

Target:

1. increasing yields, resilience and nutritional values of agricultural crops;
2. increased livestock, poultry and fish production;
3. improving the taste, shelf life and quality of food;
4. preparation of medicines in greater quantity and quality;
5. cultivation of microorganisms suitable for ecological purification of water and soil.

Genetic modifications of bacteria and yeast

The first eukaryotic gene product created by genetic engineering methods was human human insulin in **1982** . It is produced by the transfer of recombinant DNA from the β-cells *of the pancreatic islets of Langerhans* into a cell of the bacterium *Escherichia coli* or *Saccharomyces cerevisiae*, which then synthesize insulin. In **1985** growth hormon was prepared in the same way . Both substances have a simple structure (their genes do not contain introns), so bacterial cells produce them in an active form.



Insulin diagram (in purple)

Year **1986** – the creation of a vaccine against viral hepatitis B, by introducing the gene for the production of the surface protein of this virus into yeast cells. Unlike weakened or inactivated preparations of the virus, the substance does not contain viral DNA, which could itself cause the disease and is therefore completely safe.

GM animals

By genetically modifying hamster cells (**1994**), grown in culture and synthesized with deoxyribonuclease, a way to help patients with cystic fibrosis was invented . Its action dissolves the mucus accumulating in the lungs, which can cause suffocation.

GM plants

Plants are currently among the most common objects of genetic manipulation. By modifying their properties, such as resistance to drought, frost, pests or higher vitamins content , famines in third world countries can be at least partially prevented. **Golden rice** – its seeds contain an increased concentration of β-carotene, from which the human body produces vit. A. Its deficiency leads to visual disturbances. **GM potato variety Amflora** (**2010**) − the synthesis of amylosa, is eliminated by modification , the starch in the potato is then formed only by amylopectin. This is advantageous when used in industry (paper, textile). Here, the amylose is undesirable in terms of quality and is separated.

Methods of preparation of transgenic plants

Agroinfection. This method uses the ability of the bacterium *Agrobacterium tumefaciens* to transfer its own genes into plant cells using the Ti-plasmid.

Biolistic method. The desired DNA is first precipitated on the surface of small particles of heavy metal (gold, tungsten). These so-called projectiles are then "shot" into plant tissue under high helium pressure. In a certain percentage of cases, the [[nucleus] is hit, and in these hits, the foreign DNA fuses with the plant genome during the repair of damage caused by the gold bullet .

Risks of GMOs

The most discussed risks include, for example, the possible toxic or allergenic effects of food products made from GM plants. Bacteria in which the genes of foreign organisms are cloned are assessed for the risk of increasing their infectious potential. In the case of plants, since they are grown freely in the fields, transgenes could be transferred

to other related plants and thus reduce the biodiversity of the surrounding nature. Natural species would thus be genetically altered and acquire the properties of transgenic plants, e.g. resistance to insecticides – they would then be toxic, e.g. to harmless insects that eat them.

Links

Related articles

- Genetic modifications
- Genetically modified foods
- Genetic manipulation and genetic engineering
- Cloning

External links

- https://www.online.muni.cz/veda

References

- KOČÁREK, Eduard. *Genetika : obecná genetika a cytogenetika, molekulární biologie, biotechnologie, genomika.* 2. edition. Praha : Scientia, 2008. 211 pp. ISBN 978-80-86960-36-4.