

*COVID Vaccine* Amid the COVID-19 pandemic, the COVID-19 vaccine used genetic engineering to achieve immunity. The Pfizer and Moderna vaccines use mRNA genetic sequencing to help a person's body recognize the COVID virus.

*Genetic engineering history* The first genetically modified organism to be created was a bacterium, in 1973. In 1974, the same techniques were applied to mice. In 1994 the first genetically modified foods were made available.

Genetic engineering has a number of useful applications, including scientific research, agriculture and technology. In plants, genetic engineering has been applied to improve the resilience, nutritional value and growth rate of crops such as potatoes, tomatoes and rice.

In animals it has been used to develop sheep that produce a therapeutic protein in their milk that can be used to treat cystic fibrosis, or worms that glow in the dark to allow scientists to learn more about diseases.

## **BIOTECHNOLOGY – A MODERN SCIENCE OR A NEW NAME FOR AN OLD SCIENCE?**

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Biotechnology is a technology that utilizes biological systems, living organisms or parts of them to develop or create different products. It is an interdisciplinary field that emerged at the intersection of biological, chemical and technical sciences. Biotechnology follows the principle of using biological processes to develop products, processes, and systems that improve our lives. In this context, biotechnology is one of the key technologies that can help us overcome challenges of our time. This results in breakthrough products and technologies that fight diseases, minimize the ecological footprint, improve food production and create more efficient manufacturing processes.

Brewing and baking bread are examples of processes that fall within the concept of biotechnology (use of yeast (living organisms) to produce the desired product). Such traditional processes usually utilize the living organisms in their natural form (or further developed by breeding), while the more modern form of biotechnology will generally involve a more advanced modification of the biological system or organism.

Study of Biotechnology involves studies of molecules, cells, and organisms aiming to understand how biological processes work. Nowadays biotechnologist

plays an essential role in creating and developing methods of production for biomolecules such as vaccines, antibiotics, enzymes, bio-interfaces, biopolymers, biofuels, and many others. New and advanced methods of analysis are always being created.



Research in the field of bio-interfaces is characterized by interdisciplinary cooperation between the disciplines of biotechnology, chemistry, physics, medicine as well as engineers and developers. Highly complex processes are analyzed on a nanoscale, functionally processed and used, for example, to optimize and improve the compatibility and easier handling of heart and brain pacemakers.

Bio- and nanotechnology play a significant role in the development of bio-interfaces. For example, gold or silver nanoparticles are used in cancer therapy. The implementation of these technologies requires reliable, durable and non-hazardous components that do not lose any of their performance despite the required small size. Sensors in particular are crucial at bio-interfaces. They must deliver reliable results in every situation because faulty evaluations can be life-threatening.

Also, with the development of genetic engineering in the 1970s, research in biotechnology (and other related areas such as medicine, biology etc.) developed rapidly because of the new possibility to make changes in the organisms' genetic material (DNA).

Biotechnology-derived therapeutic products represent a diverse class of agents that are categorized by their method of manufacture, typically based on recombinant DNA technology. These products include recombinant proteins and nucleotides as gene therapies, anti-sense therapies, cytokines, monoclonal antibodies, growth factors, soluble receptors, fusion proteins, vaccines, and coagulation factors. Therapeutic targets of these products include genetic deficiency; neurological, cardiovascular, autoimmune and inflammatory disorders; cancer; metabolic disorders and other conditions. Given that these molecules are typically derived and produced to mimic endogenous nucleotides and proteins, their toxicity tends to be related to that Associate with over-stimulation or suppression of the targeted biological pathways. In addition, unlike potentially active metabolites Associate with small molecule therapies, the metabolic by-products of biotechnology-derived therapeutics are generally inactive amino acid and nucleotide fragments.

Through the use of biotechnological manipulation, it has been possible to develop highly precise treatment methods that can be applied in a minimally invasive manner. As a result, the interventions are maximally efficient with minimal side effects.

Also, biotechnological knowledge will be essential in the coming years as focus moves to renewable raw materials, exploration of waste products, and sustainability.

Biotechnological manipulation allows modification of genetic growth requirements of cereals, vegetables and fruits. plants become more resistant to external influences such as high heat, little water or poor soil quality. This makes a decisive contribution to ensuring that



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agriculture can be carried out under less favorable conditions and that the food supply can be secured.

As you can see, biotechnology covers many different disciplines (eg. genetics, biochemistry, molecular biology, etc.). Biotechnological manipulation is the ability to control and alter aspects of biological makeup. This technology is used in various fields to obtain more flexible food production or to combat diseases. New technologies and products are developed every year within the areas of eg. medicine (development of new medicines and therapies), agriculture (development of genetically modified plants, biofuels, biological treatment) or industrial biotechnology (production of chemicals, paper, textiles and food).

Therefore, in conclusion I would like to note, that biotechnology is a key technology of the 21st century with enormous innovation potential. At the same time, there are huge challenges to master.