Biotechnology in the Context of Sustainable Development

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Abstract. Humanity has used the biological processes of microorganisms for over 6,000 years to produce wholesome foods such as bread, cheese, and dairy products. Throughout most of the 20th century, the term "biotechnology" continued to be widely used in reference to various technologies, from fermentation processes to selective plant breeding. Currently, the term "biotechnology" includes the targeted use of molecular biology and genetic engineering methods. Modern biotechnology is based on the targeted use of 5 microorganisms and their metabolic products, cell and tissue cultures of plant and animal origin. An important feature of biotechnology is its interdisciplinary nature, since many modern technologies represent the effective integration of various disciplines.

1 Introduction

At its simplest, biotechnology is technology based on biology: biotechnology uses cellular and biomolecular processes to develop technologies and products that help improve our lives and the health of our planet [1]. We have been using the biological processes of microorganisms for over 6,000 years to produce healthy foods such as bread and cheese and to preserve dairy products. The basis of biotechnology is the use of biological processes such as fermentation and biocatalysts such as microorganisms or microbial enzymes to produce valuable products [2]. Biotechnologies provide optimization of the stages of chemical production processes by 80% or more, increase the efficiency of various production processes. When using biofuels, greenhouse gas emissions are reduced by 52% or more. Biotechnology helps to reduce water consumption and waste generation, as well as ensure their sustainable use [3]. The global community is facing growing challenges in food production. With the help of biotechnology, it is possible to improve the resistance of crops to insects, to herbicides and to promote the use of more environmentally friendly agricultural practices, as well as to obtain higher yields at a lower cost, reduce the amount of agricultural chemicals needed to grow crops, and accordingly, limit them. entry into the environment. The need of people around the world for primary health care is steadily increasing. Biotechnology, using its own set of tools and methodologies, helps to heal the world by [4]: reducing the incidence of infectious diseases, saving millions of children's lives, personalized treatment to minimize health risks and side effects, creating more

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accurate tools to detect diseases. more than 250 biotech healthcare products and vaccines are available to patients, many of which are designed to treat previously untreatable diseases. Biotechnology - is an indicator of the level of development of countries. In developed countries, biotechnological areas are actively supported and developed using modern research methods, such as molecular biology and genetic engineering. Recent achievements in the field of biotechnology help to successfully solve the urgent problems of modern society. The development of biotechnology in Russia faces certain difficulties, which are gradually overcome with the help of new investments and the organization of various research centers and technology parks. One of the progressive methods for the development of biotechnologies in the regions is the creation of biotechnological clusters.

2 Research Methodology

The application to the processing of biological sequencing data of improved methods of their processing within the framework of bioinformatics has led to new opportunities in the study of the functions of genes and the proteins they encode. The sequencing and evolution of human and microbial genomes, and the understanding of the genetic basis of many diseases, including the development of antibiotic resistance, have led to the development of new diagnostic procedures, vaccines, drugs, and treatments for many diseases (Fauci, 2001), as well as to greater understanding 9 genetics and breeding of crops and animals [5]. One of the promising modern areas of biotechnology is bionanotechnology, dealing in particular with molecular structures that can penetrate cells and carry the necessary active substances and drugs to their destination, as well as methods of stem cell research and cloning to replace dead or defective cells and tissues (regenerative medicine). In addition to its use in health care, biotechnology has proven useful in improving industrial processes by discovering and producing biological enzymes that speed up chemical reactions, for environmental cleanup, bioenergy production, and other uses. Thus, the development of modern biotechnology is largely due to scientific progress, while ancient and classical biotechnology were largely technological processes, learned to a large extent, empirically without a clear understanding of the scientific principles underlying them.

3 Results and Discussions

Biopharmaceuticals and medical biotechnology are the most significant applied fields of modern biotechnology, which for many years have contributed to the control, diagnosis and reduction of diseases by exploiting the vast natural genetic potential of organisms [6]. They include technologies that use biological microbial processes to combat various diseases, in particular, the production of drugs and diagnosticums (suspensions of neutralized microorganisms used as antigens for serological reactions) using both traditional methods and technologies. cellular, genetic and protein engineering (green vaccines, gene diagnosticums, monoclonal antibodies, constructs and products of tissue engineering, etc.). In other words, medical biotechnology is the use of living cells and other cellular materials to improve human health [7]. Medical biotechnology is actively working towards the discovery of drugs, treatment and prevention of diseases. Medical biotechnology uses tools for research aimed at finding various effective ways to maintain human health, understand the action of pathogens on it, and study the biology of human cells. One of the most important practical areas is the production of pharmaceuticals, as well as other means for combating diseases. As a fundamental component of medical biotechnology, bacteria, plant and animal cells are studied in order to understand their functioning and interaction. Medical biotechnology plays a critical role in elucidating the molecular causes of diseases

such as diabetes, cancer and rheumatic diseases. Scientists were able not only to diagnose using new methods and identify the genetic predisposition to these diseases, but also to more accurately approach treatment. In the field of biopharmaceuticals, new classes of drugs have been developed that target specific areas of the body, allowing patients to be treated more effectively. As the experience of developed countries shows, progress in the pharmaceutical field is largely determined by advances in the development of modern biotechnology. Today, there are more than 250 medical products and vaccines for incurable diseases available to patients through biotechnology[8]. The global market for biopharmaceuticals in 2010 was about $161 billion. The total volume of the biopharmaceutical market in 2015 is estimated at 264 billion US dollars. Traditional medicines obtained through biotechnology are antibiotics, vaccines and serums. In this area, the development and production of new effective agents, the improvement of existing technological processes using modern methods (membrane purification, biocatalysis, chromatography, etc.) are still relevant. The production of medical enzymes with the help of microorganisms is topical due to the high demand for drugs of this class and the extremely limited raw materials of plant and animal origin for their production.

Enzyme preparations are being developed for ophthalmology, dermatology, dentistry, neurology, traumatology and orthopedics, for surgery and the treatment of burn necrosis, purulent wounds, and scar resorption. Based on natural metabolites, medicines have been created for the prevention and treatment of alcoholism, fetal alcohol syndrome, and some types of drug addiction. The use of biotechnological methods makes it possible to create so-called edible vaccines synthesized by genetically modified plants and animals [9]. So, genetically modified goats have been created, the milk of which contains a vaccine against malaria. The lion's share of products created on the basis of modern biotechnologies (genetic engineering) were pharmaceutical proteins, primarily insulin, a-, b-, g-interferons, erythropoietin, granulocyte stimulating factor, human growth hormone, tissue plasminogen activator (t-AP) , tumor necrosis factor, epidermal growth factor, vaccines against hepatitis A and B, herpes, AIDS, cytomegaloviruses, streptokinase, urokinase, hyaluronidase and superoxide dismutase (SOD) enzymes, test systems and diagnostic kits based on monochannel antibodies (MoAT), MoAT for industrial purification of recombinant proteins (interferons, interleukins) and many other substances [10]. With the advent of these biotechnology products, many diseases that were incurable even a decade ago have a completely different prognosis. Biotherapeutics include large molecules of recombinant proteins, hormones and monoclonal antibodies, in vitro diagnostic tools for clinical research (tests for drugs, toxic and narcotic substances, hormonal tests, tumor markers, etc.). In experimental therapy, they are used for tissue engineering, therapeutic vaccines, stem cell research, lytic viruses, genetic, antisense RNA therapy (a treatment method based on turning off / stopping the synthesis of a protein involved in the development of a disease by inhibiting the translation of its messenger RNA from using short nucleotide sequences complementary to it (antisense oligonucleotides).

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biotechnology uses tools for research aimed at finding various effective ways to maintain human health, understand the action of pathogens on it, and study the biology of human cells. One of the most important practical areas is the production of pharmaceuticals, as well as other means for combating diseases. As a fundamental component of medical biotechnology, bacteria, plant and animal cells are studied in order to understand their functioning and interaction. Medical biotechnology plays a critical role in elucidating the molecular causes of diseases such as diabetes, cancer and rheumatic diseases. Scientists were able not only to diagnose using new methods and identify the genetic predisposition to these diseases, but also to more accurately approach treatment. In the field of biopharmaceuticals, new classes of drugs have been developed that target specific areas of the body, allowing patients to be treated more effectively. As the experience of developed countries shows, progress in the pharmaceutical field is largely determined by advances in the development of modern biotechnology. Today, there are more than 250 medical products and vaccines for incurable diseases available to patients through biotechnology [13]. The global market for biopharmaceuticals in 2010 was about $161 billion [16]. The total volume of the biopharmaceutical market in 2015 is estimated at 264 billion US dollars. Traditional medicines obtained through biotechnology are antibiotics, vaccines and serums. In this area, the development and production of new effective agents, the improvement of existing technological processes using modern methods (membrane purification, biocatalysis, chromatography, etc.) are still relevant. The production of medical enzymes with the help of microorganisms is topical due to the high demand for drugs of this class and the extremely limited raw materials of plant and animal origin for their production. Industrial biotechnology is the application of biotechnology for industrial purposes, including industrial fermentation [17]. It improves the efficiency and reduces the multiple environmental impacts of industrial processes, including paper and pulp production, chemical production and textiles. This includes the practice of using biocatalysts - microorganisms, or cell components, such as enzymes, to produce products in industrial sectors such as food and feed, chemicals, detergents, paper and pulp, textiles, biofuels and biogas. This direction is also actively used to reduce greenhouse gas emissions through the use of renewable raw materials for the production of various chemicals and fuels. Biocatalysts such as enzymes have been developed by industrial biotech companies to synthesize chemicals [14]. Enzymes are proteins produced by all organisms. The desired enzyme can be produced commercially using biotechnology [15]. Fermentation is the process of fermenting, for example, a sugar into an acid, which can then be used as an intermediate for the production of other chemical raw materials for various products. Some plants, such as corn, can be used in place of oil to produce chemicals. Microorganisms are finding their way into chemical manufacturing to design and manufacture new plastics/fabrics and develop new sustainable energy sources such as biofuels.

4 Conclusions

The most important task of biotechnological production is to obtain the maximum yield of the target product. To achieve this goal, the fermentation process must take place under optimal conditions, which are created with the help of fermentation equipment and the infrastructure that ensures its functioning. In this regard, the tasks related to the elimination of culture infection by foreign microflora and the provision of high-quality control of the cultivation process come to the fore. In modern industrial biotechnology, efforts are directed at obtaining a wide range of microbiological synthesis products from renewable raw materials: plant and various organic wastes, improving biomass processing technologies, producing bioproducts with improved characteristics while reducing costs and improving environmental performance. In the long term, the goal is to replace almost all

industrial materials previously produced from fossil raw materials with “green chemistry” bioproducts. Considering that the classical engineering approaches to the development and improvement of instrumentation have almost been exhausted, attention is focused on the use of biological reserves of new species, races, strains of microbial industrial producers: bacteria, yeast, fungi, microalgae.

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