

Challenges and future prospects for biotechnology

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Abstract. Biotechnology is the manipulation of living organisms or their components to produce useful products. It is an innovative interdisciplinary field that influences many industries including agriculture, veterinary medicine, medicine, pharmaceuticals and fine chemicals. It is one of the key technologies for sustainable production. However, there are challenges and some promising prospects in biotechnology. This chapter takes into account the various areas where biotechnology is challenging and where it could be a solution in the future if it is utilized effectively.

1 Introduction

Advances in biotechnology are fueled by changes in socioeconomic structures that inevitably face opposing factors, such as the risk of epidemics. The development of biotechnology has two meanings. First, it is an inevitable need linked to the fight against enemies, and second, it occurs as a natural consequence of socio-technical progress. This duality requires the application of theoretical and empirical approaches to scientific analysis in order to clearly explain and explore this phenomenon within a broader framework.

Biotechnology as a field of knowledge is a characteristic example of what J. Piaget [1] called the transition from interdisciplinary to transdisciplinary of

knowledge. transition from interdisciplinary to transdisciplinary of knowledge, being in its essence a multidisciplinary field of knowledge, in which natural, technical and engineering sciences are represented in an integrated way engineering sciences. Biotechnology, can be divided into three main areas, namely biomedicine, agro-biotechnology and industrial biotechnology.

Currently, the priority direction, given the threat to public health.

Given the public health threat posed by the covid-19 pandemic, is biomedicine. In fact, this area is responsible for the formation of an antagonistic mechanism for the spread of the COVID-19 pandemic. But the development of biotechnology is inevitably accompanied by

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the influence of the characteristic features of this sphere of economic management, namely the presence of innovative environment in the mechanism of economic management itself.

Indeed, speaking about biotechnology, the product of which is the synthesis of living systems and technological systems, the emergence of emergence as a systemic property of the final product is inevitable, which gives rise to an innovative environment and innovative product [2].

Spheres of application spheres of application of biotechnologies, taking into account their multidisciplinary application areas of biotechnologies, given their multidisciplinary nature, are extremely extensive, which, on the one hand, forms capitalized sources of profit, and on the other hand, increases capital intensity.

On the other hand, increases the capital intensity of the industry as a whole. The formation of an efficient environment.

Thus, the formation of an efficient business environment implies, in the form of source of financing of operating activities of biotechnological companies, as own, borrowed and attracted funds, as well as significant state support for the development of the industry.

A characteristic feature of the innovation environment we can be observed by the presence of biotechnology sector companies in the segment of the investment and innovation market on the Moscow Stock Exchange [3].

As we can see from the data of Table 1, out of enterprises included in the innovation sector of the economy, six enterprises (50 per cent of the total sector) belong to the companies of the biotechnological sector. This empirically confirms the innovative "nature" of biotechnology companies' activities companies.

Biotechnology is considered one of the most important and rapidly developing fields in science and technology.

Most world experts agree that the growth rate of this industry will remain high in the near future.

By 2025, the market is expected to grow to 325 billion rubles, which is 29% higher than in 2018. The growth of the Russian biotechnology market is mainly due to the rapid development of the biomedical and biopharmaceutical sectors. In 2015-2020, the total growth of the sector will be 35 billion rubles. Further growth of the biomedical sector is expected due to new analogs of original drugs and technologies, including those developed in Russia.

The monoclonal antibody (MA) segment is one of the fastest growing markets in the biopharmaceutical industry, including Russia. The first domestic original drug based on a monoclonal antibody was registered in Russia in 2019.

The second largest segment of the Russian biotech market is agriculture. By 2025, the agricultural biotechnology market will grow to about 112 billion rubles. The main driver of this sector is feed additives [4].

Biotechnology is an important field within the realm of biology. It involves the utilization of living organisms, bioprocesses, and a variety of important applications across many industries, including engineering, technology, medicine, and other sectors that rely on bioproducts. The scope of biotechnology applications is so broad that it now spans nearly every industry.

Biotechnology plays an important role in the field of conservation, particularly in areas such as bioremediation, where microorganisms are manipulated to clean up water bodies. In addition, advances in enzymes, genetic engineering, and cloning, such as PTase, which promotes the breakdown of plastics, represent some of the pioneering innovations within the field of biotechnology [5].

2 Research Methodology

It should be noted that in 2020 we are witnessing the formation of a new economic reality, in which the capitalization of companies in the biotechnology sector is shaped by expectations of a vaccine to combat COVID-19. Comparing the "technological boom" of 2000 and the investment activity of 2020, we can observe identical trends in the biotechnology sector. We can observe identical trends, in particular, the return on public offerings. In particular, the returns on public offerings of biotech companies are almost identical.

Without human intervention, any plot of arable land will be overgrown with weeds in a year. On 10 in a few years, it will be indistinguishable from the old one.

Modern farmers use more than 10,000 different pesticides, so every year, high-tech agriculture causes catastrophic damage to the environment [6]. Pests, weeds, viruses and bacteria inhabit treated fields and adapt to all these chemicals at the same rate.

How to defend and attack in the fight for the harvest. Possible scenarios for improving experiments. Human nature was again influenced by writers, including the famous "Frankenstein" by M. Shelley. The "dog's heart" doctor Bulgakov warned about criminal experiments with organ transplants. A. Belyaev also wrote about it in his novel "Professor Dowell". Modern Robin Cook wrote two books on this topic in the field of bioethics: "Coma" - about the illegal trade in organs, their mutation and possible consequences. Experiments with the human genome are like a boy pulling a watch out of a mechanism with a stick. Unverified experiments to improve humanity can end tragically. This raises the question of professional ethics. Modern scientists follow the documentation. They use bioethical principles as ethical principles. Regulatory bodies as a method of humanization. biotechnology as a method of humanization. ensuring a relatively balanced assessment. Technologies that affect humans. Evaluation of technologies that affect humans. Existence is not always obvious; genetic material should be treated with extreme caution. Advice on bioethics. There should be a council in every country, but there should also be room for creativity. Careless treatment is like an atomic explosion that can lead to the death of all mankind. Biotechnology is used in the medical, agricultural, food, and chemical industries. It is important to remember that many of these products could be produced without biotechnology [7].

Process capabilities: Efforts to utilize microbial and cell cultures for pollution reduction and energy generation hold significant promise. In the realm of molecular biology, biotechnological methods can be used to decipher genome structure, understand gene expression mechanisms, create model cell membranes for research purposes, and generate essential genes for various functions. Genetic and cellular engineering techniques allow us to modify the genetic traits and life processes of animals, as well as create plants and microorganisms with new beneficial properties not previously observed in nature [8].

The microbial industry currently uses numerous species of microorganisms, many of which are enhanced through site-directed mutagenesis and subsequent selection. This facilitates the production of a wide variety of substances on a large scale [9].

It is worth emphasizing that 2020 marks the emergence of a new economic environment in which the valuation of companies in the biotechnology sector is influenced by expectations for a COVID-19 vaccine. If we compare the investment activity in 2020 with the "tech boom" of 2000, a similar trend is observed in the biotech sector. This similarity is especially noticeable in terms of the almost identical public offering returns for biotech companies. Overall, the outlook for the biotechnology sector over the next 2-3 years appears to be economically successful. The commercial release of a vaccine to combat covid-19 will act as a trigger for continued growth [10].

3 Results and Discussions

Research on the challenges and future prospects of biotechnology has identified the following key findings.

Ethical and sociocultural challenges:

Biotechnology raises complex ethical issues related to the moral aspects of organismal modification, cloning, and the use of human embryos. It is necessary to develop effective ethical standards and laws to regulate and ensure the safety of biotechnology use.

Safety and environmental risks:

The use of biotechnology can have unpredictable environmental consequences. Great attention needs to be paid to research to prevent and minimize possible negative environmental impacts.

Regulation and legislation:

Existing legislation is not always in line with the rapid development of biotechnology. There is a need to develop an appropriate legal framework to ensure the safety and efficient management of biotechnological processes.

Technological challenges and innovation:

The development of new technologies and methods in biotechnology offers tremendous promise for fighting disease, increasing agricultural productivity, and improving the quality of life. Research and innovation should focus on developing new approaches and improving existing technologies.

Global collaboration:

Strategic international cooperation is essential for the exchange of knowledge, experience, and technology in biotechnology, which will help develop collaborative ways to address global challenges such as combating infectious diseases and achieving sustainable development.

All of these aspects summarize the complexity of the challenges facing biotechnology and emphasize the need to develop comprehensive strategies and approaches for the successful development and implementation of biotechnology innovations. Such efforts can significantly improve the quality of life and sustainability of our society in the future.

4 Conclusions

The question of the possibility of using digital pedagogy tools in the organization of the educational process meets the goal set at the state level of providing conditions for the functioning of a safe digital learning environment. Education, organized on the basis of the use of innovative digital technologies and the introduction of digital pedagogy into the educational system, contributes to a significant increase in the quality of professional training of future specialists.

Analysis of the current state of digitalization of Russian education, taking into account the experience of regional universities, shows a number of difficulties associated primarily with problems of staff compliance and professional readiness of specialists to use the tools of digital pedagogy. Improving the qualification level of teachers will significantly improve the quality of education, guiding students not only the formation of fundamental knowledge, but also the mastery of applied competencies necessary for further professional activity.

At the same time, only with developed digital skills of learners and teachers is it possible to provide quality education in flexible and innovative forms. This, on the one hand, meets the expectations and the Learners

Solving the problems of material and technical support for educational organizations is a prerequisite for the effective use of digital pedagogy as a factor in improving the quality of educational services and modernization of education, designed to provide equal access to the educational environment.

Over the past decade, the biotechnology sector in Russia has undergone a transformation. The long-term national program BIO-2020 was introduced, and a number of documents regulating the development of the bioindustry were adopted. Nevertheless, the core areas of Russian biotechnology have remained unchanged: biopharmaceuticals, biomedicine, and agricultural biotechnology. This trend is also reflected in the distribution of patents. Currently, the average annual growth rate of the Russian biotechnology market exceeds the global growth rate. However, Russia is not currently among the leading countries in biotechnology.

In conclusion, we can summarize that biotechnology plays a key role in the modern world and has enormous potential to solve complex global problems. However, it faces a number of significant challenges, including ethical, legal, environmental, and social aspects. The development of new technologies and methods requires in-depth research and a balance between progress and responsibility.

The successful development of the biotechnology industry requires international coordination, exchange of knowledge and experience, and a balanced approach to regulation and the introduction of new technologies. Effective risk management and safety must remain a priority for biotechnology developers and users.

In the future, special attention should be paid to the development of technologies that can address global challenges such as climate change, food security, and the fight against infectious diseases. Biotechnology research should aim to create innovations that can improve the quality of life and make the world more sustainable and developed.

Challenges and prospects for biotechnology should summarize the main conclusions about the problems and possible directions for biotechnology development. The following is a rough outline for this section.

1. Ethical aspects and sociocultural challenges:

Modern biotechnology requires deeper discussion and the development of ethical standards to balance scientific progress with protecting society from the negative consequences associated with biotechnological innovation.

2. Safety and environmental aspects:

Awareness of the environmental risks that biotechnology may pose emphasizes the need to develop strict regulations and standards to ensure the safety of the environment and human health.

3. Regulatory and legislative:

The legal framework needs to be strengthened to effectively control and manage the development of biotechnology. Developing appropriate legislation will help to balance innovation and public safety.

4. Technological Progress and Innovation:

Continued technological advances in biotechnology provide us with exciting opportunities to address global challenges such as disease, food security, and sustainable development.

5. international cooperation:

Global cooperation and exchange of experiences in biotechnology are key to achieving a balanced and sustainable development of the biotechnology industry.

Based on our analysis of the challenges and prospects of biotechnology, we can conclude that the effective management and development of this industry requires an integrated approach that takes into account ethical, environmental, legal and technological aspects. By striking a balance between innovation and responsible adoption of biotechnology, we can realize the full potential of biotechnology to benefit people and the planet.

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