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Bioethics As a Responsible Attitude to the Technical Development of Medicine

Abstract:

The rapid growth of technology in the natural sciences in the 21st century has brought to the forefront of humanity questions about the moral character of scientific achievements: in genetic modification of all living things, cloning, ethical issues of voluntary death, donation, environmental ethics, and so on. The study subject is aspects of responsible behavior in bioethics (moral and ethical standards) related to medical practices and environmental issues. The study object is bioethics, principles and their application in various spheres. The study aims to analyze foreign literature in the context of the problems of bioethics as a responsible attitude not only to medicine, but also to ecology, as a new standard for the development of moral and ethical standards appropriate to the time. The study used methods of content and comparative analysis of foreign publications in the background of bioethical issues. In the study, the authors considered many works, but mainly relied on the work of M.N. Dudin “Transgenic organisms (GMOs) in agriculture,” which highlighted the problem of the need to develop scientific knowledge based on morality in solving many vital problems. The second paper that served as the primary source for the analysis was an article on the first authorized clinical trial of gene therapy in U.S. history, which was conducted on September 14, 1990 at the National Institutes of Health (NIH) under the direction of William Anderson. Main results of the study: Because of theoretical analysis of the works—GMO-plants can solve the problems of food security; gene therapy helps to successfully combat genetic diseases, but

what will be the consequences of various types of interventions in nature, it is difficult to predict. The authors conclude that the introduction of a new bioethical paradigm is a matter of survival for all humankind. However, the practical application of bioethical norms is hampered by the fact that effective measures of responsibility and inevitable punishment for non-compliance with the principles of bioethics have not yet been developed.

Keywords: bioethics, responsibility, moral, ethical standards, technological progress, medicine, future of humanity.

Abbreviations:

GMO is Genetically modified Organisms,

EMA is European Medicines Agency,

NIH is National Institutes of Health.

Introduction

The modern development of medicine, namely its technological component, inevitably leads to the idea of a gap between the level of spiritual development and technology. Therefore, the issue of responsibility of scientists of different professions in the context of bioethics as a necessary standard of behavior in research and practice is relevant for all humanity. The solution of food security is the primary task of any state, but at what ecological cost it will be solved is a fundamental question for all nations. Modern civilization understands that ignoring environmental problems can lead to a catastrophic end for the humankind. It is bioethics—as an interdisciplinary field of knowledge located at the intersection of philosophy, law, medicine, sociology, political science, demography, cultural studies, and religious studies—that investigates the moral aspects of human attitudes to all phenomena that can solve the urgent problems of the 21st century. Bioethics includes a wide range of socio-economic, moral, ethical and legal issues, as universal values is not worth considering separately from biological facts.

The subject of the study is aspects of responsible behavior in bioethics (moral and ethical standards) related to medical practices and environmental issues.

The object of the study is bioethics, principles and their application in various spheres.

The study aims to retrospectively analyze the works on the problems of GMO crops use in agriculture.

Based on the purpose, the following tasks were solved:

- consider the very first officially authorized developments on DNA correction;
- conduct a comparative analysis of articles on similar problems in the works of other authors;
- analyze the need for bioethics as a new standard for the development of moral and ethical norms appropriate to the times;
- raise questions of responsible behavior not only in medicine but also in ecology.

In this study, we considered many works, but mainly relied on the work of M.N. Dudin “Transgenic organisms (GMOs) in agriculture”, which highlighted the problem of the need to develop scientific knowledge based on morality in solving many vital problems. The second paper that served as the primary source for the analysis was an article on the first authorized

clinical trial of gene therapy in United States' history, which was conducted on September 14, 1990 at the National Institutes of Health (NIH) under the direction of William Anderson. At the present stage, there are many works devoted to the problem of ethical character in scientific research "Bioethics and Global Challenges, Documents and Reflections" ([Sayamov, 2020, p. 7](#)), Lenoir N. Respect for life and the right to life in the ethics of life ([Lenoir, 1998](#)), M.N. Dudin Transgenic organisms (GMOs) in agriculture: an objective necessity to ensure global food security or a way to increase the profits of the agro-industrial complex, many other literary sources consider the need to develop scientific knowledge based on morality, and the need to solve many vital problems with the help of the latest scientific achievements ([Dudin, 2020](#)). At the same time, the attention of the world community is paid to these issues at the highest level, an example is the international documents on these issues such as "Food | United Nations" ([Food, 2025](#)) and "GMOs" ([Genetically Modified Organisms..., 2009](#)). These documents say a lot about the positive aspects and the introduction of bioethical committees in the development of new technologies and scientific discoveries. However, questions of responsibility for possible harmful consequences of thoughtless and uncontrolled use of modern scientific discoveries currently remain open. One of the key problems is the problems of responsibility and the inevitability of punishment. «Bioethics is aimed at developing moral and ethical norms, requirements and principles, creating mechanisms to ensure the use of scientific and technological achievements for the benefit of man and nature.» ([Sayamov, 2020, p. 7](#)) Thus, Federico Mayor noted "the growing importance of bioethics for a person, where his dignity and equality are the basis of rights and duties in society." ([Sayamov, 2020, p. 8](#)) According to the ideas of tenerism, which echo all existing beliefs, a person is only a small fraction, a particle of everything that exists, and a careful attitude to the surrounding world and the preservation of inner spirituality, purity of thoughts is the most important imperative. This provision has materialized in many international treaties and concepts. Thus, Noel Lenoir, who headed the International Committee on Bioethics, believed that the "concept of bioethical protection should be applied to all forms of life" ([Lenoir, 1998](#)). In our opinion, this concept is more than relevant, although it is overdue, since experiments with GMO technologies have been introduced since the last century. The slogans under which GMO technologies were promoted were more than humanistic in order to feed all the suffering, but there were hungry people, and they remained, and environmental problems intensified.

Materials and Methods

The purpose is to analyze foreign literature in the context of the problems of bioethics as a responsible attitude not only to medicine, but also to ecology, as a new standard for the development of moral and ethical standards appropriate to the time. The objective is to reveal the problems of responsible attitudes in innovative achievements in the framework of environmental security. Design is "The Method of Qualitative Document Analysis". The novelty of the work lies in the fact that we have examined the composite subject of bioethics based on a combination of the idiographic method of cognition and the nomothetic method, with the former dominating. The nomothetic method is quantitative, while the idiographic is qualitative. Thus, using a combination of nomothetic and idiographic methods, we analyzed two works on the use of innovative technologies in the plant and human genome, one of which solves the

global problem of hunger, but may be a source of congenital genetic diseases in humans. This combination of methods is an example of integration, a synergetic approach. The natural sciences, especially medicine, being a largely nomothetic science, reflect any private object as an expression of generic concepts to be replaced, while the idiographic sciences, to which bioethics belongs, view the object as a unique whole.

The combination of methods contributes to overcoming apparent technologism in bioethical communication. Using the idiographic-nomothetic method, it is possible to conduct sociological monitoring of the state of society, as well as to project social reality. The combination of both methods helps to eliminate conformism in bioethics, which, due to moral relativism and legal conflicts in different countries, adheres to a minimum level of morality. This fact demonstrates that it is not always possible to maintain a responsible attitude on the part of scientists, and under certain conditions bioethics cannot maintain generally accepted standards of moral norms. The limitation in the study is associated with the use of predominantly qualitative method, and to a lesser extent quantitative method. The subjective nature of the documents analyzed, the limited number of documents studied, which could affect the objectivity of the results.

Results

According to the latest edition of “The State of Food Security and Nutrition in the World 2020”, in 2019, almost 690 million people worldwide were hungry—10 million more than in 2018, and almost 60 million more than five years ago. In addition, billions of people cannot afford healthy and nutritious foods due to their high cost and low availability. Asia has the largest number of hungry people, but in Africa their number is growing at the fastest pace (*Food*, 2025). Unfortunately, the most popular products of the poor—tomatoes, soybeans, corn, rice, potatoes—have undergone genetic processing. If there were no laws regarding the use of GMO products before, today in Europe, in Russia, these products are partially banned. For example, in Russia, crops of genetically modified wheat are in Stavropol, Altai and Kuban, so the population of these areas is exposed to certain risks. The euphoria from the effectiveness and phenomenal properties of genetically modified crops contributed to the fact that by the end of 2008 the area of GMO crops exceeded 114.2 million hectares. According to the most conservative estimates, these crops were grown by about 10 million farmers in 21 countries of the world (*Genetically Modified Organisms...*, 2009). In our opinion, a paradoxical situation has developed—countries with a high standard of living, first of all, were obliged to be on the alert because of the safety of public health. In our opinion, they (the richest countries) had to produce GMO crops, and the rest (poor) had to grow and consume, thereby putting themselves at risk, but we see from the figure (*Gene Therapy...*, 2017) that by 2019, agricultural land for GMOs amounted to 191.7 million hectares.

Since 2013, the absolute and relative growth has slowed down and amounted to 18 million hectares, or 23.9%, respectively, for the period 2013-2019 (at the beginning of the year) (*Figure 1*).

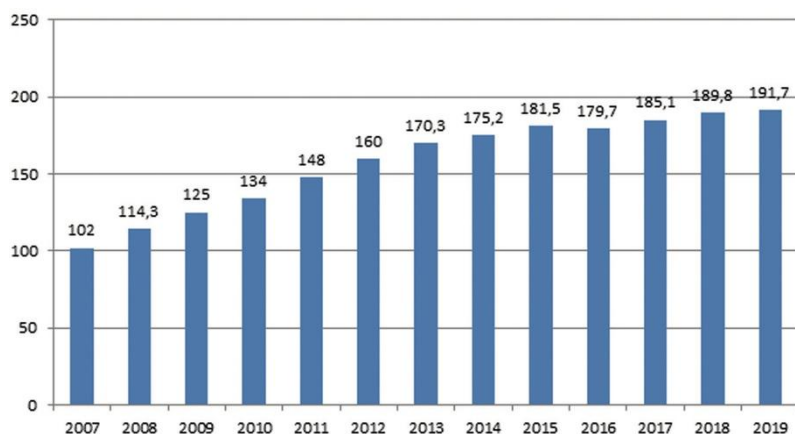


Figure 1. Areas under GMO products (*Dudin, 2020*)

Thus, although growth has slowed down, but has not decreased, acreage is still given over to GMO products. M.N. Dudin believes that the harm from products with GMOs is greatly exaggerated and in fact the widespread deterioration of health is nothing more than the result of pesticide treatment, as well as from harmful food additives. Positive aspects of GMO technologies M.N. Dudin argues, referring to the following: The economic benefits of using GMOs are multifaceted:

- increasing the efficiency of agricultural production;
- increasing crop yields;
- reducing crop diseases and losses from pests and adverse weather conditions;
- reducing pest control costs.

In particular, it is believed that all economic benefits, including resistance to drought and pests, higher yields and lower costs, lead to increased food security.

Ensuring food security—increasing the gross harvest of basic food crops, such as rice, corn, soybeans, directly increases the level of food security, especially in third world countries (*Dudin, 2020, p. 115*). Reducing the environmental threat: reducing the volume of pesticides by an average of 37% (*Klümper & Matin Qaim, 2014*). At the same time, M.N. Dudin points to the dubious advantage of reducing the number of harmful insects. However, in nature, in the absolute sense of the word, there are no harmful and useful insects. Pointing to the reduction of pollution of soil, rivers and reservoirs from the production of agricultural crops, as well as animals and fish, we must understand that with a reasonable and careful attitude to nature, negative consequences from agriculture and animal husbandry can be avoided. And regardless of how protected GMO technologies are, one thing is for sure: a person produces plants, animals and birds that will affect the ecosystem, since the delayed manifestation of unpredictable new properties of a transgenic organism is unknown and the danger of manifestation in several generations is probably inevitable, which may lead to the appearance of unplanned mutants that will be resistant to transgenic bacteria and other organisms. The microflora of a person consuming GMO products may be resistant to antibiotics. Scientists suggest that as a result of the use of marker genes, there is a threat that the genes of GMO products will pass into the human intestinal microflora. The created chimeras of plant origin do not give further harvest after a single use, as well as the offspring of birds and animals. Accordingly, the need to buy the

source material every time puts everyone in a dependent position. Of course, supporters of genetically modified foods will certainly point out that, firstly, this is all assumed, and secondly, the process is not complete, but the scientific community, in my opinion, should be very careful when interfering with the genome of living beings. The generation of the 20th century watched with amazement how technological advances in the field of natural sciences gave rise to phenomena from science fiction films. And, perhaps, they live in captivity of stereotypes, however, according to the ancient proverb, what you eat is what you eat, so, in the end, eating GMO foods, we ourselves to some extent become chimeras, and as a natural result, new congenital genetic diseases can arise, the genesis of which will be genetically modified products. Progress does not stand still, so the ongoing work on changing the genome of plants and animals later began to be performed in humans, first not publicly, and then at the official level. An example and a successful result of this is the fight against genetic diseases. It is believed that one of the first authorized in American history was a clinical study in gene therapy, which took place on September 14, 1990 at the National Institutes of Health under the leadership of William Anderson. Four-year-old Ashanti Desilva was being treated for a severe genetic defect of complex combined immunodeficiency associated with a deficiency of the enzyme ADA. In the blood taken from the patient, the defective gene was replaced by a functional variant. This led to a partial restoration of the Ashanti immune system. This temporarily stimulated the production of the missing enzyme, but did not lead to the formation of new cells with a functional gene. Ashanti continued to receive corrected T-cell injections every two months and could lead a normal life (*Bulletin of Roszdravnadzor*, 2011). This success inspired and gave hope to many people for healing from genetic diseases. In modern medicine, the definition of gene therapy is accepted as a method of treating (correcting) diseases (hereditary, multifactorial, acquired (infectious), oncological) by introducing foreign (missing) genetic information (genes) into the tissues or cells of the patient to change gene defects or give cells new functions (*FGBNTSSMP...*, 2024). Initially, gene therapy was considered as a means of treating hereditary diseases at the genetic level, i.e., correction of the genome at the level of the DNA molecule. However, at present, the use of gene therapy has significantly expanded and includes not only methods of correcting hereditary pathologies and acquired diseases, but also the treatment of viral infections at the genetic level by introducing full-fledged functionally active (therapeutic) genes or DNA sequences regulating gene activity into cells (*FGBNTSSMP...*, 2024). In fact, in the future, many medicines, like a magic wand, will heal suffering. However, human intervention in nature is not always predictable, and many years of clinical research are required for their safe use. The big question is what kind of supervisory authorities should be in order to effectively influence the scientific community, as well as the people who finance these projects. Since genetic technologies promise huge dividends and temptations, such as world fame, a lot of money. There are always a lot of scammers around this, who repeatedly and radiantly describe the possibilities of genetic engineering to the entire world community. In this regard, a group of scientists J.P. Evans, E.M. Meslin, T.M. Marto, T. Caulfield from the USA, Great Britain and Canada in their recent article in the journal *Science* drew readers' attention to the inflating "genetic bubble"—people's hopes that the achievements of genetic medicine will be realized in the near future and will find their practical application are not sufficiently substantiated yet. The authors of the article urge not to succumb to "genetic euphoria" (*Evans et al.*, 2011). Perhaps one

of the most advanced control systems today is the System of Authorization of Gene Therapy procedures in the United States, since it is multi-step, and each protocol for a future procedure must be approved first by the Biosafety Committee, and then by an Advisory Committee at the National Institutes of Health. It is further reviewed by the National Food and Drug Safety Service. After the appropriate approval, the protocol is published in the journal “Human Gene Therapy,” and each protocol is approximately 30–40, up to 50 pages of the smallest font, where all the details, all the safety issues are reflected (*The First Gene Therapy...*, 2021). To date, the FDA has not issued a single permit for the widespread clinical use of gene therapy drugs (*Bulletin of Roszdravnadzor*, 2011). At the same time, the US National Institutes of Health officially published data on almost two thousand clinical trials using gene therapy drugs at the first to third phase level (*The International Council...*, 2021). The development of gene therapy in the United States, as well as in Japan and Australia, is an example of how regulation occurs through dynamic guidelines and rules, according to which protocols are drawn up and certain manipulations are allowed. The EMEA is actively working in this area. This medicines quality control body has published a number of guidelines and recommendations concerning gene therapy drugs, of which the Guidelines for Preclinical Research, Guidelines for Clinical Monitoring, and yet to be approved Guidelines on the Quality, Preclinical and Clinical Aspects of Medical Devices containing Genetically Modified Cells should be noted. In some European countries, such as Austria, Sweden, Norway and France, existing laws on genetic engineering have been supplemented with sections on gene therapy. A special group on gene therapy is very actively involved in the work of the International Conference on the Harmonization of Drug Requirements (ICH) (*Global Ethics Observatory*, 2024). Many international organizations, realizing the need for control, are working to create effective measures. For example: UNESCO has engaged in the development of human genetics and bioethics at the global level. An important achievement in this work was the adoption in October 2005 of the Universal Declaration on Bioethics and Human Rights (*Dommel & Alexander*, 1997). Along with them, such normative documents as the Helsinki Declaration of the World Medical Association “Ethical Principles of Medical Research with Human Participation” (1964, the 2000 edition is applied) are used for international legal regulation in the field of bioethics (*Dommel & Alexander*, 1997), The Council of Europe Convention on Human Rights and Biomedicine (1997) and its Additional Protocols concerning the prohibition of human cloning, transplantation, and biomedical research (*United Nations Declaration...*, 2005). Thus, the entire progressive community understands that these organizations are trying to streamline and introduce technological progress in a civilized way. However, life on planet Earth does not fit into the established framework. Despite the specifics of medical knowledge and the content of the educational process, the formation of a responsible and bioethically developed personality of a medical specialist is formal. The doctor’s consciousness is closest to philosophical thinking, since the object of research is life and death as such. In the history of philosophical thought, it is quite difficult to find a thinker who would bypass the problem of life and death. Plato’s famous statement that philosophy is nothing but preparation for death and the ability to die, which was subsequently repeatedly reproduced in various versions and words by other sages and philosophers (*Plato*, 1990, p. 70). Existentialism has become one of the most popular trends in modern realities, since life and death are one of the main categories, the salt of the uniqueness of human existence. The most prominent

representative of existentialism, M. Heidegger, considering the problem of the meaning of being, took its finiteness as one of the main defining characteristics of human existence and deduced another, no less important category, characteristic of being, namely time. Largely because of the finiteness of human existence, only for man, as M. Heidegger argued, it is “open” in the sense that only he has an understanding of being (Heidegger, 2006). According to many existentialists, the specificity of human existence largely determines his freedom, which, however, cannot be separated from his responsibility. Freedom and responsibility are one of the central categories of another outstanding representative of existentialism, J.-P. Sartre, who, like his like-minded people, recognized exclusively individual responsibility, which, moreover, meant, in fact, the responsibility of a person, an individual before his own beliefs (Sartre, 2002, p. 20). However, in the modern era, when humanistic ethics is undergoing revision, revision and a new one is being intensively formed, in particular, environmental ethics, there is a need and necessity for a new interpretation of humanism, considering rapid changes both in human existence and in man himself and his psychology. Modern achievements and achievements in biomedical practice and technologies, as P.V. Tishchenko emphasizes, radically transform traditional ideas about the limits of human existence, about existential principles of personality, about moral and immoral, about freedom and responsibility, about justice, etc. (Yudin & Tishchenko, 1998). The content of the category of responsibility is quite rich and ambiguous. In recent decades, attempts have been made to interpret responsibility in the plane of the so-called activity-oriented, meaningful, communication-sociological, philosophical-sociological approaches. From the point of view of the activity approach, responsibility is interpreted as an individual’s awareness of his personal duty to society as a whole, a certain circle of people, as well as his duties, the meaning and consequences of his own actions, the need to be responsible for them, for his behavior, as the ability to admit his guilt. In the “Modern Explanatory Dictionary of the Russian language,” edited by S.Y. Kuznetsov, responsibility is defined as “the need to give an account of their actions, deeds, etc.; the obligation to be responsible for their possible consequences; the seriousness, importance of something” (Kuznetsov, 2008). “The modern philosophy of responsibility recognizes the human person in its true meaning, appeals to the spiritual understanding of the essence of man, while demanding from the state to ensure the sustainable development of a just society.” (Osipov, 2014) “It is worth noting that the development of a sense of the responsibility of the individual towards the state and of the state towards the individual is of no small importance in bioethics. However, the state is made up of human beings, so initially it is necessary to achieve a full understanding of the responsibility of the individual, first and foremost, to himself or herself. Scientific and technological progress is not only a source of civilizational advantage, but it often threatens human existence.” (Seidalieva & Barynbaeva, 2017) Bioethics, therefore, is one of the phenomena of social consciousness that will change the thinking of all mankind in the future.

Discussion

The study aims to analyze the problem of bioethics as a responsible attitude not only in medicine, but also in ecology, as a new standard for the development of moral and ethical norms in science. Currently, the use of gene therapy has become ubiquitous and it is not only the correction of hereditary pathologies, but also the creation of new technologies for the

introduction of full-fledged functionally active genes with specific tasks. Existing organizations providing control over the introduction of innovative technologies in medicine in the USA, Canada, Australia and Europe seem to guarantee compliance with bioethical norms. However, from time to time, news of the use of genetic engineering without adherence to bioethics standards breaks through, confirming the need for strict control over new technologies. In the global world, there are still varying understandings and perceptions of bioethics in different cultures. There is an ongoing discussion in the global community about the need to create international standards and norms to regulate new technologies to accommodate cultural differences and ethical norms (“Regulating Emerging Technologies: A Global Perspective”, “The Role of Ethics in Technology Regulation”). In the United States and European countries, genetic testing has become widespread and this poses a threat to the possibility of data leakage. India and China are investing heavily in biotechnology and genetic research. In China, genome-editing technologies (CRISPR-Cas9) are actively used to treat genetic diseases and improve crops. According to the laws of dialectics, any phenomenon has positive and negative sides, so in the 21st century we should consider all possible consequences of these technologies. Limitations of the study are related to the subjectivity of the analysis and the insufficient number of documents reviewed. The implications of the study emphasize the need to develop and implement new moral and ethical standards, based on new international legal instruments.

Conclusion

We investigated the problems of responsible attitude to innovative achievements in the framework of environmental security. Based on theoretical analysis of articles of various nature: on GMO-technologies in agricultural production can indeed solve the problems of food security of all mankind, gene therapy in practice has shown its success in the fight against hereditary diseases. However, human intervention in nature is not always predictable, and their safe use requires years of clinical trials. The big question is what oversight bodies should exist to effectively influence the scientific community, as well as the people who fund these projects. After all, gene technology promises dividends: money and world fame. Thus, we believe that: a philosophical understanding and interpretation of the concept of bioethics as a social and professional responsibility is impossible without an understanding of the need for moral and ethical standards in matters of scientific and professional activity. In this connection, we suggest that bioethics be taught from an early age as eco-bioethics, and that it be presented at universities as global and social bioethics. Because the organization and forms of teaching bioethics are inadequate to the demands of our time and hinder the formation of bioethical ideas, attitudes, abilities, knowledge and skills in students. In the future, we will continue research in this area in order to develop the categorical and conceptual apparatus of bioethics.

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Conflict of Interest

The authors declare that there is no conflict of interest.

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