

# Gene Therapy In Biomedicine In Uzbekistan: New Approaches To The Treatment Of Oncological Diseases And Problems Of Local Significance

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**Abstract:** This article discusses the issues of using gene therapy in the treatment of oncological diseases in Uzbekistan, new approaches implemented in this area, and local problems conditions. The global successes of gene therapy and such factors as infrastructure, personnel qualifications, financial opportunities in Uzbekistan will be analyzed. The article presents information on the research conducted in this area, their results, discussions and directions for future development. The main obstacles to the implementation of gene therapy at the local level are identified and solutions are proposed. The article serves as a useful resource for health professionals, researchers and policy makers.

**Keywords:** Gene therapy, cancer, biomedicine, Uzbekistan, treatment approaches, local issues, health infrastructure.

**Introduction:** gene therapy is one of the most promising areas of modern biomedicine, allowing to treat diseases at the genetic level. In particular, gene therapy is recognized as a new source of hope for life-threatening conditions such as cancer. Successful results are being recorded worldwide by targeting tumors and activating the immune system using technologies such as CRISPR-Cas9. In Uzbekistan, the healthcare system has undergone a significant development in recent years, but there are a number of problems with the implementation of high-tech approaches such as gene therapy. This article will analyze the current state of gene therapy in oncology in Uzbekistan, new approaches and obstacles in local conditions [1]. In Uzbekistan, oncological diseases are one of the main problems of the healthcare system. In recent years, the incidence of cancer has increased, which makes the search for effective treatment methods a pressing issue. Gene therapy is considered as an innovative solution in this regard, but at the local level its implementation depends on infrastructure, funding and qualifications of specialists. The article attempts to delve into these issues and outline directions for further development.

**Literature review:** Aimed at highlighting the current situation in the field of gene therapy and treatment of oncological diseases in Uzbekistan, which indicates the limited availability of data in this area. In general, there are very few specific studies on gene therapy, but there are a number of sources on reforms in the healthcare system, especially in oncology, and achievements in the field of biomedicine. These resources mainly focus on general trends, infrastructure problems and the need to implement modern technologies, but there are practically no in-depth developments directly devoted to gene therapy. For example, in sources devoted to the modernization of the health care system, programs for the early detection and treatment of oncological diseases are discussed. These programs mainly focus on the detection of cancer among women, emphasizing the importance of modern technological approaches, but without specific information on innovative methods such as gene therapy. The effectiveness of new equipment introduced in oncology centers and its impact on the treatment process were studied. Here, the main attention is paid to gene therapy in general, but it is noted that practical experience is very limited at the local level [2]. There is also information on projects implemented within the framework of international cooperation, such as the supply of modern equipment for the development of oncology services. These projects discuss the possibilities of forming the technological base necessary for gene therapy, but there is still insufficient preparation for the implementation of gene therapy in practice. Developments in the field of pediatric oncology focus on the issues of mastering foreign experience and training specialists, but here too there is no special emphasis on gene therapy, but only the general importance of innovative approaches is emphasized. In addition, such initiatives as the creation of

pediatric hematology and oncology centers are aimed at improving the healthcare infrastructure and attracting foreign specialists. However, these sources do not mention gene therapy, instead highlighting general problems in biomedicine, such as lack of resources and shortage of qualified personnel. The analysis shows that scientific and practical research in the field of gene therapy is insufficiently developed in Uzbekistan. In many cases, the main attention is paid to general oncology, modernization of the healthcare system and infrastructure. This raises the need for a more in-depth study of the local application and development possibilities of gene therapy [3].

**Methods:** In the study The study used a broad approach to explore the potential and challenges of gene therapy in the treatment of cancer in Uzbekistan. The main methods included qualitative and quantitative analysis. First of all, existing articles, scientific reports, and official documents related to gene therapy and oncology in Uzbekistan and abroad were thoroughly reviewed. This literature review helped to understand the global and local context of the topic. In-depth interviews were also held with oncology and biomedical experts in Uzbekistan to discuss the practical opportunities, barriers and prospects for applying gene therapy at the local level. The study analyzed cancer statistics provided by the Ministry of Health and international organizations, which played an important role in determining the current state of the local healthcare system. Finally, the gene therapy infrastructure in Uzbekistan was comparable with the experience of developed countries such as the United States and the European Union, which clarified local shortcomings and opportunities. The study was conducted from January to December 2024 and used multiple sources to ensure the reliability of the data, which helped to ensure the objectivity of the analysis [4]. **Results:** The study sheds light on the current status and future possibilities of gene therapy in Uzbekistan in the treatment of oncological diseases. In recent years, modern methods such as immunotherapy and targeted therapy have begun to be introduced in the field of oncology in Uzbekistan, but gene therapy is still at the testing stage. The Republican Oncology Center and the Children's Hematology Center in Tashkent are establishing a primary infrastructure for genetic analysis, which is an important step in the development of gene therapy in the future. Small projects aimed at studying advanced technologies such as CRISPR-Cas9 have been launched within the framework of foreign cooperation, but they are not yet large-scale. However, there are serious obstacles to the implementation of gene therapy. Firstly, there is a lack of high-tech laboratories and specialized equipment, which limits the research and treatment processes. Secondly, the limited financial resources make it difficult to implement such expensive projects as gene therapy, since the state budget cannot allocate sufficient funds for such innovative areas. Thirdly, the number of specialists specializing in gene therapy is small, and the process of mastering foreign experience is slow. In addition, the lack of a clear legislative framework regulating gene therapy further complicates testing and implementing experiments into practice. Statistics show that cancer is a serious problem in Uzbekistan: about 30,000 new cases are diagnosed annually, but only about 10% of patients have access to modern treatment methods. On the other hand, domestic research in the field of gene therapy consists of only five projects in 2024, which confirms that the development of this area is still at an early stage. These results show that serious reforms in the areas of infrastructure, financing, training and legislation are needed for wider implementation of gene therapy in Uzbekistan. At the same time, foreign cooperation and the initiation of research projects provide the opportunity to achieve significant success in this area in the future [5].

**Discussion:** The issue of introducing gene therapy in the treatment of oncological diseases in Uzbekistan opens up important opportunities based on global experience, but this process faces a number of problems and obstacles. Innovative methods such as gene therapy, especially CAR-T cell therapy, have shown high efficiency in the treatment of blood cancers such as leukemia and lymphoma in the USA and Europe. These technologies significantly improve the quality of life of patients, increasing their life expectancy. And in Uzbekistan, to implement such advanced treatment methods, it is necessary to resolve technological, financial and personnel issues. First of all, the practical application of gene therapy requires modern laboratories and special equipment. This requires significant investment, since such infrastructure is difficult to build in the short term within the capabilities of the local budget. Raising funds in partnership with international financial organizations such as the World Bank or the Islamic Development Bank may be an important step in solving this problem. However, it is important not only to acquire these laboratories, but also to constantly update

them and ensure compliance with international standards [6]. The second important aspect is the issue of qualified personnel. Working in the field of gene therapy requires a high level of experience and specialized knowledge. Currently, there are not enough specialists in this area in Uzbekistan. Abroad, especially in countries such as the United States, Europe or South Korea, it is necessary to establish programs for training specialists and exchanging experience. At the same time, domestic medical universities need to introduce special educational programs on gene therapy. This not only helps to train new specialists, but also ensures the development of the industry in the long term. Conclusions: international cooperation also plays an important role in this process. By expanding cooperation with organizations such as WHO, UNOPS, there is an opportunity not only to receive financial assistance, but also to master advanced experience and technologies. For example, by developing scientific cooperation with South Korea and European countries, Uzbekistan can expand its research in the field of gene therapy and develop solutions adapted to local conditions. The benefits of introducing gene therapy are numerous. Firstly, this method improves the quality of life of patients, as it is more effective and has fewer side effects compared to traditional treatments (chemotherapy or surgery). Secondly, it allows for optimization of treatment costs in the long term, as in some cases gene therapy is used as a one-time treatment. Thirdly, the introduction of these technologies brings the healthcare system of Uzbekistan closer to international standards, which is beneficial not only for domestic patients, but also for the country's image on a global scale. However, financial and infrastructural problems slow down this process. Currently, the reforms carried out in the field of oncology in Uzbekistan are yielding positive results, but there are not enough special programs and studies on gene therapy. Thus, with the help of a number of proposals, significant progress can be achieved in this area. For example, a special state program should be developed for the development of gene therapy, which should be included in the "Uzbekistan-2030" strategy. This program should be financed not only from the state budget, but also implemented in cooperation with international organizations. In addition, it is necessary to develop a legislative framework regulating gene therapy, since this area requires special safety and ethical standards. Early detection of cancer and expansion of genetic screening programs are also important, since early diagnosis increases the effectiveness of treatment and reduces costs. Thus, the introduction of gene therapy in the treatment of oncological diseases in Uzbekistan opens up great opportunities, but this process requires a long-term strategy, large investments and international cooperation. If these issues are resolved in stages, Uzbekistan will not only improve the health of its citizens, but will also become one of the leading states in the region in the field of healthcare.

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