

## IMMUNOLOGICAL FOUNDATIONS AND CHALLENGES IN ORGAN TRANSPLANTATION

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**Abstract.** Compared to transplantation of other organs, such a direction as kidney transplantation has more than half a century of history. During this period, tremendous experience has been accumulated regarding the modernization of surgical techniques, organ preservation, improvement and optimization of immunosuppression protocols, as well as postoperative management of patients. By the end of the 90s, modern survival rates for renal transplants and recipients had been achieved. The success of kidney transplantation, however, has led to the fact that "waiting lists" for the operation are growing steadily every year around the world.

**Keywords.** Immunosuppression, hemodialysis, allogeneic transplant, immune response.

One of the essential factors determining the success of organ transplantation is the immunological compatibility of donor and recipient tissues. Achievements of the last decade of the last century in the field of fundamental immunogenetics, which made it possible to concretize the mechanisms of the implementation of the main functions of proteins. The gene-encoded immune response, as well as the transition from the study of genes of the human immune response from serological to molecular-genetic, have not only opened up fundamentally new possibilities for introducing these advances into medicine, but have made it possible to put them into practice with unprecedented speed [4].

Thanks to these advances, the effectiveness of kidney transplants (based on the results of the annual survival rate in the centers that switched to donor selection based on molecular genetic typing) increased by

twenty%. At the same time, the remaining indicators of the functional graft significantly improved.

Treatment of end-stage chronic renal failure is one of the most pressing modern medical and social problems. Existing methods of renal replacement therapy for end-stage chronic renal failure: hemodialysis. Peritoneal dialysis and allotransplants of the kidneys are constantly being improved, which leads to an increase in the life expectancy of patients, but not always - in quality. At the same time, the number of patients requiring renal replacement therapy is constantly increasing, which complicates the availability of J10. Today, kidney transplantation is considered as the optimal method of renal replacement therapy, since it increases the duration and quality of life of patients to a greater extent than peritoneal and hemodialysis. In addition, it is known that kidney transplantation provides a higher quality of life for patients, and is also the most preferred by the method of renal replacement therapy from an economic point of view [5],

The discovery and use of modern methods of immunosuppression made it possible to reduce the likelihood of developing an acute rejection reaction and to increase the graft survival rate during the first year after the operation, leaving the long-term survival rates of the renal allotransplant unsatisfactory. In connection with this, methods of predicting the conflict "donor-recipient" are being actively developed.

The interest of researchers in the study of immunological parameters in organ transplantation and kidney transplantation in particular has always remained at a high level, but the opportunity to study the delicate relationship between the recipient's organism and the donor organ has appeared in the last twenty years. This is associated with a number of important discoveries in the field of fundamental immunology. This entailed the introduction into wide practice of new reliable and highly sensitive research methods, modern instruments and diagnostic systems [2]. The use of new complex methods requires clinical understanding.

So, in particular, after the introduction into practice of the molecular genetic approach to typing HLA genes, it became necessary to conduct a comparative analysis

of the results obtained by both methods. Such studies were carried out by many laboratories around the world that are engaged in histotyping [1]. The data obtained revealed serious discrepancies in the typing results. Therefore, similar works aimed, ultimately, at the optimization of immunophenotyping continue and remain relevant.

Treatment of chronic renal failure is one of the medical and social problems for modern medicine. There are now a growing number of methods for the kidney and its maintenance, for example: Temporary renal hemodialysis, in addition to kidney transplantation, which increases the life expectancy of patients. But not always. Currently, the number of patients in need of kidney transplantation and the number of transplant options is increasing.

Renal transplantation, renal complications, impaired adaptation of the donor organism to the transplanted kidney are associated with the immunogenesis of the individual organism. Changes in the physiological activity of class T lymphocytes in the body after kidney transplantation are accompanied by changes in all immunogenetic conditions in the body, which leads to a decrease in renal vital signs, resulting in renal complications, decreased vital signs of renal transplantation within three years and changes in physiological functions. . In this regard, we organize research, observational work on the preservation of vital signs of the kidney, placed in the state of studying its immunogenesis after kidney transplantation.

It is known that a graft transplanted to a recipient from a genetically foreign donor does not take root and is inevitably rejected. At the same time, genetic differences between donor and recipient tissues play a key role in the development of allogeneic transplant rejection.

Antigens providing intraspecific differences are designated as tissue compatibility (histocompatibility) antigens and belong to the major histocompatibility gene complex (MHC) [6]. In humans, the MHC is called HLA (human leukocyte antigen). The biological significance of MHC lies in ensuring the interaction of body cells, recognizing its own, foreign and altered own cells, triggering and implementing an

immune response against carriers of foreign information, positive and negative selection of T-cell clones, presentation of the targets of the immune response.

The immunological nature of graft rejection was demonstrated by Peter Medawar in an experiment on the transplantation of a genetically alien skin graft in rabbits [7]. Both humoral and cellular mechanisms play a role in transplant rejection. Cellular rejection mechanisms cause T-lymphocytes to become sensitized to the transplanted antigens. These lymphocytes cause damage to cells of foreign tissue by either direct cytotoxicity or secretion of lymphokines. T cell damage is characterized by parenchymal cell necrosis, lymphocytic infiltration, and fibrosis. Humoral mechanisms are mediated by antibodies that may be present in the serum of the recipient before transplantation or develop after transplantation of foreign tissue. Humoral factors damage the transplanted tissue through reactions that are equivalent to type II and III hypersensitivity reactions. The interaction of antibodies with the antigen on the surface of the transplanted cells leads to cell necrosis, and the accumulation of immune complexes in the blood vessels activates complement, which leads to the development of acute necrotizing vasculitis or chronic fibrosis of the intima with vasoconstriction.

The tolerance of the immune system is understood as a specific immunological nonresponsiveness to antigens. In this case, the absence of a response to this antigen is characteristic, but the response to any other is preserved. According to the figurative expression of R.V. Petrova, tolerance is immunity with a minus sign. The lack of response of the immune system to its own antigens protects the body from autoaggression [8]. When tolerance to alloantigens is established, the transplanted tissue may take root. Tolerance to antigens exogenously entering the body can be induced both during the neonatal period and at puberty. The mechanisms of the immune system that allow blocking aggression against one's own or donor cells and tissues are conditionally divided into central and peripheral. Central tolerance is induced in the central organs of immunogenesis - in the thymus gland and bone marrow - and limits the autoreactivity of T and B lymphocytes.



## References

1. Le Blanc K. Immunomodulatory effects of fetal and adult mesenchymal stem cells. *Cytotherapy*. 2003;5(6):485–489.
2. II Imomjonovich, SS Fayzullayevich, NJS Erkinovich. [Immunogenesis of Kidney Transplantation, Maintenance of Vital Signs of Transplanted Kidney](https://doi.org/10.2478/21941822). *Annals of the Romanian Society for Cell Biology*. 2021/3/30. <http://annalsofrscb.ro/index.php/journal/article/download/2194/1822>
3. Nurova G. U., Nurov U. I., Boboqulova D. F. Studying and Analysis of Medical and Social Aspects of the Course of Vasomotor Rhinitis in Patients in a Comparative Aspect // *Barqarorlik va yetakchi tadqiqotlar onlayn ilmiy jurnali*. – 2021. – Т. 1. – №. 6. – С. 545-550.
4. Нурова Г. У. Особенности течения вазомоторного ринита у больных с нарушениями функции щитовидной железы // *актуальные вопросы медицины критических состояний*. – 2021. – С. 54-55.
5. Akhmedova D. B., Khodjiyeva D. T. Improvement of the algorithm for the use of hirudotherapy for the prevention of chronic tension headache // *American journal of medicine and medical science*. – 2021. – Т. 2. – №. 11. – С. 69-70.
6. Bahodirovna A. D., Tadjiyevna H. D. Observation of vegetative disorders in patients with chronic tension headache and migraine // *British medical journal*. – 2021. – Т. 1. – №. 1.2.
7. Bahodirovna A. D. Frequency of observation of anxiety and depression in the diagnosis of primary headaches // *Art of Medicine. International Medical Scientific Journal*. – 2021. – Т. 1. – №. 2.
8. Imomjonovich I. I. Study of the Specificity of the Immunological State in Kidney Transplantation // *International journal of health systems and medical sciences*. – 2022. – Т. 1. – №. 6. – С. 162-165.
9. Imomjonovich I. I. Determination of vital quality indicators of immune cells // *образование наука и инновационные идеи в мире*. – 2023. – Т. 22. – №. 8. – С. 89-92.

10. Imomjonovich I. I. Maintaining vital signs of the transplanted kidney //World Bulletin of Public Health. – 2023. – Т. 22. – С. 70-73.
11. Imomjonovich I. I. Immunological processes in organ transplantation //european journal of modern medicine and practice. – 2023. – Т. 3. – №. 3. – С. 29-32.
12. Imomjonovich I. I. STUDY OF Immunosuppressive processes after kidney transplantation //Journal of new century innovations. – 2022. – Т. 18. – №. 4. – С. 96-100.
13. Mirakramovna Y. M. et al. Covid-19 dan keyin rivojlangan miyelitlar //образование наука и инновационные идеи в мире. – 2025. – Т. 63. – №. 2. – С. 396-400.
14. Mirakramovna Y. M., Kutbiddinovna R. G., Karimdzhanovna S. A. S. Clinical and Neurological Features with Covid-19 Associated Cavernous Sinus Thrombosis //Zhongguo Kuangye Daxue Xuebao. – 2024. – Т. 29. – №. 3. – С. 224-229.
15. Mirakramovna Y. M. et al. Clinical diagnostic status of myelitis developed after covid-19 //journal of new century innovations. – 2025. – Т. 71. – №. 1. – С. 6-9.
16. Mirakramovna Y. M. et al. The importance of cerebral vascular anomalies in the origin of cerebrovascular diseases //journal of new century innovations. – 2025. – Т. 71. – №. 1. – С. 3-5.
17. Yakubova M. M., Rakhimova S. E., Kushaeva D. S. Presentation of the intestinal microbiota as an independent organ //Original medicine. – 2023. – Т. 2. – №. 1.
18. Якубова М. М. Uyqu va insult. Yuzaga kelishi va kechishi xususiyatlari. – 2024.
19. Abzalova, Muxsina Baxtiyor, and Marxamat Mirakramovna Yakubova. "Uyqu va insult. Yuzaga kelishi va kechishi xususiyatlari." *Журнал гуманитарных и естественных наук* 13 (2024): 8-12.