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Unlocking the Body s Defense: Exploring the Frontiers of Transplantation Immunology

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Abstract

Bone marrow transplantation, a life-saving procedure also known as hematopoietic stem cell transplantation
Transplantation immunoloks tprercomlh, ees, develop nprelat trapeutic absttegies, s anpq.yat thwpla,
revolutionized the treatment of end-stage organ failure, oering hope and renewed life to countless individuals worldwide. However, the success of transplantation hinges on the complex interactions between the donor gra and the recipient's immune system. e immune system, inherently vigilant and responsive, recognizes foreign substances and launches an immune response to protect the body from potential harm. When a transplanted organ is perceived as foreign, the immune system's response can lead to gra rejection, impairing its function and survival [3,4] e major histocompatibility complex (MHC), also known as the human leukocyte antigen (HLA) system, plays a pivotal role in transplantation immunology. e compatibility between the donor's and recipient's MHC molecules inuences the immune response, as they are responsible for presenting antigens to immune cells. Mismatches in the MHC molecules can trigger immune reactions, resulting in gra rejection. Understanding the intricacies of MHC compatibility and the factors inuencing alloreactivity is crucial for successful transplantation. In recent years, remarkable progress has been made in the eld of transplantation immunology. Scientists have gained insights into the immunological memory of the immune system, elucidating the mechanisms underlying acute and chronic rejection. is knowledge has paved the way for the development of innovative diagnostic tools and immune monitoring techniques that enable early detection of rejection episodes, facilitating timely interventions to preserve gra function. Moreover, advancements in immunosuppressive therapies have revolutionized transplantation

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Materials and Methods

Animal models

Human tissue samples

[illegible]

Biomarkers for rejection and tolerance

[illegible]

Novel immunosuppressive therapies

[illegible]

Tolerance-inducing strategies

[illegible]

Advancements in organ engineering and preservation

[illegible]

Xenotransplantation

[illegible]