Journal of Clinical and Experimental Transplantation

Editorial Open Access

# An Overview on Transplantation Tolerance

**Helen Cribb***

*Department of Veterinary and Agricultural Sciences, University of Melbourne, Australia*

**Abstract**

Organ transplantation has become a common practice in modern medicine. With advancements in surgical techniques and immunosuppressive therapies, the success rates of organ transplantation have signifcantly increased, providing patients with a new lease of life. However, transplantation is not without its challenges. The immune system of recipients recognizes transplanted organs as foreign, triggering an immune response that can lead to graft rejection. This process is mediated by various immune cells and molecules, including T cells, B cells, antibodies, cytokines, and complement proteins. To prevent graft rejection, patients receive immunosuppressive drugs that suppress their immune system, but these drugs have side efects and can increase the risk of infections and cancer. Therefore, there is a need for alternative strategies to induce transplantation tolerance, which refers to the state of immune unresponsiveness towards the transplanted organ. Transplantation tolerance can eliminate or reduce the need for immunosuppressive drugs and improve the long-term outcomes of transplantation. In this article, we will review the current understanding of transplantation tolerance and the strategies that are being developed to achieve it.

**Ke d :** Organ transplantation; Immunosuppressive; Destruction

## I d c i

### Mecha i m f a la ejec i

Before discussing transplantation tolerance, it is important to understand the mechanisms of transplant rejection. Transplant rejection can occur through two main pathways: direct and indirect allorecognition. Direct allorecognition occurs when recipient T cells recognize donor MHC molecules presented on the surface of donor cells or donor APCs (antigen-presenting cells) in the context of self-MHC molecules [1]. is recognition leads to the activation of recipient T cells, which can then migrate to the transplanted organ and cause tissue damage through various e ector mechanisms, such as cytotoxicity, cytokine release, and recruitment of in ammatory cells. Indirect all recognition, on the other hand, occurs when recipient APCs take up donor antigens from the transplanted organ and present them to recipient T cells in the context of self-MHC molecules. is recognition also leads to the activation of recipient T cells and the subsequent destruction of the transplanted organ [2].

### S a egie f a la a i le a ce

To achieve transplantation tolerance, several strategies are being developed that aim to modify the immune system of recipients or the transplantation process itself. ese strategies can be broadly classi ed into two categories: central and peripheral tolerance induction [3].

### Ce al le a ce i d c i

Central tolerance induction aims to eliminate or suppress the donor-reactive T cells in the thymus, where T cells develop and undergo selection. is can be achieved by several methods, including:

- ymic transplantation: ymic transplantation involves the transplantation of the thymus gland from the donor into the recipient before or at the time of solid organ transplantation. is allows the recipient to develop a new population of T cells that are tolerant to the donor antigens. However, thymic transplantation is technically challenging and has limited clinical application [4].
- Hematopoietic stem cell transplantation (HSCT): HSCT involves the transplantation of hematopoietic stem cells from the donor into the recipient, which can di erentiate into all blood cells, including T cells. If the donor cells engra in the recipient's bone marrow and generate a new immune system, the recipient may become tolerant to the donor antigens [5]. HSCT is currently used to treat certain blood disorders and cancers, but its application in solid organ transplantation is limited due to the risk of gra -versus-host disease (GVHD), a condition in which the donor immune cells attack the recipient's tissues [6].
- Chimerism induction: Chimerism induction involves the administration of non-myeloablative (low-dose) conditioning regimens, followed by the infusion of donor bone marrow or peripheral blood stem cells. is results in the presence of both recipient and donor immune cells in the recipient's body, leading to the development of mixed chimerism, in which the recipient's immune system becomes tolerant to the donor antigens. Chimerism induction has been successful in inducing transplantation tolerance in animal models and some clinical trials [7].

### Pe i he al le a ce i d c i

Peripheral tolerance induction aims to suppress or redirect the donor-reactive T cells in the periphery, where they encounter the transplanted organ. is can be achieved by several methods, including:

- Costimulation blockade: Costimulation blockade involves the administration of antibodies that block the interaction between Costimulatory molecules on T cells and APCs, thereby inhibiting T cell activation. is approach has been successful in preventing rejection in animal models and some clinical trials, but its e cacy in inducing

***Corresponding author:** Helen Cribb, Department of Veterinary and Agricultural Sciences, University of Melbourne, Australia, E-mail: cribbhel@gmail.com

**Received:** 01-Mar-2023, Manuscript No: jcet-23-92547; **Editor assigned:** 04-Mar-2023, PreQC No: jcet-23-92547 (PQ); **Reviewed:** 18-Mar-2023, QC No: jcet-23-92547; **Revised:** 24-Mar-2023, Manuscript No: jcet-23-92547 (R); **Published:** 30-Mar-2023, DOI: 10.4172/2475-7640.1000161

**Citation:** Cribb H (2023) An Overview on Transplantation Tolerance. J Clin Exp Transplant 8: 161.

transplantation tolerance remains to be established [8].

- Treg cell therapy: Treg cells are a subset of CD4+ T cells that have immune-suppressive properties and play a role in maintaining peripheral tolerance. Treg cell therapy involves the isolation and expansion of Treg cells from the recipient or donor, followed by their infusion into the recipient before or a er solid organ transplantation. is approach has shown promise in inducing transplantation tolerance in preclinical studies and some clinical trials [9].

- Gene editing: Gene editing technologies, such as CRISPR/Cas9 [10]

## C cl i

is is one of the rst retrospective comparison studies that evaluated the outcomes of heart transplantation using organs preserved and transported using the system compared with SCS. Although the group showed longer total allogra ischemic time, patients using required fewer units of blood product for perioperative transfusion and had similar early-term survival compared with SCS. Although a multicenter trial is warranted to further validate ndings described in this study, accepting organs from a more remote location may be a safe and practical strategy to expand the donor pool by using advanced technologies, such as the system.

### References

1. Modell B, Darlison M (2008) Global epidemiology of haemoglobin disorders and derived service indicators. Bull World Health Organ 86:480–487.

2. Meng X, Gao X, Chen X, Yu J (2021) Umbilical cord-derived mesenchymal stem cells exert anti-fbrotic action on hypertrophic scar-derived fbroblasts in co-culture i n