



# Practical Basic Immunology

## Kidney Dialysis Techniques Department

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## **In Vivo Immunological Manipulation**

### **Learning Objectives**

**By the end of this lecture, students will be able to:**

- 1- Define in vivo immunological manipulation**
- 2- Explain basic mechanisms of immunological manipulation**
- 3- Identify clinical applications in kidney diseases and dialysis**
- 4- Describe modern immunotherapeutic approaches used**
- 5- Analyze benefits and risks associated with these interventions**

# What is In Vivo Immunological Manipulation?

## **Definition:**

**Intentional therapeutic interventions in the immune system within a living organism to achieve specific therapeutic goals.**

## **Main Types**

**1- Immunostimulation**

**2- Immunosuppression**

**3- Immunomodulation**

**4-Immunization**

## **Relevance for Renal Technology Students**

- ▶ Kidney patients often suffer from immune disorders**
- ▶ Dialysis patients are susceptible to infections due to immunosuppression**
- ▶ Kidney transplant recipients require immunosuppressive drugs**
- ▶ Autoimmune kidney diseases require immune interventions**

# Mechanisms of Immunological Manipulation

## A. Immunosuppression:

- 🌀 Corticosteroids (e.g., Prednisone)
- 🌀 Calcineurin inhibitors (Cyclosporine, Tacrolimus)
- 🌀 Antimetabolites (Azathioprine, Mycophenolate)
- 🌀 Monoclonal antibodies (Basiliximab)

## B. Immunostimulation:

- ▲ Cytokines (Interferon, Interleukin)
- ▲ Colony-stimulating factors
- ▲ Therapeutic vaccines
- ▲ CAR-T cell therapy

## **Applications in Kidney Diseases**

- 1- Lupus Nephritis: Immunosuppressants, steroids**
- 2- Goodpasture Syndrome: Plasmapheresis, cyclophosphamide**
- 3- Glomerulonephritis: Rituximab, cyclophosphamide**
- 4- Kidney Transplant Rejection: Various immunosuppressants**

## **Special Considerations for Dialysis Patients**

- 1- Drug Metabolism: Altered due to impaired kidney function**
- 2- Nephrotoxicity: Avoid drugs harmful to residual kidney function**
- 3- Infection: Increased risk due to immunosuppression**
- 4- Drug Interactions: With other dialysis medications**

## **Recent Advances in Immunotherapy**

- ♣- Biological Therapies: Monoclonal antibodies**
- ♣- Cellular Therapy: Stem cells, regulatory cells**
- ♣- Gene Therapy: Modifying immune genes**
- ♣- Personalized Immunotherapy: Based on patient's immune profile**

## **Challenges and Risks**

- 1- Increased risk of opportunistic infections**
- 2- Drug toxicity (renal, hepatic, neurological)**
- 3- Hypersensitivity reactions**
- 4- Increased malignancy risk**
- 5- High cost of modern therapies**

## **Role of Dialysis Technicians**

- 🌀 **Monitor patients for signs of infection.**
- 🌀 **Report side effects of immunologic drugs.**
- 🌀 **Understand drug interactions.**
- 🌀 **Educate patients about warning signs.**
- 🌀 **Collaborate with multidisciplinary medical team.**

## **Practical Case Study**

**45-year-old patient, recent kidney transplant:**

- **Prescribed medications: Tacrolimus, Mycophenolate, Prednisone**
- **Required: Drug level monitoring, infection signs, kidney function**
- **Potential complications: CMV infection, nephrotoxicity**

## **Summary**

- 1- In vivo immunological manipulation is a powerful tool in kidney diseases**
- 2- Balancing benefits and risks is crucial**
- 3- Recent advances are promising but complex**
- 4- Multidisciplinary healthcare team is essential for success**

## **Scientific References**

- 1- Abbas, A. K., Lichtman, A. H., & Pillai, S. (2020). Cellular and Molecular Immunology.**
- 2- Kidney International Reports (2023). Immunotherapy in Nephrology.**
- 3- Journal of the American Society of Nephrology (2022). Recent Advances in Renal Immunotherapy.**
- 4- UpToDate (2024). Immunosuppression in Kidney Transplant Recipients.**

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