

General Immunology Program
Degree Course in Medicine and Surgery
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General Features and Key Players of the Immune Response

- Definitions and Historical Overview
- Intra- and Extracellular Pathogens
- Cell-Mediated and Humoral Immunity
- Innate Immunity and Adaptive Immunity
- Physical/Chemical Barriers
- Cells and Tissues of the Immune System
- Pathogen Recognition: PAMPs vs. Antigen
- Overview of the Immune Response

Features of Innate Immunity

- Cells of Innate Immunity
- Phagocytosis and Degranulation
- Chemotaxis
- Pathogen Recognition: PRRs and PAMPs – DAMPs
- Humoral Response: The Complement System and Effector Mechanisms

Features of Adaptive Immunity

- Cells of the Adaptive Response and Division of Roles
- Key Features:
 - Specificity
 - Memory
 - Tolerance
- Pathogen Recognition: Antigen
 - Epitopes
 - Antigen Immunogenicity
 - Intrinsic Characteristics
 - Extrinsic Characteristics

The Lymphatic System

- Lymphoid Tissues and Organs
- Adhesion Molecules
- Cytokines and Chemokines

The Inflammatory Response

- Causes and Role of Inflammation
- Signs of Inflammation
- Acute Inflammation
 - Initiation

- Progression
 - Vasodilation
 - Active and Passive Hyperemia
 - Leukocyte Diapedesis
 - Exudate Formation (Composition and Different Types of Exudates)
- Resolution
- Chemical Mediators of Inflammation
- Overview of Chronic Inflammation
- Systemic Manifestations of Inflammation

Antigen Presentation to T Lymphocytes

- Major Histocompatibility Complex
 - MHC Class I and II
- T Cell Receptor Complex (TCR)
- T Cell Co-receptors (CD4 and CD8)
- Antigen Presentation Pathways:
 - Class I Antigen Presentation (Endogenous Pathway)
 - Class II Antigen Presentation (Exogenous Pathway)
- MHC Diversity
 - Polymorphism, Polygeny and Codominance

Development, Activation and Functions of T Lymphocytes

- Development of T Lymphocytes
 - V(D)J Recombination and Receptor Development
 - Positive Selection
 - Central Tolerance and Negative Selection
- Activation of Naïve T Lymphocytes and Differentiation into Effector T Cells
- Effector T Lymphocytes:
 - Cytotoxic T Cells (CTL)
 - Helper T Cells
 - Th1, Th2, Th17 and Tfh
- MHC (HLA) Structure and Genes
 - Antigen Binding
 - Non-classical MHC Molecules
 - MHC Diversity
- TCR Structure and Genes
 - Binding to Antigen and MHC Molecules
 - TCR Diversity

Development, Activation and Functions of B Lymphocytes

- Development of B Lymphocytes
 - Immunoglobulin Genes and BCR Diversity
 - Central Tolerance: Clonal Deletion
- Activation of Naïve B Cells and Antibody Production
 - T-Independent Responses and Short-Lived Plasma Cells

- T-Dependent Responses and Long-Lived Plasma Cells
 - Primary and Secondary Antibody Responses
 - Germinal Centers
 - Affinity Maturation, Class Switching and Immunological Memory

Immunoglobulins: B Lymphocyte Receptors and Antibodies:

- Structure of Immunoglobulins
- Isoform and Isotype Variations
- B Cell Receptor Complex (BCR)
- Antibody Effector Mechanisms
 - Neutralization
 - Opsonization
 - Complement Activation
 - Antibody-Dependent Cell-Mediated Cytotoxicity (ADCC)

Natural Killer, NKT and $\gamma\delta$ T Lymphocytes

- Distribution and Role
- Effector Mechanisms

Regulation of the Immune Response

- Peripheral Tolerance
- Regulatory T Lymphocytes
- Inhibitory Receptors

Basic Concepts of Clinical Immunology

Vaccination

- Natural and Artificial Immunization
- Active and Passive Immunization
- Objectives and Requirements of Vaccines
- Types of Vaccines

Hypersensitivity Reactions:

- General Overview of the Different Types of Hypersensitivity
- Allergies and Immediate Hypersensitivity
 - Sensitization
 - Reaction

Transplant Immunology

- Types of Transplantation and Rejection
- Allorecognition and Histocompatibility Antigens