

HMX Fundamentals Immunology

Expanding knowledge of the immune system has led to recent medical advances, and an understanding of the basic concepts of immunology is now essential for anyone interested in health care. This course covers the processes that enable our immune systems to respond to evolving threats, as well as new, immunology-based disease treatments. Participants will:

- Understand how the innate and adaptive immune systems function to protect the body from disease
- Learn what happens when the immune system breaks down, leading to immunodeficiency and autoimmunity
- See how key immunology concepts are linked to the treatment of disease, including through new therapies that harness the power of the immune system

Topics Covered

Course Overview

- Course introduction
- Meet the faculty
- Basic terms and concepts

Innate Immunity and Inflammation

- Sentinel cells and circulating leukocytes
- Inflammatory events and signaling
- The formation of pus

Microbial Recognition and Responses in Innate Immunity

- Pattern recognition receptors
- Innate immune signaling
- The antiviral state
- The complement system

Antibodies - Structure and Function

- B lymphocytes
- Antibody structure and function
- How antibodies can cause disease

Lymphocyte Development and Diversity

- Lymphocyte development
- Clonal selection and expansion
- Differences between B and T lymphocytes
- The generation of lymphocyte receptor diversity

T Cell Activation by Antigens

- The role of dendritic cells
- The lymphatic system and delivery of antigen to lymph nodes
- Adaptive immune activation in secondary lymphoid tissues

- Costimulation and inhibitory signaling
- Antigen presentation

T Cell-Dependent B Cell Responses

- T cell activation of B cells
- The germinal center reaction
- Isotype switching and affinity maturation

Helper T Cells

- Helper T cell functions
- Helper T cell subsets
- The role of helper T cells in disease

Cytotoxic T Cells

- Cytotoxic T cell functions
- Selection and expansion of cytotoxic T cells
- Contraction and memory
- Therapies that target cytotoxic T cell functions

Failures of the Immune System

- Immunodeficiencies
- Mechanisms of tolerance and loss of self-tolerance
- Autoimmune diseases
- Allergic diseases

Immunology-Based Therapy of Diseases

- Transplantation and transfusion
- Vectored immunoprophylaxis and chimeric antigen receptor T cells
- Neoantigen discovery and checkpoint blockade

Each HMX course is designed to give learners a solid foundation in the basic science principles that are relevant to human health and disease. Concepts are taught using whiteboard-style videos and animations and reinforced by interactive elements, true-to-life scenarios, and real patient cases to enhance learning.