



UNIVERSITÀ  
DEGLI STUDI DI MILANO-BICOCCA

## COURSE SYLLABUS

### Immunology I

2122-2-H4102D011-H4102D033M

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#### Aims

The course will give the basic knowledge of immunology with special consideration to the importance of the immune system in medicine.

The aim of the course is to give the basic knowledge of the structural and molecular mechanisms of the immune system. The immune system is an integrated set of molecules and cells that work in a coordinated way to maintain the body's homeostasis and protect it from foreign agents, such as microorganisms and their products. The course will address the dynamics and complexity of humoral and cell-mediated immune responses and the main alterations of the mechanisms of immune-mediated diseases. At the end of the course the student will be able to describe: the organization of the immune response towards the different types of insults; the peculiarities of the different components of the immune system; the main pathological mechanisms of immune-mediated diseases.

#### Contents

- General characteristics of immune responses
- Cells and tissues of the immune system
- Innate Immunity
- Adaptive Immunity
- Major Histocompatibility Complex and Antigen Presentation
- Antibodies and Antigens

- Immunity to microorganisms and Vaccinations
- Immunopathology

## Detailed program

**Introduction to the immune system.** Natural and adaptive responses. Anatomical-Functional Organization of the Immune System.

**Innate immunity:** recognition of molecular structures by the cells of the innate immune system. Soluble effector molecules of innate immunity: the complement, Pentraxins, collectins and ficolins. The innate responses induced against infection. Inflammatory response: main proinflammatory cytokines, leukocyte recruitment, ingestion and killing of microorganisms by phagocytes, systemic and pathological effects of inflammation. Antiviral response. Mechanisms of regulation of the innate immune response.

**Antigen presentation to T lymphocytes.** The major histocompatibility complex. Characteristics of genes and function of class I, II and III molecules. The processing and presentation of the antigen. Cells presenting the antigen.

**The cells of the adaptive immunity.** Origin, differentiation, circulation. T lymphocytes: the antigen receptor. Maturation, activation and differentiation (T helper, T killer and T regulator). B lymphocytes: the receptor for antigen and maturation. Differentiation and independent and dependent T activation. Formation of the germinal center, maturation of receptor affinity and class switching. The plasma cells.

**Antibodies:** structure and biological properties of antibody classes. The antigen-antibody reaction. Affinity, avidity, specificity. Kinetics and regulation of the antibody response. Monoclonal antibodies.

**Functional anatomy of systemic and local immune responses.** Immune Responses in Practice. Immunity to microorganisms. Vaccinations (theoretical bases and perspectives) and principles of immunotherapy.

**Immunopathology** - Introduction to Immunopathology. Hypersensitivity Diseases. Molecular mechanisms and classification of hypersensitivity reactions. Diseases caused by antibodies. Diseases caused by T lymphocytes. Therapeutic approaches.

**Immunological Tolerance and Autoimmunity.** Cellular and molecular mechanisms of T and B lymphocyte tolerance towards self and conventional antigens. Autoimmunity: etiology and pathogenesis of autoimmune diseases.

**Congenital and acquired immunodeficiencies.** Deficiency of innate immunity, severe combined immunodeficiencies, antibody deficiencies. Therapeutic approaches to congenital immunodeficiencies. Secondary immunodeficiencies. Pathogenesis of HIV infection. Immune response to HIV. AIDS therapy and prevention.

**Transplant Immunology.** Adaptive immune response to allogeneic transplantation, effector mechanisms of allograft rejection, prevention and treatment of transplant rejection.

## Prerequisites

Knowledge of the introductory courses indicated in the regulation of the degree course

## Teaching form

Frontal lectures and support videos. Interactive lessons based on computer simulations of pathological clinical questions

Lessons in attendance, subject to any ministerial changes following the COVID pandemic situation. If the teaching is given in a mixed or remote mode, the necessary changes with respect to what was previously stated may be introduced, in order to comply with the program.

## Textbook and teaching resource

Abul Abbas Andrew Lichtman Shiv Pillai - Cellular and Molecular Immunology 9th Edition- Elsevier

Casey Weaver, Kenneth Murphy-Janeway "Immunobiology" - ed. Garland Science

## Semester

I Semester

## Assessment method

The exam includes a written test with multiple choice questions on different Immunology's topics. The questions will assess the degree of depth achieved by the student. In the specific case of Immunology, questions are asked on all the fundamental aspects of the individual parts of the Program above. The test will also include an open-ended question (essay) that will assess the ability to link the different topics covered.

The exam is considered passed only if at least 60% of the questions including the open-ended question are answered.

## Office hours

Monday morning by appointment

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