UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Pathology and Immunology 1

2223-2-H4101D255-H4101D173M

Aims

To introduce the student to the knowledge of etio-pathogenesis of human diseases, the students will be able to understand the fundamental pathophysiological mechanisms of diseases. Topics for in-depth knowledge on the molecular mechanisms underlying the pathogenesis of diseases and the identification of potential diagnostic and therapeutic targets will be developed and on immune response.

Contents

GENERAL PATHOLOGY

· Molecular Pathology

· Cellular Pathology

IMMUNOLOGY AND IMMUNO-PATHOLOGY

Detailed program

• **General Pathology.** Etiology. Pathogenesis. Homeostasis and disease. Onset and course of diseases. Acute and chronic diseases. Physiological and pathological predisposing factors.

• **Causes of diseases I. Extrinsic causes of disease.** Physical: radiation, electricity, atmospheric pressure, heat. Chemicals: Toxic substances of natural origin, organic solvents, metals, drugs. Biological: bacteria, viruses, protozoa, fungi, metazoans. Virulence. Pathogenicity. Transmission of infections. Spread of infectious agents.

• **Cell response to damage. Reversible damage.** Activation of protective mechanisms: expression of inducible stress genes. Adaptation. Hypertrophy, Hyperplasia, Hypotrophy, Hypoplasia, Metaplasia, Dysplasia. Hypoxia damage. Damage from ischemia. Damage from ischemia / reperfusion.

• **Cell response to damage. Irreversible damage.** Cell death: necrosis and apoptosis. Neoplastic transformation.

• **Tissue response to damage. Inflammation I.** Cardinal signs of inflammation. Pathway of inflammation. Cells involved in inflammation. Cell migration: Chemotaxis, adhesion molecules. Chemical mediators of inflammation: histamine, serotonin, interleukins and cytokines, prostaglandins, leukotrienes, permeability factors and proteases.

• **Inflammation II.** Acute inflammation: I. serosa, I. serofibrinosa, I. catarrhal, I. purulent, I. hemorrhagic. Chronic inflammation. Granuloma.

• **Tissue repair.** Tissue cleansing. Granulation tissue. Evolution: *Restitutio ad integrum*, Healing. Wound Repair

• **Acute inflammation. Burns**

• **Chronic inflammation.**
• **Arteriosclerosis and Atherosclerosis**

• **Systemic effects of inflammation.** Acute phase proteins. Fever: general information, temperature measurement. Physiopathology of thermo-regulation: thermogenesis: basal metabolism, regulation of thermogenesis, thermodispersion. Alterations of body temperature. Non-febrile hyperthermia: sun-stroke, heat-stroke. Febrile hyperthermia: pathogenesis of fever, exogenous pyrogens and endogenous pyrogens, course of fever. Types of fever.

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

• **Innate immunity**: receptors used by innate immunity cells and cytokines. The complement: activation mechanisms and biological functions.

• **Major Histocompatibility complex**. Characteristics of genes and function of class I, II and III molecules. Presentation of the antigen to T lymphocytes. Antigen presenting cells.

• **The cells of 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 switch. 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. Vaccinations (theoretical bases and perspectives) and principles of immunotherapy.

• **Regulation of the immune response.** Role of antigens, antibodies, lymphocytes, NK cells. Idiotypical modulation. Neuroendocrine modulation. Genetic control.

• **Tolerance.** Experimental induction of tolerance. Thymic tolerance to self antigens. Selection and Development of T Cells. Peripheral tolerance to self antigens. Privileged sites. Role of T cells and Dendritics. Tolerance of B Cells to self antigens.

• **Hypersensitivity reactions. Type I hypersensitivity reactions.** IgE. Allergens. Role of Cellue T, Mastcellulas

and Basophils. Genetics of allergies. Type II hypersensitivity reactions. Mechanism of damage. Reactions against blood cells. ABO system. Reactions against tissue antigens.

• **Delayed hypersensitivity reactions. Type III hypersensitivity reactions**. Immune complex diseases. Formation, persistence and deposition of complexes in tissues. Hypersensitivity reactions Type IV. Contact hypersensitivity. Cellular reactions. Granulomas.

• **Autoimmunity.** Etiology and Pathogenesis of autoimmune diseases.

• **Immune response in infectious diseases**. Immunity to viruses, bacteria and fungi. Evasion of immune defenses. LPS action mechanism.

• **Immunodeficiency** - Primary

• **Immunodeficiency** - Acquired

• **Transplant immunology**. Immunological barriers to transplantation. Histocompatibility antigens. Rejection. Role of lymphocytes in rejection. Prevention of rejection. Principles of immunosuppressive therapy.

• **Molecular medicine and personalized medicine.**

• **Molecular and cellular pathology.** Extracellular matrix pathologies (amyloidosis, prion disease, collagenopathies, elastopathies, fibrosis). Intracellular accumulations disorders (steatosis). Diseases of ionic membrane transporters (cystic fibrosis). Hemoglobin diseases (sickle cell anemia, thalassemia). Disorders of enzyme inhibitors (alpha 1-antitrypsin deficiency).

• **Physiopathology**. Physiopathology of haemostasis and haemorrhagic diseases. Renal physiopathology, glomerulopathies and tubulopathies, polycystic kidney. Physiopathology of glycemic control and diabetes mellitus.

Prerequisites

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

Teaching form

Lectures and exercises

Textbook and teaching resource

- Robbins e Cotran: Le Basi Patologiche delle Malattie. Edizione. Elsevier

- Pontieri-Russo-Frati: Patologia Generale. Edizione. Piccin.

- Abbas A.K.: Fondamenti di Immunologia. Funzioni e alterazioni del Sistema Immunitario. Piccin

Semester

II semester II year

Assessment method

The evaluation will be carried out through a multiple choice test focused on the topics of Immunology and immuno-pathology (60 questions) and an oral examination. The interview will evaluate the degree of knowledge achieved by the student. Questions will be asked about all the fundamental part of the program.

Office hours

By appointment

Sustainable Development Goals

GOOD HEALTH AND WELL-BEING