DIPARTIMENTO DI SCIENZE

COURSE:

Pathophysiology and Immunology

ACADEMIC YEAR: **2018-2019**

TYPE OF EDUCATIONAL ACTIVITY: Basic

TEACHER: Prof. Giuseppe TERRAZZANO

e-mail: giuseppe.terrazzano@unibas.it | website:

phone: 0917 20 61 63 | mobile (optional): 3475708475

Language: **Italiano**

ECTS: 8 (lessons e tutorials/practice)	n. 64 of hours: (lessons e tutorials/practice)	Campus: **Potenza** Dept./School: **Dipartimento di Scienze** Program: **Biotechnologies LM9**	Semester: II from 01/03/2019 to 31/05/2019- 20/06/2019

EDUCATIONAL GOALS AND EXPECTED LEARNING OUTCOMES

The course of Pathophysiology and Immunology is the main teaching whose educational purpose is the transfer of knowledge on both the pathophysiology and immunology, as well as the applications of the two disciplines in biomedical research and diagnosis of human and animal diseases. The basic aim of the course will be to address the study of the main pathophysiological processes at the basis of diseases in human and animals. In addition, the immune response will be studied in its significance of defense against disease, as well as for his role in the etiological and pathophysiological determinism of immune-mediated diseases. A further aim is to use the pathophysiological and immunological knowledge in medical, pharmaceutical and veterinary diagnostics.

A) The main knowledge provided will be:

- the elements and basic principles of the pathophysiological processes and of the mechanisms underlying the disease's determinism; - The understanding of pathophysiological events at the molecular and cellular level, as well as in charge of tissues, organs, apparatuses and systems of the human organism; - The advanced elements for the study of the immune system and its role in defense against disease and in determining the pathological processes.

B) The principal of the student's ability, applicable to the foreground, will be:

- Identification of the principal pathophysiological features of diseases; - Identification of scientific-experimental methodologies for the understanding of pathophysiological processes at the level of cells, tissues, organs, apparatuses and systems in humans and animals; - Evaluation of the immune response and its role in the disease determinism; - Use the knowledge in the field of medical, pharmaceutical and veterinary diagnostics.

PRE-REQUIREMENTS

1. elementary concepts of the structure of molecules, cells and cell substructure;
2. Knowledge over the basics of anatomy and physiology of the cells, organs, apparatus and systems in human and animals;

SYLLABUS

The course is divided into the following thematic-learning modules based on classroom lessons (see detailed course program): 1. Basics (2 hours); 2. Primary Endocrine disorders and hormonal functions (10 hours); 3. Pathophysiology of lipid metabolism and atherosclerosis (6 hours); 4. Pathophysiology of organs and systems (8 hours); 5. Primary disorders of both the blood and haematopoiesis (6 hours); 6. Physiology of the immune response: a) the innate response (8 hours); 7. Physiology of the immune response: b) the specific response (8 hours); 8. Pathophysiology of the immune response (8 hours); 9 Pathophysiology response to infection, damage and inflammation (8 hours);

Detailed program: **1. Fundamentals.** Areas of study ofgeneral pathology and pathophysiology. Concepts of health and disease; etiology, pathogenesis, evolution; course, results. **2. Principles of the scientific method and epidemiological and experimental methodology.** Primary endocrine disruption and the regulated functions. Main endocrine glands and their hormones. Chemical nature of hormones. Pathophysiology of the action of hormones. Mechanism of action and pathways of hormonal signal transduction: the messengers and the biological response circuits. General etiology
and pathogenesis of endocrine diseases. Pathophysiology of hyperfunctions and hypofunctions and the endocrine glands. Pathophysiology of insensitivity of the target tissues to 'hormone. side-effects from excess hormones. Disendocrinopatie paraneoplastic. Abnormalities of glucose homeostasis The endocrine axes: 1) axis hypothalamus-pituitary-thyroid; 2) axis hypothalamus-pituitary-adrenal axis; 3) the hypothalamic-pituitary- gonadal axis. hypothalamic hormones. pituitary hormones. thyroid hormones. adrenal hormones. pituitary hormones. gonadal hormones. Pathophysiology of the secretion of the endocrine pancreas and adrenal glands. Etiology and pathogenesis of the various types of diabetes mellitus. Metabolic abnormalities in diabetes. Pathogenesis of chronic complications of hyperglycemia. Pathophysiology of thyroid hormone secretion. **3. Pathophysiology of lipid metabolism and atherosclerosis.** Main physiological and pathophysiological mechanisms of lipid metabolism. Hypercolestorlemia family. Atherosclerosis. **4. Pathophysiology of organs and systems of regulated functions.** Breathing: physiological and pathophysiological mechanisms. The respiratory system. The kidney: features and major changes in pathophysiological sense. The nervous system and neurodegenerative diseases: Parkinson's, Alzheimer's, Huntington's diseases. **5. primary disorders of the blood and blood forming organs.** Hematopoiesis. Hemoglobin: Genetics, structure and functions. The red blood cell. Pathophysiology of anemias. Etiology of anemia by hematopoietic defects. Pathogenesis of hemoglobinopathies. Pathogenesis of thalassemia. Coagulation (notes) and Hemophilia A. **6. Pysiology of the immune response: a) the innate response**. Physical and physiological barriers innate immunity. The recognition of pathogens in innate immunity. Interferons and cytokines. The complement system. Phagocytosis. Macrophages and professional phagocytes. Opsonization and phagocytosis. Mechanisms of killing phagocytes: the role of reactive oxygen species and nitric oxide. The antigen-presenting cells: macrophages, dendritic cells and B lymphocytes. Characteristics, types, location and functions of dendritic cells. Natural killer cells: phenotypes, functions, receptors and recognition of diversity mechanisms. **7. Pysiology of the immune response: b) the specific response of acquired immunity**. cellular and molecular basis of the immune response. Origin of the specificity and diversity of lymphocytes. clonal selection. Organization of the immune system. Primary and secondary lymphoid organs. Distribution and recirculation of immune cells. The antigen. Thymus-dependent and thymus-independent Antigens, superantigens. The antigen receptor of B lymphocytes. Structure and function of the soluble molecule (antibody) and the membrane antigen receptor of B lymphocytes (BCR). The combining site. Biological functions of the classes and subclasses. The antigen receptors of lymphocytes T. Molecular structure of gene products. Organization of genes and rearrangement mechanisms. Development of B and T lymphocyte repertoire The cellular and molecular mechanisms that operate from precursor stem cell to the naïve and mature T or B lymphocyte. Positive and negative selection of T cells in the thymus. Selection of B lymphocytes in the bone marrow. The markers of lymphocyte development and study methods. The molecules of the Major Histocompatibility Complex (MHC). Gene's polymorphism and organization. Molecular structure and classification of gene products (MHC class I and II). Structure and function of the combinatorial groove. Role of MHC class I and II molecules in antigen presentation. The antigen presentation to the immune system.
The native antigen recognition by B cells and MHC-restricted recognition by T lymphocytes. Cells that present antigen to CD4 + T lymphocytes (professional APC) and cells that present antigen to the CD8 + T cells. Processing (processing) of the extracellular and intracellular antigens. Activation of lymphocytes T and B. The transduction mechanisms of the BCR and TCR signal. Major pairs of adhesion molecules and co-stimulation involved in the process. The cytokines that participate in the polarization of the immune response. The network of interactions that controls the innate and acquired immune responses. Role of cytokines in the differentiation of T lymphocytes into Th1 and Th2 subsets. Characteristics, development and functions of the two subpopulations. Characteristics, development and functions of T helper subpopulations and Th17. Effector mechanisms of humoral. The cooperation between T and B lymphocytes. Plasma cells. Assembly mechanisms of immunoglobulin isotype switching, affinity maturation of antibodies. Kinetics of primary and secondary response. Effector mechanisms of cell-mediated. Macrophage activation mediated by Th1 lymphocytes. The cytotoxic T lymphocytes (CTL) and the molecular mechanisms of the killing of the target cell. Natural killer cells (NK): origin and phenotypic characteristics and recognition of target cells. Cytotoxicity antibody-dependent cell-mediated. Control mechanisms of the immune response regulatory Treg cells, the immune tolerance. Central and peripheral tolerance to self antigens. Tolerance to foreign antigens. The immune response to pathogens. **8. Pathophysiology**
of the immune response. Hypersensitivity reactions. General concepts of hypersensitivity reactions. Mechanisms

and main events of anaphylactic reactions. Mechanisms and main manifestations of cytolytic or cytotoxic reactions. Mechanisms and main manifestations of immune complex reactions. Delayed hypersensitivity. Autoimmunity and autoimmune diseases. Loss of tolerance mechanisms. Classification and pathogenesis of autoimmune diseases. Relations between HLA phenotype and frequency of autoimmune diseases Transplant. Deficiency of the immune system. congenital immunodeficiencies. Acquired immunodeficiencies. Immunology of aging. Tumor immunology. **9. Pathophysiology response to injury, infections, and inflammation**. Fever: mechanisms, related molecular circuits, type and progression, pathophysiological changes of thermoregulation.

TEACHING METHODS

The course includes 64 hours of teaching, divided into classroom lessons

EVALUATION METHODS

Final oral examination to ascertain the acquisition by the students of the knowledge and skills described in the "Educational objectives and expected learning outcomes". The final evaluation will be expressed by a vote (30/30).

TEXTBOOKS AND ON-LINE EDUCATIONAL MATERIAL

o Pontieri. Patologia Generale - PICCIN;
o Parham. Immunologia- EDISES;
o Robbins e Cotran, Le basi patologiche delle malattie, Elsevir Editore
o Abbas. "Immunologia Cellulare e Molecolare", Piccin Editore
o Doan, Le basi dell'immunologia, Zanichelli.

INTERACTION WITH STUDENTS

At the beginning of the course, after describing the objectives, the detailed program and the Learning method, the teacher will indicate the reference texts and the availability of teaching materials (lessons, lecture notes, scientific articles, the course program , etc.). In this regard, during the course, the teacher will share with students, in electronic format (pdf sheet), each lesson took place on an appropriate web platform. The hours reserved for the interaction with student will be from 11.30 am to 01.30 pm on Wednesday and from 02.00 pm to 03.00 pm on Thursday. In addition, the teacher will be available for contact with the students, through the use of email or phone.

EXAMINATION SESSIONS (FORECAST)[1]

13/02/2019, 13/03/2019, 15/05/2019, 19/06/2019, 10/07/2019, 11/09/2019, 20/11/2019, 4/12/2019

SEMINARS BY EXTERNAL EXPERTS YES X NO

FURTHER INFORMATION

[1]Subject to possible changes: check the web site of the Teacher or the Department/School for updates.