GENERAL PATHOLOGY AD PATHOPHYSIOLOGY

1. language

Italian.

2. course contents

Coordinator: Prof. CALVIELLO GABRIELLA
Year Course: 2023/2024, II Course year-II semester; III Course year-I semester

General Pathology and Pathophysiology 1 (MG0253), II Course year-II semester (ufc: 4)

General Pathology and Pathophysiology 2 (MG0412), III Course year-I semester (ufc: 13)

General Pathology practicals (ufc: 1)

Modules and lecturers:
- *General Pathology and Pathophysiology 1* (MG0041) - 4 ufc - ssd MED/04
Proff. Simona Serini, Gabriella Calviello, Simona Serini, Ruggero De Maria Marchiano, Mariapaola Marino, Francesco Ria, Gabriella Calviello, Mariapaola Marino, Ruggero De Maria Marchiano.
- *General Pathology and Pathophysiology 2* (MG0414) - 13 ufc - ssd MED/04
Proff. Carlo Provenzano, Gabriella Calviello, Mariapaola Marino, Giovambattista Pani, Francesco Ria, Gabriella Calviello, Giovambattista Pani, Simona Serini, Ruggero De Maria Marchiano, Simona Serini, Mariapaola Marino, Alessandro Sgambato.

- *General Pathology practicals* (MG0415) - 1 ufc - ssd MED/04
Proff. Simona Serini, Tobias Longin Haas, Mariapaola Marino, Simona Serini, Carlo Provenzano, Tobias Longin Haas, Mariapaola Marino, Tobias Longin Haas, Simona Serini, Mariapaola Marino, Carlo Provenzano.

3. BIBLIOGRAPHY

-ROBBINS-COTRAN, Le Basi Patologiche delle Malattie, vol. I e II, Ed. EDRA Masson, X Edition, 2021.
-RUBIN, Patologia generale - Anatomia patologica, Ed. Piccin, VII Edition, 2019.
-PONTIERI, RUSSO, FRATI. Patologia generale, vol. I e II, Ed. Piccin. V Edition, 2015.
-MAINIERO, MISASI, SORICE, PONTIERI. Patologia generale e Fisiopatologia generale 1 e 2. Ed. Piccin, 2018 e 2019.
-ABBAS-LICHTMAN-PILLAI, Immunologia cellulare e molecolare, Ed. EDRA, X Edition, 2022.
-MURPHY & WEAVER, Immunobiologia di Janeway, Ed. Piccin. IX Edition, 2019.
-HARRISON, Principi di medicina interna, Casa Editrice Ambrosiana, XX Edition, 2021: Chapter 36, “Ipossia e Cianosi”; Chapter 37, “Edema”; Chapter 49, “Alterazioni dei liquidi e degli elettroliti”; Chapter 50, “Ipercalcemia e ipocalcemia”; Chapter 51, “Acidosi e alcalosi”; Chapter 59, “Anemia/Policitemia”; Chapter 61, “Emorragia/Trombosi”; Chapter 252; Insufficienza cardiaca: fisiopatologia e diagnosi; Chapter 271, “Ipertensione Arteriosa”; Chapter 279, “Disturbi della funzione respiratoria”; Chapter 296; “Approccio al paziente in shock” Chapter 303, “Biologia cellulare e molecolare del rene”.

Textbook (guide for Practicals):
-P.R. WHEATER, H.G. BURKITT, A. STEVENS, J.S. LOWE, Istopatologia essenziale. Testo atlante, Casa Editrice Ambrosiana, 2003.

It is necessary for the students to have a textbook of *General Pathology and Pathophysiology 2*

and one of *Immunology* among those recommended or another textbook, after teachers' approval. It is optional, but highly recommended, to have the suggested atlas for practicals.

4. LEARNING OBJECTIVES

General pathology studies the morphological and functional modifications, which are at the basis of the biological alterations of the homeostasis and are essential for the development of the different diseases. In particular, it studies the causes (etiology) responsible for the different pathologies and the mechanisms (pathogenesis) whereby a disease arises and evolves. Moreover, it is focused on the modifications of the functions of organs and systems in pathological conditions.
Knowledge and understanding - (Dublin 1): By the end of the Course, the students will acquire the knowledge of the causes at the basis of cellular and molecular damages, as well as the mechanisms of reaction, and the basic pathological processes that may follow, both at mechanistic and morphologic levels. Moreover, the students will acquire the main principles of scientific methodology and will know how a scientific paper is structured.
Applying knowledge and understanding – (Dublin 2)**:** By the end of the Course, the students will know how to apply the acquired knowledge. They will understand how basal pathological processes may alter the functions of organs and systems and mediate the passage from the damage occurring in cells and tissues to the development of a complex disease. Moreover, the students will: -recognize the pathological processes in microscopic tissue sections; know how to make a bibliographic search and the most used bibliometric criteria.
Making judgements - (Dublin 3): By the end of the Course, the students will know how to integrate the acquired knowledge and competences, as well as to answer to questions on clinical cases, by organizing in a transversal way what they have learned during the Course for each single topic. The students will be able to read a scientific paper and evaluate the originality and methodologic accuracy.
Communication skills (Dublin 4): By the end of the Course, the students will know how to communicate what they have learned on the causes and mechanisms involved in the development of pathological processes and different diseases. Moreover, they will be able to clearly communicate knowledge and personal judgments both to experts and non-experts.
Learning skills (Dublin 5) - By the end of the course students will develop better study skills and strategies aimed at multi-source, self-directed and ongoing learning. In particular, they will gain the capacity to deepen and update their knowledge by capitalizing on bibliographic searches and on use of web-based electronic databases.

5. prerequisites

Key prerequisites include the knowledge of:

a) the fundamentals of Physics;

b) the structures of organic and inorganic molecules, as well as of biochemical and molecular pathways in which they are involved;

c) the structures of cells, tissues, organs and systems;

d) the physiologic mechanisms involved in the functioning of cells, tissues, organs and systems.

It is mandatory for the students to have passed the exam of *Physiology* to be admitted to the exam of *General Pathology and General Pathophysiology 2.*

6. TEACHING METHODS

The topics of the lectures will be scheduled in detail. The schedules of the two modules of *General Pathology and Pathophysiology 1* and *General Pathology and Pathophysiology 2* will be available

for the students at the beginning of the respective semester.

The Course will be taught through:

a) Interactive frontal lectures. Sometimes, small presentations on clinical cases and the Problem Based Learning (PBL) methodology will be used to obtain highest levels of interest and to better deepen the topics. Multiple choice questions concerning the topic will be asked in some lessons and will represent the basis for further discussion.
b) "Reverse classrooms", with contents being provided in advance for students' homework in the form of slide presentations, book chapters and links to web-based multimedia, and presented in the classroom from students to students under teacher guidance.
c) Teaching units given in small group (within the Practicals), where the students will be able to practice in the interpretation and identification of the morphological substrates of the diseases.

Teaching methods - (Dublin 1) The teaching methods described above will allow the students to achieve an adequate knowledge that makes them able to understand how the basal pathological processes can: a) alter the functions of the organs and system, b) mediate the passage from the damage occurring in cells and tissues to the development of a complex disease.

Applying knowledge and understanding - (Dublin 2) and Making judgements (Dublin 3) The teaching methods described above will allow the students to critically organize the acquired knowledge starting from the etiological agents and the mechanisms involved in the pathological processes and then considering the diseases that can arise, as well as the organs and systems implicated in them and the clinical presentation.

Communication skills - (Dublin 4) The level of interaction obtained by using these teaching methods will make able students to clearly communicate knowledge and personal judgments both to experts and non-experts.
Learning skills - (Dublin 5): By the end of the course, thanks to the teachers' indications, as well as the formal lessons, the interactive in-depth studies proposed and the practicals the students will be able to develop skills and strategies aimed at multi-source, self-directed and ongoing learning. Moreover, they will gain the capacity to deepen and update their knowledge by capitalizing on bibliographic searches and on use of web-based electronic databases.

7. OTHER INFORMATIONS

Continuous feedback is provided to students during classes, at intervals and at the end of each lesson. Teachers are available for consultation by e-mail or in person upon appointment.

The educational offer of the Course includes also the three following eligible activities (monographic course):

-Monographic Mini-Course: 0.5 UFC
Problem based learning (PBL) (Prof. Giovambattista Pani), code A000592.
Experimental models and methodology: cytofluorimetry (Prof. Donatella Lucchetti), code MG0563.
Experimental models and methodology: cell cultures (Prof. Donatella Lucchetti), code MG0566.

Each monographic course will be held in two weeks during the first semester of the third-year course, in parallel with the Course of *General Pathology and Pathophysiology 2*. Each student will be allowed to enroll in just one Mini-Course. The available places for each Mini-Course are 20. WHITE COATS ARE REQUIRED for the Practical on blood smear procedure and evaluation.

-Internship in General Pathology laboratories: 1,0 CFU (a semester of frequency in the assigned laboratory, upon agreement with the teachers. The available places are 5 (Prof. Gabriella Calviello).

8. METHODS FOR VERIFYING LEARNING AND FOR EVALUATION

Methods for verifying learning include:

-A first written test held in person, which will be performed through the Blackboard platform. The students will take the test from within the Campus, using their electronic devices (PC), under the direct supervision of the teaching staff. The students will be asked to download the Respondus Lockdown Browser in their PC and to take the written tests consisting of 60 multiple-choice questions having just one correct answer out of five possible ones. The questions are focused on all the topics treated in the lectures of *General Pathology and Physiopathology 1 e 2* and in the *Practicals*. The number of questions is proportional to the UFC of each module. The questions are structured to evaluate how the students has been able to comprehend (***Understanding - Dublin 1)*** and apply the knowledge/competence achieved ***(Applying knowledge– Dublin 2***). Particularly, the last point is verified by questions based on specific clinical case that in the questions will be examined in all the aspects.
The score in this first text is expressed in thirtieth. To each correct answer is assigned a score equal to 0.5. To each incorrect answer is assigned a score equal -0.25, and to each unanswered question is assigned a score equal to zero. The students will be admitted to the second part of the exam only if a score of 18/30 is reached. The student will be able to reach the maximal final score (30/30) only if they have reached a score 23/30 in the first test.

- A second part of the exam held in person, which will be focused on the *Practicals* and consisting in a test performed at the PC after having drawn a packet containing 5 multiple choice questions. The morphological identification of pathological processes is requested, as well as theoretical notions regarding the preparation of a smear of peripheral blood and the knowledge of major parameters of a cell blood count exam. The questions allow to evaluate if and how the students are able to comprehend (***Understanding - Dublin 1)*** and apply the knowledge and competence achieved ***(Applying knowledge– Dublin 2***. In this test, the minimal score is 0/5 (when no one of the answers is correct). The maximal score is 5/5 (when all the answers are correct). The students will be admitted to the third part of the exam only with a score 2/5.

- A third oral part of the exam held in person: it is based on at least three questions on the program of the lectures of the two modules of *General Pathology and Pathophysiology 1* and *General Pathology and Pathophysiology 2.* The different UFCs of the two modules will be considered when formulating the questions. In this part of the exam, the score obtained will be related to how the students answer to the questions (no answer, incorrect answer, superficial answer or detailed answer that is discussed from multiple points of view). Moreover, it will be taken into account the ability of the students to demonstrate:

To have achieved the knowledge and competence according to the objectives detailed above (***Knowledge and understanding: Dublin 1-Applying knowledge and understanding: Dublin 2);***

To be able to integrate the acquired knowledge and competences by organizing in a transversal way what they have learned during the Course for each single topic (***Making judgements: Dublin 3)***.

To clearly communicate using a correct terminology (***Communication skills: Dublin 4)****:*

To show to have deepened and updated their knowledge by capitalizing on bibliographic searches and use of web-based electronic databases (***Learning skills: Dublin 5)****.*

The maximal score (30/30) can be obtained when the students show to possess all the requisites described above (***Dublino1-5***) at the maximal degree.
The *laudem* will be obtained by the students that are able to expose the topics with absolute precision, self-confidence and excellence. The agreement of the entire Examination Board is required as well.

All the scores obtained (in the oral exam and in the two previous parts of the exam) will be considered to formulate the final score.

9. program

General Pathology and Pathophysiology 1

Lectures:

-Introduction to the Course. The concept of health and disease, etiology, and pathogenesis.

-Etiology: classification and characteristics of the main etiological factors (physical, chemical and biological factors). Molecular basis of the genetic diseases.

-Cellular Pathology. Mechanisms of cellular adaptations, injury and death. Degenerative diseases: intracellular and extracellular accumulations: steatosis and amyloidosis. Biological bases of cellular aging.

-Inflammation: etiology and classification. Signs of inflammation: vascular and cellular reaction; chemical mediators of acute inflammation; Cellular migration and phagocytosis; Exudate: composition, functions and development. Chronic inflammation; Granulomatous inflammation; Systemic effects inflammation (fever, acute phase proteins, leukocytosis). Resolution of the inflammatory response; Tissue repair, wound healing, fibrosis.

-Immunology: mechanisms of innate and adaptive immunity cells and tissues of the immune system; the complement system; the major histocompatibility complex (MHC); antigens and antigen receptors; lymphocyte maturation, activation, and regulation; antibody production; mechanisms of costimulation; effector mechanisms of immune response; cytokine; immunologic memory; central and peripheral tolerance, vaccines

Practicals:

-Preparation of a peripheral blood smear, staining with May-Grunwald Giemsa and recognition of the different corpuscular elements at the microscope. Reading and interpretation of normal Complete Blood Count (CBC) tests.

-At the microscope: recognition of the basic morphological signs of acute and chronic inflammation in microscopic sections of diseased tissues.

General Pathology and Pathophysiology 2

Lectures:

Oncology: Pathological growth. Tumor Epidemiology Classification. Tumor classification: criteria; features of the neoplastic proliferation. Morphological features of tumors. Biological features of neoplastic cells. Carcinogenic agents. Hormones and Tumors. Carcinogenesis and its phases. Invasion and Metastasis. Oncogenes and Tumor suppressor genes. Systemic effects of cancer. Principles of cancer therapy.

-Immunopathology. Hypersensitivity and allergy. Immunodeficiencies; Autoimmunity and Autoimmune diseases. Transplants and rejection. Immunity and pregnancy. Tumor immunology. Tumors of the immune system.

-Pathophysiology: Alterations of the main homeostatic systems: adaptive response to stress; fluid, electrolyte and acid-base imbalances.

-Blood pathophysiology: hemopoiesis and hemocatheresis; anemia and erythrocytosis; disorders of granulocytes and monocytes; bleeding disorders.

-Cardiovascular pathophysiology; Hemorrhage, hyperemia; ischemia; thrombosis; embolism; infarction; arteriosclerosis and atherosclerosis; edema; hypertension; heart failure and shock.

-Respiratory pathophysiology: disturbances of ventilation (obstructive and restrictive), pulmonary circulation and gas exchange. Hypoxia and cyanosis.

-Renal pathophysiology: mechanisms of glomerular and tubular injury; nephritis and nephrosis; acute kidney injury and chronic kidney disease.

-Pathophysiology of Metabolism: Glycemic control and its altered regulation. Diabetes mellitus. Metabolic syndrome. Hereditary metabolic disorders.

-Liver pathophysiology: mechanisms of hepatic damage, fibrosis, and cirrhosis. Portal hypertension. Hepatic failure. Jaundice. Hepatitis.

-Endocrine Pathophysiology: pituitary, thyroid, and adrenal glands.

-Food and nutritional disorders. Smoke, alcohol, and related pathologies

-Epigenetics and Non-Communicable Diseases (NCDs)
-Methodology of scientific research: Methodology of bibliographic research. The main bibliographic databases (PubMed). Main bibliometric indexes (IF, H-index, rank). The scientific inquiry: from the bibliographic research to the hypothesis. Organization/structure of a scientific paper.

Practicals:
-Reading and interpretation of normal and pathologic Complete Blood Count (CBC) tests.
At the microscope: Recognition and analysis of the morphological features of benign and malignant tumors in microscopic tissue sections.