

## DEGREE IN MIDWIFERY

### **Integrated Teaching: GENERAL PATHOLOGY AND PHYSIOPATHOLOGY**

SSD: MED/07, MED/05, MED/04

Credits: 6

Responsible Professor: Daniele Armenia

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MODULE: Microbiology

SSD: MED/07

Number of credits: 1

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MODULE: General Pathology

SSD: MED/04

Number of credits: 3

Professor: Angela Nebbioso

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MODULE: Clinic Pathology

SSD: MED/05

Number of credits: 1

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### **PREREQUISITES**

In order to follow the course profitably it is expected that students have preliminary knowledge of the basic principles of biology, anatomy, biochemistry, physiology, histology, anatomy and physiology.

### **LEARNING OBJECTIVES**

Knowledge of the following objective will be essential: structure of different microorganisms, microbial pathogenicity, interactions between micro-organism and host, causes and mechanisms of onset of the main microbial aetiology diseases. In addition, knowledge of bacterial, viral, mycotic or protozoal infections of gynaecological and obstetric interest will be indispensable in order to identify potential clinical problems during professional activity.

Moreover, the course introduces to the understanding of the mechanisms and phenomena that underlie human pathologies, in particular the changes in the state of health, the main exogenous and endogenous causes of disease, the fundamental mechanisms of disease and the biological mechanisms of defence, reaction to damage, regeneration and repair, as well as knowledge of the main aspects of the pathophysiology of organs and systems with particular reference to particular biological needs during pregnancy.

The course's aim is to allow the students 1) to learn on aspects of cell pathology and of the alterations of the integrated functions of tissues, organs, and systems, which may turn useful in the technical setting, and 2) to provide the knowledge of the main biomarkers for the evaluation of physiology and pathological conditions of the human body.

### **LEARNING OUTCOMES**

The specific learning outcomes of the program are coherent with the general provisions of the Bologna Process and the specific provisions of EC Directive 2005/36/EC. They lie within the European Qualifications Framework (Dublin Descriptors) as follows.

At the end of this teaching, students will be able to:

### Knowledge and Understanding

- List the criteria of bacterial and virological classification
- Describe the architecture of the bacterial, fungal and protozoal cell and the structure of the viral particles
- Explain the metabolism and bacterial growth: the production of bacterial spores
- Describe the basics of bacterial and viral genetics: transformation, transduction, bacterial conjugation, viral genetic variability
- Describe the pathogenic action of bacteria and viruses: transmission routes and stages of the infectious process
- Explain the process of toxin production and explain the mechanisms of action of exotoxins and endotoxins
- Describe the general characteristics of viral polymerases e viral genetic variability
- Explain the basics about innate immunity and cell-mediated immunity
- Describe the characteristics of immune sera and vaccines
- Explain the general principles for the diagnosis of diseases caused by pathogenic microorganisms
- Describe the main congenital and sexually transmitted infections caused by viruses, bacteria, fungi, and protozoa
- Describe the basics of microbiological pharmacology: notes on anti-bacterial and antiviral drugs and resistance mechanisms
- Describe the exogenous and endogenous causes of diseases
- Explain the mechanisms of disease, biological defence, reaction to cell and tissue damage, tissue responses, regeneration, and repair, together with their principal alteration
- Describe the state of disease resulting from the interaction of the causes with the body's regulatory mechanisms

### Applying Knowledge and Understanding

- apply the principles of midwifery to selected cases, problems, and a variable range of situations
- use the tools, methodologies language and conventions of midwifery to test and communicate ideas and explanations

### Communication Skills

- present the topics orally in an organized and consistent manner
- use a proper scientific language coherent with the topic of discussion

### Making Judgements

- recognize the importance of an in-depth knowledge of the topics consistent with a proper education
- identify the importance of a proper theoretical knowledge of the topic in the clinical practice

## **COURSE SYLLABUS**

### ARMENIA

Characteristics of the main infection agents. Vital associations: commensalism, mutualism, parasitism. Associated microbial flora. Generalities on infection diseases: infectious ratio, infection and disease, endogenous infection, exogenous infections, opportunistic infections.

IMMUNOLOGY - Concept of innate immunity and acquired immunity. Role of the immune response in different infections. Survival of infection agents to immunity mechanisms. Principles of microbiological diagnostics.

BACTERIOLOGY - The bacterial cell: structure and essential functions. Gram negative and Gram positive. The bacterial spore. Cultivation of bacteria: growth and development of bacterial populations. Elements of bacterial genetics: mutations and mechanisms of genetic recombination. Principles of pathogenicity and virulence. Bacterial toxins: exotoxins and endotoxins. Mode of action of the main antibacterial drugs. Resistance to chemotherapy and antibiotics. Main bacteria responsible for human infection diseases, with particular reference to diseases of obstetrical-

gynaecological and maternal-foetal district (gonorrhoea, syphilis, group B streptococci infection).  
VIROLOGY -Nature, methods of study and classification of viruses. Composition and architecture of the viral particle. Cultivation of viruses. Virus-cell relationship: productive infection, transforming infection. Virus-to-host relationships: acute, persistent, latent, slow infections. Pathogenic mechanisms in viral infections. Vaccines and basis of antiviral chemotherapy. Infections with the main sexually transmitted and vertically transmitted viruses: hepatitis B virus (HBV), hepatitis C virus (HCV), human immunodeficiency virus (HIV), human papilloma virus (HPV), herpes simplex virus (cytomegalovirus, herpes simplex virus type 1 and type 2), rubella virus and Parvovirus B19.  
MYCOLOGY -Habitat and morphology of fungi (yeasts, mycelial fungi). Fungal cell structure. Infections of the urogenital district by species of the genus Candida.  
PARASITOLOGY - The protozoa cell: morphology and structure. Main characteristics of Helminths and Arthropods. Protozoa of gynaecological interest: Toxoplasma gondii; Trichomonas vaginalis.

### NEBBIOSO

Introduction to the study of General Pathology

Definition of the state of health. The concept of homeostasis.

Definition of disease Aspects of the morbid process: etiology and pathogenesis, clinical manifestations, diagnosis, prognosis.

Cellular pathology: cell damage and death

Mechanism of cellular damage: free radical damage, hypoxia damage. Altered intracellular calcium homeostasis.

Reversible cell damage. Irreversible cell damage.

Cell adaptations: atrophy, hypertrophy, hyperplasia, metaplasia, dysplasia. Degeneration. Cellular aging.

Cell death: necrosis and apoptosis

Inflammation

Definition and general characteristics. Acute inflammation or angiophlogosis. The vasculoemetic phenomena of inflammation: hemodynamic modifications and exudate formation. Inflammatory mediators of tissue and plasma origin. Cellular response in inflammation: inflammation cells, chemotaxis and phagocytosis; histolesivity of inflammatory cell products. Outcomes of inflammation: chronicization, healing, abscess, fibrosis. Chronic inflammaton or histophlogosis. Causes of chronic inflammation. Chronic inflammation cells and mediators. Types of chronic inflammation.

### D'ORAZI

1) Body defenses against pathogens. The first (mechanical/physical barriers), second (innate immunity) and third line (specific immunity, cellular and antibodies) of defence. T and B lymphocytes; antigens and antibodies. The immunodeficiency. The autoimmune diseases. The allergies. Coombs test and RH group. Erythroblastosis fetalis.

2) Molecular mechanisms of tumoral transformation: oncogenes and tumor suppressor genes. The causes of cancer including chemicals and biological carcinogenesis; the phenotype of the transformed cell; tumor classification; epidemiology and prevention; the molecular mechanisms of tumor progression and metastatization. The relationship between cancer cells and tumor microenvironment. Inflammation and cancer. Nutrition and cancer.

3) Pathology of haemostasis and coagulation. The platelet, hemocoagulative and fibrinolytic phases. The main disorders of haemostasis and coagulation. The main defects of the plasma and fibrinolytic (hemophilia) phases.

Molecular mechanisms of atherosclerosis, formation of atheromatous plaque and related consequences; thrombosis; embolism; infarction; hypoxia and cyanosis; oedema. Mechanism of diabetes, classification, and consequences.

### CARDILLO

The concept of disease: the disease as an alteration of the normal state; the disease as a modification of the organism's homeostasis; illness as a loss of health. Morbid state. Syndrome. Etiology: the concept of "cause" in pathology. Pathogenesis.

General etiology. Chemical causes (environmental pollutants). Physical causes (high and low temperatures, variations in atmospheric pressure). Feeding as a cause of illness.

The cellular response to damage. Reversibility and irreversibility of cellular lesions. Cellular adaptation processes to injury (atrophy, hypertrophy, hyperplasia, metaplasia, dysplasia) and hypoxia.

Cell death. Necrosis, apoptosis, and other types of cell death: morphological aspects, molecular mechanisms. Evaluation of cellular damage with serum-enzymatic techniques.

Inflammation and repair of injuries. Innate immunity and acute inflammatory reaction: tissue, vascular, cellular and molecular aspects, systemic manifestations (leukocytosis, acute phase response, fever). Chronic inflammation: role of macrophages and lymphocytes, polarized responses of type 1 and 2, granulomas. The healing of tissue lesions: tissue, cellular and molecular aspects. Fibrogenesis, fibrosis and pathological aspects of tissue repair.

General Oncology. The concept of neoplasia. Histogenetic and clinical classification criteria of benignity and malignancy. Tumor atypia. Cancer markers. Natural history of the tumor: dormant state, angiogenesis, infiltrative growth, metastasis. Metastatic pathways, metastasis organotropism. Chemical cause of tumors, experimental carcinogenesis, multi-phase carcinogenesis, concept of tumor progression. Physical cause of tumors: ionizing and exciting radiation, oncogenic DNA and RNA viruses. Cellular proto-oncogenes, tumor suppressor genes. Regulation of normal and neoplastic proliferation. Gene that controls progression in the cell cycle and senescence. Genomic instability. Neoplastic cachexia. Epigenetic mechanisms altered in tumors. TNM classification.

### ROMEO

How to use biomarkers; biomarkers in clinical practice.

#### HEMATOLOGY AND HEMOSTASIS IN PREGNANCY

Composition and functions of blood. Blood count and leukocyte formula. Red blood cells: physiology and pathology (anaemia, hemoglobinopathies); Platelets and leukocytes; Evaluation parameters of iron metabolism, ferritin, transferrin. Iron deficiency, vit B12 deficiency and folate deficiency. Blood groups, maternal-foetal incompatibility.

Haemostasis in pregnancy; evaluation of platelet function and of the fibrinolytic system; laboratory investigations for the definition of hypercoagulability states; diagnostic tests for poliabortivity.

FUNDAMENTALS OF IMMUNOLOGY: general characteristics of the immune system (components, functions, alterations); Immunity and inflammation.

#### KIDNEY FUNCTION:

Markers of kidney function: creatinine, creatinine clearance, azotaemia, uric acid, electrolytes, complete urine test (chemical-physical and morphological). Laboratory tests for the diagnosis of eclampsia.

#### LIVER FUNCTION

Transaminases, bilirubin, and others, LDH; laboratory tests for the diagnosis of intrahepatic cholestasis in pregnancy.

#### GLUCOSE AND LIPID METABOLISM

Indicators of glucose metabolism: glucose, glucose tolerance curves; laboratory tests for the diagnosis of gestational diabetes. Cholesterol, HDL triglycerides, LDL, apolipoproteins.

## **COURSE STRUCTURE**

The course consists of 84 hours of classroom teaching, composed of frontal lessons and interactive learning activities, especially using presentations of clinical cases.

## **COURSE GRADE DETERMINATION**

ARMENIA (written + oral exam)

Students' preparation shall be assessed by a written examination, followed by an oral test. The written exam shall be constituted by multiple-choice questions. Each correct answer shall receive one point. The final result of the written exam shall be given by the sum of the assigned partial point totals from correct answers. To have access to the oral test students must obtain a minimum of 18 points in the written exam.

ARMENIA, NEBBIOSO, D'ORAZI, CARDILLO, ROMEO (oral exam)

The final evaluation of the integrated course will be oral. The evaluation criteria for the oral exam will be acquired knowledge (range score: 0-8), making judgements (range score: 0-8), communication skills (range score: 0-7), learning skills (0-7). The students must be able to demonstrate their knowledge on the contents, to organize in a critical way the topics established by the program, using an appropriate language.

## **OPTIONAL ACTIVITIES**

Students can request optional workshops to deepen some specific topics.

## **READING MATERIALS**

Le basi della Microbiologia. Autori: Richard A. Harvey, Pamela C. Champe Bruce D. Fisher

Patologia e Fisiopatologia Generale per corsi di laurea triennale G.M.Pontieri PICCIN;

Patologia Generale e fisiopatologia, Celotti, Edises

M. Parola. Patologia Generale ed Elementi di Fisiopatologia. Ed. EdiSES;

S.R. Lakhani, S.A. Dilly, C.J. Finlayson, M.Gandhi, L. Calorini, Ma. Del Rosso. Le basi della Patologia Generale. CEA – Cara Editrice Ambrosiana. Zanichelli.

Kumar, Abbas e Aster - Robbins and Cotran – LE BASI PATOLOGICHE DELLE MALATTIE Elsevier.

G. Federici- Medicina di laboratorio – Mc Grow Hill 2014, IV edizione

G.M. Pontieri - Elementi di Patologia e Fisiopatologia Generale - Per i corsi di Laurea in Professioni Sanitarie -Edizioni Piccin (4a Edizione, 2018).

Gronowski, Ann M. (Ed.): Handbook of Clinical Laboratory Testing During Pregnancy (testo in lingua inglese)

Joyce Le Fever Kee. Laboratory and Diagnostic Tests with Nursing implications. (10 th Edition). PEARSON Editor

Didactic and integrative material provided by the lecturer