



## SYSTEM DISEASES 2 - AA 2022-2023

### SYLLABUS

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*Legend:* H= Hematology, P= Pneumology, I= Imaging, PA= Pathology, PH = Pharmacology

#### HEMATOLOGY COURSE

##### OVERVIEW

This course is designed to guide medical students across the essential features of clinical and laboratory hematology and to achieve an understanding on the current knowledge of the blood disease processes in terms of pathophysiology and the underlying genetic and molecular abnormalities. Including also quick reminders of the basic sciences, this course will mainly focus on practical aspects and clinical cases, in particular with regard to diagnostic aspects, with the goal of facilitating the learning process and the retention of fundamental information in the field of hematology. Routine and specialized hematology tests will be discussed, with an emphasis on performing and interpreting test results. Theory will be applied for the evaluation, classification, diagnosis and monitoring of blood diseases.

The course will start introducing the general principles of hematologic evaluation, specimen collection, and basic laboratory procedures, together with the origin and development of blood cell. The following lectures will first deal with the various disorders of erythrocyte production, function, and destruction. Nutritional anemia, membrane disorders, enzyme deficiencies, hemoglobinopathies and other disorders will be discussed, including laboratory detection methods, analyses, and diagnoses. A comprehensive look at lymphadenopathy, lymphoproliferative disorders and gammopathies will then be addressed, encompassing etiology, laboratory evaluation, diagnostic algorithms and clinical characteristics. Specific lectures will integrate the knowledge of lymphoproliferative disorders with basic concepts of pharmacology, pathology, advanced imaging techniques and radiotherapy. Coagulation disorders, including bleeding and thrombosis, will be also directed in the first half of the course. Thereafter, a comprehensive evaluation of acute and chronic leukemias (including myeloproliferative disorders, myelodysplastic syndromes, acute myeloid leukemia and acute lymphoblastic leukemias will be addressed. Clinical indications and complications associated to hematopoietic stem cell transplantation will be also discussed

### Learning Objectives – Clinical Hematology

#### Approach to the patient with anemia

- Illustrate hematopoiesis and the physiologic basis of red cell production
- Illustrate the definition of anemia and indicate the most frequent causes (anemia classification)
- Describe routine laboratory tests in anemia diagnosis/classification
- Describe clinical presentation (signs and symptoms) and clinical consequences of anemia
- Describe General principles in the treatment of anemia

#### Approach to the patient with a bleeding/thrombotic disorder

- Illustrate the pathophysiology of hemostasis (primary and secondary hemostasis)
- Clinical evaluation of patients with bleeding: patient history, clinical examination, laboratory tests
- Indicate the main causes of primary hemostatic (platelet) disorders and secondary hemostatic (coagulation) disorders and illustrate the differences in the clinical manifestations and laboratory tests of disorders of primary and secondary hemostasis
- Describe general principles in the treatment of bleeding disorders
- Clinical evaluation of patients with thrombosis: patient history, clinical examination, laboratory tests
- Indicate the most relevant inherited and acquired thrombotic disorders
- Describe general principles in the treatment of thrombosis

#### Approach to the patient with “cytosis” (leucocytosis, erythrocytosis, thrombocytosis)

- Indicate the main causes of absolute erythrocytosis, leucocytosis and thrombocytosis
- Suggest a diagnostic pathway for patients with “cytosis”

#### Approach to the patient with myeloid malignancies (Bone Marrow Failures, Leukemia, Myelodysplastic syndromes, Myeloproliferative neoplasms, Therapy-related myeloid neoplasms):

- Clinical evaluation of Bone Marrow Failures, Leukemias, Myelodysplastic syndromes, Myeloproliferative neoplasms, Therapy-related myeloid neoplasms
- Clinical evaluation of inherited predisposition to hematological malignancies
- Indicate the general criteria on which the classifications of myeloid malignancies are based.
- Describe the different morphologic and clinical features of myeloid malignancies
- Describe the onset framework of myeloid malignancies (considering the medical history, physical examination and alterations in blood tests).
- Suggest a diagnostic pathway to reach the stage of clinical action.
- Illustrate the natural history and indicate the main therapeutic options.
- Indicate the most relevant inherited disorders associated with increased risk of developing myeloid malignancies

#### Approach to the patient with lymphadenopathy

- Illustrate the structure and function of a lymph node.
- Illustrate the definition of lymphadenopathy and indicate the most frequent causes.
- Describe the clinical meaning of the objective features of a lymphadenopathy.
- Indicate the features of a lymphadenopathy requiring attention.



- Indicate the most frequent or serious causes of localized and generalized lymphadenopathy (Consider: lymphoma, acute leukemia, other malignancies, infections [bacterial, protozoal, viral], inflammatory causes, and AIDS)
- Discuss the indications and limits of biopsy and fine-needle aspiration in the approach to the swollen lymph node.
- Suggest a diagnostic pathway for lymphadenopathy.

#### Approach to the patient with lymphocytosis

- Illustrate the definition of lymphocytosis and indicate the most frequent causes.
- Describe the clinical meaning of a lymphocytosis.
- Indicate the most frequent or serious causes of lymphocytosis.
- Suggest a diagnostic pathway for lymphocytosis.

#### Approach to the patient with splenomegaly

- List the most frequent causes of splenomegaly.
- Illustrate the classification of splenomegaly with special reference to etiopathogenetic conditions.
- Indicate the repercussions on the CBC profile of hypersplenism.
- Describe the repercussions on the CBC profile of splenectomy.

#### Chronic Lymphocytic Leukemia

- Definition and biology of CLL.
- Describe the different morphological and clinical features of CLL.
- Describe the onset framework of CLL (considering the medical history, physical examination and alterations in blood tests).
- Suggest a diagnostic pathway to reach the stage of clinical action.
- Illustrate the natural history and indicate the main therapeutic options.

#### Plasma Cell Disorders 1

- Describe epidemiology, risk factors, and molecular pathophysiology of plasma cell disorders.
- Describe the morphological and clinical features (signs and symptoms, laboratory findings, radiological findings) of plasma cell disorders

#### Plasma Cell Disorders 2

- Describe the diagnosis of plasma cell disorders [monoclonal gammopathy of undetermined significance (MGUS), smouldering multiple myeloma, multiple myeloma, solitary plasmacytoma, plasma cell leukemia]
- Discuss the risk stratification of plasma cell disorders, including staging systems, genetic-based prognosis, and risk-adapted therapy.
- Illustrate the natural history and indicate the main therapeutic options.

#### Plasma Cell Disorders 3

- Discuss the risk stratification of plasma cell disorders, including staging systems, genetic-based prognosis, and risk-adapted therapy.
- Illustrate the natural history and indicate the main therapeutic options.

#### Hodgkin Lymphoma

- Describe the different morphologic and clinical features of HL.
- Describe the onset framework of HL (considering the medical history, physical examination and alterations in blood tests).
- Suggest a diagnostic pathway to reach the stage of clinical action.
- Illustrate the natural history and indicate the main therapeutic options, including chemotherapy, radiotherapy, targeted agents and immunotherapy.

#### Non-Hodgkin Lymphoma 1

- Describe the epidemiology, risk factors and the classification of non-Hodgkin lymphoma.
- Molecular pathophysiology of non-Hodgkin lymphoma.

#### Non-Hodgkin Lymphoma 2

- Describe the clinical features (signs and symptoms, laboratory findings, radiological findings) of non-Hodgkin lymphoma.
- Describe the diagnosis and staging of non-Hodgkin lymphoma.

#### Non-Hodgkin Lymphoma 3

- Suggest a diagnostic pathway to reach the stage of clinical action.
- Illustrate the natural history and indicate the main therapeutic options, including chemotherapy, radiotherapy, targeted agents and immunotherapy.

#### Immunotherapy for Lymphoid Malignancies

- Illustrate cell-based immunotherapy (CAR-T cells; stem cell transplantation)
- Illustrate antibody-based immunotherapy (Bi-specific T-cell engagers)

### **Learning Objectives – Imaging**

#### Imaging in lymphoproliferative disorders: staging and evaluation of response

- Illustrate the use of integrated imaging in lymphoma, and the use of CT and FDG PET in the staging and therapy response assessment

#### Radiation hematology

The Radiation Oncology program offers an insight on the basis of radiotherapy treatment and an overview of the different techniques characterizing modern radiotherapy. Students will be guided in the exploration of the workflow of radiation treatment: from the 1st consultation, to the indication, simulation CT scan and treatment delivery. Acute and late side effects and management of the most common complications will be addressed.

Main clinical indications for radiotherapy in hematological malignancies will be illustrated, including Hodgkin and non-Hodgkin lymphoma, multiple myeloma and plasmacytoma.

- Describe the principles of integration of radiotherapy and systemic therapy
- Describe the principles of radiotherapy for Hodgkin lymphoma, non-Hodgkin lymphoma, multiple myeloma and plasmacytoma

### **Learning Objectives – Pathology**

- Distinguish between lymphoma and leukemia.
- Illustrate how and why the classification of malignant lymphomas has evolved over time with emphasis on the Kiel, REAL and WHO classification.
- Compare and contrast the main morphological and clinical features of Hodgkin e non Hodgkin lymphomas.
- Become familiar with the most commonly encountered forms of lymphoid neoplasia and relative immunomarkers and genetic diagnostic abnormalities.
- Illustrate the indications and limitations of FNAB for the diagnosis of malignant and not malignant lymphadenopathy.
- Illustrate the most common not malignant lymphadenopathies which have to be distinguished from malignant lymphomas; illustrate the pathological basis of nodal tuberculosis, sarcoidosis, cat scratch disease, infectious mononucleosis, HIV infection

### **Learning Objectives – Pharmacology**

- Describe the general aspects of chemotherapy
- Illustrate pharmacological targets, dose considerations, combinations, resistance, side effects
- Describe main classes of chemotherapeutic drugs
- Discuss the classification and mechanism of action of the different classes of chemotherapeutic drugs
- Describe other anti-cancer drugs
- Illustrate general principles and examples of biological therapies, immunotherapy, hormonal therapy and targeted therapy

### Suggested websites

<http://www.hematology.org/>

<http://www.leukemia-net.org/content/diagnostics/diagnostics/morphology/>

<http://www.esh.org/>

<http://imagebank.hematology.org/>

<http://teachingcases.hematology.org/>

<http://www.hematologylibrary.org/site/webfocus/content/index-toc.xhtml>

## **OVERVIEW**

The lungs and the respiratory system are actually far more complex than many other organs and apparatus. The lungs must play multiple roles, gases exchanges, oxygen supplementation, removing of wastes, toxins, and defense against hostile intruders. Nowadays epidemiological data shows that the respiratory diseases are becoming more and more important in terms of morbidity, invalidity and mortality. Lung diseases are not only a killer but an impressive number of patients are now living worldwide with a chronic pulmonary disease with a terrific impact on hospitalization and general economic impact. Based on these data, the present course tries to focus on the most important aspects of respiratory medicine examining prevalence, risk factors, physiopathological and clinical features of the most important chapters of lung diseases. For more complex diseases or clinical presentations, an integrated approach with other specialists (i.e.: radiologists, pathologists, pharmacologists, ENT...) will be used in order to describe in an accurate way the complexity and the heterogeneity of them.

## **Learning Objectives – Respiratory Diseases**

### Chronic Obstructive Pulmonary Disease (COPD).

- Describe the current definition of the disease
- Describe the epidemiology, pathophysiology, diagnosis, symptoms, and prognosis of the disease
- Define exacerbation COPD
- Define Treatment Strategies according Guidelines

### Asthma

- Describe the epidemiology, pathophysiology, diagnosis, symptoms, and prognosis of the disease
- Describe the asthma allergic pathway
- Describe the features of asthma exacerbation
- Asthma as an example of Personalized Medicine and Precision Medicine
- New Biologic Treatments
- Describe the relationship between asthma and rhinitis

### Respiratory Allergies

- Describe immune Response in Allergy
- Describe allergy Onset and Allergy March
- Describe allergic Rhinitis & Chronic Rhinosinusitis as Asthma Comorbidities
- Describe nasal Polyposis as Asthma Comorbidities

### AIT-Allergen Immunotherapy

- Definition & Rationale
- Allergen Extracts and Routes of administration
- Molecular Allergen Diagnosis
- AIT Efficacy and current indications

### Pulmonary Function Tests basis & interpretation

- Definition & Rationale of basic tests
- Interpretation of spirometry
- FeNO-Nitric Oxide Exhaled Measure
- DLCO
- Bronchial Hyperresponsiveness

### Anaphylaxis & Drug Allergy

- Definition & Basic Mechanisms
- Causes and Risks
- Prevention
- Treatment Principles

### Interstitial lung diseases

- Clinical overview and general approach (classification)
- Describe Idiopathic Pulmonary Fibrosis (epidemiology, pathophysiology, diagnosis, symptoms, and prognosis)
- Describe Sarcoidosis (epidemiology, pathophysiology, diagnosis, symptoms, and prognosis)
- Describe Pneumoconiosis and hypersensitivity pneumonia (epidemiology, pathophysiology, diagnosis, symptoms, and prognosis)
- Describe peculiar radiological findings in interstitial lung diseases and differential diagnosis
- Describe peculiar pathological findings in interstitial lung diseases
- Pharmacologic approach to interstitial lung diseases

### Pneumonia

- Describe Community-Acquired Pneumonia (epidemiology, pathophysiology, diagnosis, symptoms, and prognosis)
- Describe Hospital-Acquired Pneumonia (epidemiology, pathophysiology, diagnosis, symptoms, and prognosis)
- Health Care Acquired Pneumonia
- Pneumonia in ICU patients

### OSAS and Sleep disorders

- Describe the changes in Cardiorespiratory System during sleep
- Describe Obstructive Sleep Apnea Syndrome (epidemiology, pathophysiology, diagnosis, symptoms, and prognosis)
- Introduction to Continuous Positive Airway Pressure (CPAP) for OSAS treatment

### Primary tumor of the Lung & Pleura

- Discuss Epidemiology and risk factors
- Present Prevention
- Define Signs and symptoms
- Discuss Diagnosis
- Discuss Staging and prognosis
- Present Treatment

### Pleura effusion and pneumothorax

- Describe the pathophysiology of pleural effusions



- Describe Transudative Pleural Effusion (epidemiology, symptoms, diagnosis, and prognosis)
- Describe Exudative Pleural Effusion (epidemiology, symptoms, diagnosis, and prognosis)
- Introduction to the management of pleural effusions
- Describe the pathophysiology of Pneumothorax
- Describe the classification of Pneumothorax (epidemiology, symptoms, diagnosis, and prognosis)
- Introduction to Pneumothorax treatment

#### ARDS & Respiratory failure

- Describe the pathophysiology concepts of respiratory failure
- Type 1 respiratory failure (classification, diagnosis, symptoms)
- Type 2 respiratory failure (classification, diagnosis, symptoms)
- Introduction to noninvasive mechanical ventilation

#### Tuberculosis

- Describe the Microbiology and Immunology of Mycobacteria
- Describe Tuberculosis (epidemiology, pathophysiology, diagnosis, symptoms, and prognosis)
- Describe the current approach for latent tuberculosis infection
- Describe the classes of pattern recognition receptors involved in the recognition of mycobacterium tuberculosis (MTB)
- Describe the cellular and humoral immune mechanisms involved in the control of MTB infection
- Describe the molecular pathways involved in initiation of appropriate adaptive response against MTB
- Discuss the role of these pathways and other host factors in the clinical outcome of MTB infection
- Discuss the potential host biomarkers of MTB exposure and MTB infection

#### Cystic Fibrosis-Bronchiectasis

- Describe the pathophysiology of bronchiectasis
- Classification and morphological features of bronchiectasis
- Pathogenesis of cystic fibrosis
- Clinical manifestations of cystic fibrosis
- Peculiar radiological features of bronchiectasis and cystic fibrosis
- Pathological findings in bronchiectasis and cystic fibrosis
- Principles of current & Future Treatments of bronchiectasis (including thoracic physiotherapy) and cystic fibrosis

#### Pulmonary Thromboembolic Disease

- Definition and Classification
- Describe the pathophysiology
- Clinical features
- Principles of current & Future Treatments

#### Eosinophilic Pulmonary Diseases

- Describe the pathophysiology
- Classification and morphological features
- Principles of current & Future Treatments



### Cough

- Describe the pathophysiology of cough reflex
- Describe the clinical features of cough
- Main causes and differential diagnosis of cough
- Lower/upper airway disorders inducing cough
- Psychological disorders associated with cough
- Radiological findings in diseases characterized with cough
- Principles of current & Future Treatments

### Non pharmacological approach to lung and airway diseases

- Describe the psychological profiles of patients and their attitude the lung and airway diseases
- Treatment adherence to inhaled treatment
- Quality of life in respiratory diseases
- Pulmonary rehabilitation
- Thoracic physiotherapy

### Hot Topics in Pulmonary Disease

- COVID-19 interstitial pneumonia
- Prevention strategies for SARS-CoV-2 infection
- SARS-CoV-2 and other respiratory diseases
- Novel treatments for COVID-19

### Learning Objectives – Imaging

The topics of the learning objectives will be addressed in specific lectures dedicated to imaging or in multidisciplinary lessons.

#### Interstitial lung diseases

- To be confident with the anatomy of the secondary pulmonary lobule;
- To describe the typical radiological patterns recognized in interstitial lung diseases using the appropriate terminology.

#### Emphysema, cystic fibrosis and bronchiectasis

- To become confident with the radiological appearance of emphysema on X-ray and CT;
- To describe the typical radiological appearance of bronchiectasis;
- To illustrate the role of the different imaging modalities in the evaluation of patients with cystic fibrosis.

#### Pulmonary thrombo-embolism

- To review the diagnostic work-up for patients with suspected pulmonary embolism;
- To learn the basic principles and the clinical use of ventilation/perfusion imaging in thrombo-embolism;
- To illustrate the interventional radiology techniques currently employed to treat pulmonary embolism.



### Lung cancer

- To illustrate the use of integrated imaging, like CT and FDG PET, in diagnosis and staging of lung cancer;
- To describe the use of CT and FDG PET in the staging and therapy response assessment of lung cancer should also be known;
- To be familiar with the basic principles of radiation oncology in lung cancer.

The topics listed below will not be covered through lectures and are left to student self-studying. Dedicated readings will be suggested at the end of each lecture.

- Students should be able to analyze a normal chest X-ray and to recognize the main radiologic findings associated to pleuro-pulmonary and mediastinal disorders (in particular consider: broncho-pneumonia, pneumothorax, pleural effusion, acute pulmonary edema and lung cancer).
- Students are required to systematically analyze a CT of the chest and recognize the main anatomical structures.
- Students should be able to illustrate the main imaging modalities and their indications in the evaluation of lung and mediastinal diseases.

### **Learning Objectives – Pathology**

#### Inflammatory and interstitial lung diseases

- Illustrate the pathological basis of the main inflammatory and interstitial lung diseases with particular emphasis on obstructive pulmonary diseases, chronic diffuse interstitial diseases and pulmonary infection (lobar and bronchopneumonia) and related local, cardiac and systemic complications.
- Illustrate the pathological basis of pulmonary embolism.
- Illustrate the pathological basis of diffuse alveolar damage.

#### Lung and pleural tumors

- Illustrate the pathogenetic features of pleuro-pulmonary tumor development and the main etiological agents.
- Illustrate how pulmonary tumors arise through a series of morpho-phenotypic and molecular events, and how some of them may be of diagnostic, prognostic or predictive importance.
- Illustrate the main histological and cytopathological approaches to the diagnosis of pleuro-pulmonary tumors.
- Illustrate the main histotypes of pulmonary tumors with regard to epidemiology, gross and microscopical features and behavior with emphasis on the concepts of grading and staging.
- Illustrate which are the main information which have to be reported in a pathological diagnosis of pleuro-pulmonary tumors

### **Learning Objectives – Pharmacology**

#### Drugs used to treat Asthma and COPD

- Describe quick-relief medications and long-term asthma control medications
- Describe bronchodilators, leukotriene inhibitors and antagonists, mast-cells stabilizers



Drugs used to treat Cystic Fibrosis

- Antibiotics, Mucolytics, Anti-inflammatory agents, Agents used for molecular treatment:  
Potentiators and Correctors

Anti-tussive agents



**Subjects: Hematology (written exam), Pneumology (written and oral exam), Pathology (written exam), Pharmacology (written exam) and Imaging (written exam)**

**Written Exam:** the written exam is based on a MCQ test divided into 3 blocks of 10 questions for each of the following subjects: Pathology, Pharmacology and Imaging, and 2 blocks of 20 questions for each of the following subjects: Hematology and Pneumology.

To pass the written exam, students must answer at least 60% of all questions, without scoring less than 50% in each specific subject.

Scores of the written exam will be based on the number of questions answered correctly as indicated in the table below:

<b>% of correct answers</b>	<b>Mark</b>
>80%	28/30
75-80%	27/30
70-74%	25/30
65-69%	23/30
61-64%	21/30
60%	18/30
<60%	Fail

**Oral Exam (Pneumology only):** all students must take an oral examination. The oral exam is a discussion of one or two key topics in Pneumology related to the Priority Presenting problems Portfolio (PPP Portfolio) as well as the topics explained during the lessons. The student will also be asked to contextualize these topics in a clinical case. The final evaluation of written and oral examinations must be comprised between 21/30 and 28/30

The final score obtained during the exam (calculated from the average mark of Hematology and Pneumology) will be modified by the evaluation of the OSCE and the Portfolio with the following criteria: Portfolio (+ 2, -2); OSCE (+ 1, -1).