

# BLOOD DISEASES

Total credits <b>4.5</b>	Theory credits <b>2.5</b>	Practical credits <b>2</b>
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## GENERAL OBJECTIVES

During the course students must acquire the theoretical knowledge and clinical skills needed to identify the main problems associated with diseases of the haematopoietic system. They must also be able to reach a diagnosis through the logical application of current diagnostic methods and understand the basis of treatment for the main blood diseases, as well as the side effects they may produce.

## SPECIFIC OBJECTIVES

A. At the end of the course students must be able to identify the main problems associated with diseases of the haematopoietic system, specifically:

1. Anomalies revealed by blood tests
2. Anaemia
3. Other red series changes
4. Leukocyte changes
5. Platelet changes
6. Pancytopenia
7. Adenopathy
8. Haemorrhage
9. Thrombotic states

B. Students must understand the theoretical bases of the diagnostic methods used with diseases of the haematopoietic system, specifically:

1. Obtaining and processing of peripheral blood samples
2. Automated hematimetric methods
3. Obtaining and processing bone marrow samples (aspirated and biopsy)
4. Obtaining and processing ganglion biopsies
5. Cytofluorimetry
6. Immunocytohistochemistry
7. Study of coagulation factors
8. Cytogenetics
9. Molecular biology
10. Nuclear medicine
11. Conventional radiology and the use of new imaging techniques (CAT, NMR).

C. Students must understand the theoretical bases of the different therapeutic procedures used with diseases of the haematopoietic system, specifically:

1. Haematopoietic colony growth factors
2. Cytostatics
3. Biological response modifiers
4. Differentiation inducers

5. Radiotherapy
6. Haematopoietic progenitor transplant
7. Gene therapy
8. Hemotherapeutic support
9. Anticoagulant and fibrinolytic treatment

D. Students must acquire the following skills:

- Take a correct history that includes questioning and interpretation of the symptoms related to the main problems associated with blood disorders and diseases of the haematopoietic system.
- Interpret normal and pathological parameters revealed by the main haematological laboratory tests.
- Carry out a careful physical examination of peripheral ganglion regions and the spleen.
- Identify and interpret changes in ganglions, the spleen and the liver that are related to haematological diseases using the information gained from different diagnostic imaging techniques, such as conventional x-ray, CAT and NMR.

## SYLLABUS

### 1. Introduction to haematology

Haematology as part of internal medicine. Recognize that haematological changes often reflect an alterations in another organ or system. Basis of diagnosis in the patient with blood disease. Main haematological tests. Systematic examination of the patient with probable blood disease. The simplest haematological tests and their utility in diagnosing diseases of the haematopoietic system.

### 2. Blood: components and functions

Erythrocytes, leukocytes and platelets: main morphological and functional characteristics. Plasma components: plasma proteins. Normal counts and values. Interpreting variations. Interpreting electrophoresis of plasma proteins.

### 3. Haematopoiesis

Stages of haematopoiesis. Germinal cell compartments. Haematopoietic organs: structure and function. Growth factors. Embryo and adult haematopoiesis. Concept of stem cell and differentiation of blood cells. Erythropoiesis. Granulopoiesis. Thrombocytopoiesis. Lymphopoiesis. Bases of the action of haematopoietic growth factors. Function of bone marrow.

### 4. Iron metabolism disorders

Bases of iron metabolism. Haemochromatosis. Haemosiderosis. Genetic bases of haemochromatosis. Basic causes of haemosiderosis and its clinical repercussions. Prevention and treatment of these diseases.

### 5. Anaemia

General aspects. Concept and classification. General clinical features of anaemia. General assessment of the anaemic patient. Understanding that anaemia itself is a sign of a disease that needs to be diagnosed. Criteria for diagnosing anaemia. Reaching a diagnosis of anaemia through clinical interview, reticulocyte count, MCV, MCH and MHCC. Importance of aetiological treatment.

### 6. Hypochromic anaemia

Iron deficiency anaemia: aetiology, diagnosis and treatment. Sideroblastic anaemia: diagnosis and treatment. Thorough understanding of iron deficiency anaemia as one of the most common medical problems. Most frequent causes. Sideraemia values, transferring saturation index and ferritinaemia in diagnosis. Differential diagnosis between iron deficiency anaemia and anaemia due to chronic disease.

### 7. Macrocytic anaemia (I)

Classification. Pernicious anaemia. Other forms of megaloblastic anaemia due to vitamin B<sub>12</sub> deficiency. Megaloblastic anaemia due to folate deficiency. Other forms of macrocytic anaemia. General approach to the diagnosis of macrocytic anaemia. Forms of presentation of pernicious anaemia. Treatment. Complications.

## 8. Macrocytic anaemia (II)

Megaloblastic anaemia due to folate deficiency. Other forms of macrocytic anaemia. Most frequent causes of folic deficiency. Prevention. Treatment. Diseases that may be accompanied by non-megaloblastic macrocytic anaemia.

## 9. Chronic disease anaemia

Concept, aetiopathogeny, diagnosis and treatment. Distinction between chronic disease anaemia due to blockade of iron deposit and iron deficiency anaemia. Main diseases that may give rise to these types of anaemia. Bases of treatment: role of transfusions, prevention of transfusion haemosiderosis, role of new therapeutic agents such as erythropoietin.

## 10. Haemolytic anaemia (I)

General study of the haemolytic syndrome. Classification. Corpuscular haemolytic anaemia: hereditary spherocytosis, elliptocytosis and related disorders, erythroenzymopathy (G-6-PD deficiency and others). Clinical and analytic data that suggest a suspected haemolytic anaemia. Most common forms of haemolytic anaemia in our geographical region, particularly hereditary spherocytosis. Treatment.

## 11. Haemolytic anaemia (II)

Extracorporeal haemolytic anaemia (isoimmune-autoimmune, microangiopathic) and nocturnal paroxysmal haemoglobinuria. Autoimmune haemolytic anaemia considered as an autoimmune *disease*. Most commonly associated entities (collagenosis, lymphomas, viral infections, etc.). Diagnostic value of erythrocyte morphology in the diagnosis of microangiopathic anaemia.

## 12. Haemoglobin disorders

Concept and classification. Thalassaemia. Unstable haemoglobin and that with altered affinity for O<sub>2</sub>. Metha- and sulfahemoglobinemia. Drepanocytosis and other haemoglobin disorders. Bases of haemoglobin changes. Correct interpretation of beta-thalassaemia minor as the most common anomaly. Distinction from iron deficiency anaemia.

## 13. Dyserythropoiesis

Concept and classification. Congenital dyserythropoiesis. Acquired dyserythropoiesis. Most common forms of dyserythropoiesis (acquired). Differential diagnosis with respect to thalassaemia and megaloblastic, sideroblastic and haemolytic anaemia. Importance of bone marrow examination in diagnosis.

## 14. Bone marrow insufficiency

Concept and classification. General examination of the patient with pancytopenia. Diagnosis of pancytopenia. Distinguish between bone marrow insufficiency and hypersplenism. Limitations of bone marrow aspiration and advantages of biopsy in the diagnosis of these conditions.

## 15. General bone marrow insufficiency. Aplastic anaemia. Nocturnal paroxysmal haemoglobinuria and Fanconi's syndrome

Concept and classification. Clinical aetiopathogeny, prognosis and treatment: recognizing the symptomatology of aplastic anaemia, in particular its severe forms. Most frequent causes. Criteria of severity. Indications for the main types of treatment, in particular immunosuppression and the allogeneic transplant of haematopoietic progenitors. Tests required to diagnose nocturnal paroxysmal haemoglobinuria and Fanconi's syndrome.

## 16. Selective bone marrow insufficiency

Erythroblastopenia. Other types of selective bone marrow insufficiency. Erythroblastopenia as a model of selective bone marrow insufficiency. Importance of autoimmune mechanisms. Role of immunosuppressant agents in the treatment of these diseases. Diseases that may be associated with selective bone marrow insufficiency.

## 17. Myelodysplastic syndromes (MDS)

Concept and classification. Clinical features, diagnosis, development and treatment. Concept of MDS. Differences between MDS and acute leukaemia and bone marrow insufficiency of the aplastic anaemia form. Classification of MDS. Distinction between primary and secondary MDS. Clinical and analytic data that raise suspicion of MDS. Importance of cytogenetics in the classification of MDS. Prognosis. Possibility of developing into acute leukaemia.

## 18. Granulocyte function disorders

Concept and classification. Main clinical forms. Importance of granulocytes in defending against infection. Data that raise suspicion of a granulocyte function disorder.

## 19. Chronic granulocytopenia

Concept and classification. Clinical forms. Relationship between the degree of granulocytopenia and the risk of infection. Diagnosis of pseudogranulocytopenia and true granulocytopenia. Utility of haematopoietic growth factors in treatment.

## 20. Agranulocytosis

Concept, aetiology, clinical features, diagnosis and treatment. Myelotoxic action of certain drugs (agranulocytosis, a characteristic example). Prophylaxis and treatment of infections in patients with granulocytopenia. Role of haematopoietic growth factors in treatment. Importance of empirical antibiotic treatment in cases of infection. Preventing future episodes of agranulocytosis. Informing patients about the risk of new episodes of agranulocytosis.

## 21. Acute leukaemia

Concept and classification. General clinical features. Bases of treatment. Different types of acute leukaemia, different incidence according to age and advances in classification based on morphology, immunophenotype and cytogenetics. Main cytogenetic and molecular changes associated with acute leukaemia. Personal, family and social repercussions of the disease.

## 22. Acute lymphoblastic leukaemia (ALL)

Classification, clinical features and diagnosis. Prognosis and treatment. Main types of ALL. Differences in prognosis between ALL in children and in adults. Bases of treatment. Possibility of curing ALL in children. Side effects of treatment, both immediate and long term (especially learning disorders) and according to the tumours which may appear in children cured from ALL. Recognize the impact of the disease on the patient's family.

## 23. Acute myeloblastic leukaemia (AML)

Classification, clinical features, diagnosis, prognosis and treatment. The different varieties of AML. Classification of AML. Main cytogenetic changes that may be observed in AML and their correlation with the different sub-types of leukaemia. Bases of treatment and problems derived from it. Bases and choice of treatment: candidates for chemotherapy and candidates for haematopoietic progenitor transplant.

## 24. Chronic myeloproliferative syndromes (CMS)

CMS as *clonal* syndromes. Classification. Common clinical and analytic characteristics. General diagnosis. Understanding the concept of *monoclonal haematopoietic disease*. Clinical and analytic findings that raise suspicion of a chronic CMS. Importance of cytogenetics in the diagnosis of CMS.

## 25. Chronic myeloid leukaemia (CML)

Clinical features, diagnosis and treatment. CML as a model of chronic CMS. The different stages of the disease (chronic, acceleration-transformation, blastic crisis). Molecular bases of the disease, in particular the role of 9;22 translocation and expression of the bcr/abl gene. Therapeutic strategy. Outcomes expected with the different kinds of treatment: interferon, haematopoietic progenitor transplant.

## 26. Polycythemia vera

Classification and general diagnosis of polyglobulia. Clinical features, diagnosis and treatment of polycythemia vera. Diagnosing the most common forms of polyglobulia. Diagnostic criteria for polycythemia vera. Complications associated with the disease. Basis of treatment. Side effects of treatment.

## 27. Idiopathic myelofibrosis

Concept, clinical features, diagnosis and treatment. Concept of *myelofibrosis* (idiopathic and secondary). Diagnostic criteria. Principles of treatment.

## 28. Essential thrombocythemia

Concept, clinical features, diagnosis and treatment. Distinction between reactive thrombocytosis and essential thrombocythemia. Diagnostic criteria. Complications. Basis of treatment.

## 29. Leukemoid reactions

Concept. Most important causes. Leukoerythroblastic syndromes. Bases of differential diagnosis between leukemoid reactions, chronic myeloproliferative syndromes and acute leukaemia. Value of leukoerythroblastic syndrome as a sign that raises suspicion of metastatic bone carcinomatosis.

## 30. Chronic lymphoproliferative syndromes (LPS)

Concept and classification. General diagnosis. Concept of LPS, its cellular basis and methods used in classification. Reaching a diagnosis of chronic LPS. Most common diseases within this group.

### **31. Chronic lymphatic leukaemia (CLL)**

Concept, clinical features and diagnostic criteria. Prognosis and treatment. CLL as the most representative disease among chronic LPS. Diagnostic and prognostic criteria. Main complications of this disease. Indications and basis of treatment.

### **32. Other chronic lymphoproliferative syndromes**

Prolymphocytic leukaemia. Hairy cell leukaemia. Leukaemic lymphomas. T leukaemia-lymphoma in adults. Review of other chronic CLS that are less common than CLL. Cytomorphological, immunophenotypic and cytogenetic bases of its classification. Natural history of these diseases and basis of treatment.

### **33. Monoclonal gammopathy**

Concept and classification. General diagnosis. Use of simple tests (proteinogram, radiology, bone marrow aspiration) to identify the existence of monoclonal gammopathy. General diagnostic approach.

### **34. Multiple myeloma**

Concept, clinical features, diagnosis, prognosis and treatment. Multiple myeloma as the most representative disease among the forms of monoclonal gammopathy. Diagnostic and prognostic criteria. Basis of treatment.

### **35. Other forms of monoclonal gammopathy**

Monoclonal gammopathy of unknown significance. Heavy chain diseases. Distinction between multiple myeloma and monoclonal gammopathy of unknown significance. Clinical features of treatment of hyperviscosity. Correlation between monoclonal gammopathy and chronic LPS, lymphomas and other diseases.

### **36. Malignant lymphomas**

Concept and classification. General diagnosis of adenopathy. Correct clinical interpretation of the meaning of adenopathic findings according to the patient's history, the localization, the characteristics and other data from the examination. Understanding the heterogeneity of malignant lymphomas. Value of ganglion biopsy in diagnosing adenopathy. Basis of the classification of malignant lymphomas (morphology, immunophenotype).

### **37. Hodgkin's disease**

Histological varieties. Clinical features, diagnosis, study of extension and prognosis. Treatment. Hodgkin's disease as a model of malignant haemopathy in which great treatment advances have been made. Side effects of treatment. Approaches to patient care.

### **38. Non-Hodgkin lymphomas**

Classification of clinical interest: lymphomas of *low* malignancy; lymphomas of *high* malignancy. Clinical features, diagnosis, study of extension and prognosis. Main varieties of non-Hodgkin lymphomas. Be familiar with the different varieties, from the most aggressive to the most indolent. Identify the different risk groups according to prognostic factors. Therapeutic strategy with respect to these diseases and the role of new treatment approaches such as haematopoietic progenitor transplants.

### **39. Pathology of the phagocytic mononuclear system (FMS)**

Concept of PMS and the cell lines of which it is comprised. Malignant histiocytosis. Reactive histiocytosis. Langerhans cell disease (histiocytosis X). Importance of haemophagocytosis as a reactive phenomenon. Basic diagnostic criteria. FMS pathology as a model of interdisciplinary disease.

### **40. Spleen diseases**

Review of the anatomy and function of the spleen. Hypersplenism and hyposplenism. Indications and risks of splenectomy. Main methods for studying splenomegaly. Diagnosis of hypersplenism. Diseases most often accompanied by splenomegaly. Indications for splenectomy. Risks of splenectomy and prevention.

### **41. Haemostatic diseases: general features**

Review of the physiology of haemostasis. Function of platelets. Coagulation and fibrinolysis factors. General diagnosis. Diagnosing a haemorrhagic disease by means of the clinical interview: examination and basic laboratory tests.

### **42. Vascular haemorrhagic diathesis**

Rendu-Osler-Weber disease. Schönlein-Henoch disease. Other vascular purpura: diagnostic procedures. Recognize purpura as a sign of systemic disease.

### **43. Thrombocytopenia**

Classification. Idiopathic thrombocytopenic purpura. Thrombotic thrombocytopenic purpura. Other forms of thrombocytopenia. Classification of thrombocytopenia into central (megakaryocytic) and peripheral (megakaryocytic) forms. Relationship between the degree of thrombocytopenia and the risk of haemorrhage. Symptomatic treatment of haemorrhagic diathesis due to thrombocytopenia. Treatment strategy with idiopathic thrombocytopenic purpura and in patients who are refractory to corticosteroids. Situations that may increase the likelihood of haemorrhage in the case of platelet reduction.

### **44. Thrombocytopathy**

Classification. Main forms of congenital thrombocytopathy. Main forms of acquired thrombocytopathy. Criteria for suspecting thrombocytopathy. Diseases most commonly associated with acquired thrombocytopathy.

### **45. Coagulopathy**

Classification. General diagnosis. Congenital and acquired coagulation disorders. Laboratory tests for identifying coagulopathy.

### **46. Congenital coagulopathy**

Haemophilia: clinical features, diagnosis, treatment, complications. Von Willebrand's disease: clinical features, diagnosis and treatment. Other coagulation disorders. Study of factor VIII pathology as the most common congenital coagulopathy. Emergency treatment. General view of treatment problems and the psychosocial aspects of these diseases. Main side effects of treatment.

### **47. Acquired coagulopathy**

Disseminated intravascular coagulopathy: causes, clinical features, diagnosis and treatment. Circulating anticoagulants. Vitamin K deficiency and other forms of coagulopathy. Clinical and analytic data that raise suspicion of disseminated intravascular coagulopathy. Diseases most commonly associated with this syndrome. Therapeutic strategies.

### **48. Thrombosis**

Factors that predispose to thrombosis. Deficiency of protein C, protein S and AT III. Anticoagulant treatment. Anti-platelet-aggregating agents. Fibrinolytic treatment. Risk factors associated with thrombosis. Basis of public health education in order to reduce these risk factors. Onset and monitoring of anticoagulant treatment. Main drugs that interfere with the action of anticoagulants.

### **49. Haemotherapy: bases**

Functions and organization of a blood bank. Role of the physician in capturing donors. Functioning and mission of a blood bank. Need for a transfusion policy involving all levels of health administration and society.

### **50. Blood groups**

A, B, O, Rh, Lewis and other systems. HLA system. Leukocytic antigens. Platelet antigens. main blood groups and other antigen systems in relation to haemotherapy and transplants.

### **51. Transfusion therapy**

Indications for transfusion of blood and its components. Adverse effects of transfusions. Indications for transfusion. Situations in which haemotherapeutic support is unnecessary. Emergency treatment of transfusion accidents.

### **52. Plasmapheresis and cytoapheresis**

Bases and indications of both procedures and therapeutic indications.

### **53. Haematopoietic progenitor transplants**

Types of transplant. Indications. Complications. Theoretical bases of bone marrow transplant. Therapeutic indications. Types of transplant and main therapeutic indications. Main complications of transplants. Role of voluntary donor registers in haematopoietic progenitor treatment strategies.

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## **TEACHING PLAN**

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### **THEORY CLASSES**

1. **Haematopoiesis.** Bases of haematopoiesis and their regulation. Haematopoietic growth factors. Anatomical and functional structure of lymphatic tissue in relation to haematopoiesis. Lymphopoiesis.
2. **Laboratory tests in haematology.** Obtaining and processing peripheral blood and bone marrow samples. Normal hematimetric values. Other useful laboratory tests for studying diseases of the haematopoietic system.
3. **Anaemia.** Diagnostic criteria. Classification of anaemia. General clinical characteristics of anaemia. Assessing the anaemic patient.
4. **Anaemia (I). Microcytic hypochromic anaemia.** Classification. Iron deficiency anaemia. Treatment. Sideroachrestic anaemia.  
**Normocytic normochromic anaemia.** Chronic disease anaemia. Diseases associated the anaemia. Differential diagnosis between chronic disease anaemia and iron deficiency anaemia.
5. **Anaemia (II). Macrocytic anaemia.** Megaloblastic anaemia. Aetiology, clinical features, treatment. **Haemolytic anaemia:** classification, aetiopathogeny and treatment.
6. **Other erythrocyte changes.** Haemoglobinopathy. Most frequent forms in our geographical region. Diagnosis, clinical features and treatment. Enzymatic changes. Most frequent forms in our geographical region. Diagnosis, clinical features and treatment.
7. **Leukocyte changes: quantitative disorders: leukocytosis, leukemoid reaction and leukoerythroblastic syndrome.** Causes. Assessing the patient with leukocytosis. **Neutropenia and agranulocytosis.** Classification. Aetiopathogeny and treatment. Prophylaxis of infections in neutropenic patients. **Qualitative disorders: functional granulocyte changes.** Classification, congenital forms, acquired forms. Agents that produce changes in granulocyte function.
8. **Bone marrow aplasia.** Concept and diagnostic criteria. Classification. Clinical features. Diagnosis. Severity criteria. General therapeutic strategy. Other types of bone marrow insufficiency: **nocturnal paroxysmal haemoglobinuria. Fanconi's syndrome.** Selective bone marrow insufficiency: **erythroblastopenia.**
9. **Myelodysplastic syndromes.** Classification (primary and secondary forms). General syndrome. Cytogenetic changes. Factors that predict the transformation into acute leukaemia and survival rates. Treatment.
10. **Acute myeloblastic leukaemia.** Classification. Clinical features. Laboratory data. Diagnosis. Basis of treatment.
11. **Acute lymphoblastic leukaemia.** Classification. Clinical features. Laboratory data. Diagnosis. Basis of treatment.
12. **Chronic myeloproliferative syndromes (I).** Concept and classification. **Polycythemia vera, idiopathic myelofibrosis, essential thrombocytemia.** Diagnostic criteria, clinical features and natural history of these diseases. Prognosis. Treatment.
13. **Chronic myeloproliferative syndromes (II). Chronic myeloid leukaemia.** Diagnostic criteria. Molecular biology of CML. Natural history of the disease. Prognostic factors. Basis of treatment of CML.
14. **Chronic lymphoproliferative syndromes (I). Classification. Chronic lymphatic leukaemia.** Diagnostic criteria. Natural history. Prognostic factors. Treatment.
15. **Chronic lymphoproliferative syndromes (II). Prolymphocytic leukaemia, hairy cell leukaemia, leukaemic lymphomas.** Diagnostic criteria, natural history, prognosis and treatment.
16. **Lymphomas (I).** Classification. Histopathology. Immunophenotype. Cytogenetic and molecular changes. Molecular basis of lymphomagenesis.
17. **Lymphomas (II). Hodgkin's disease.** Classification. Clinical features. Prognosis. Treatment. Complications of short- and long-term treatment.
18. **Lymphomas (III). Non-Hodgkin's lymphomas.** Characteristics and natural history of the main clinical forms (follicular lymphomas, large cell lymphomas, mantle cell lymphomas, T lymphomas).
19. **Monoclonal gammopathy (I). Classification. Multiple myeloma.** Diagnostic criteria. Natural history. Prognostic staging. Complications. Treatment.
20. **Monoclonal gammopathy (II). Monoclonal gammopathy of unknown significance. Heavy chain disease. Amyloidosis.** Diagnostic criteria. Clinical features. Natural history. Prognosis. Treatment.
21. **Haematopoietic progenitor transplants.** Types of transplant. Indications. Complications. Outcomes.
22. **Haemostasis and coagulation: physiology of haemostasis and coagulation. Main assessment tests.**
23. **Thrombocytopenia. Classification. Idiopathic thrombocytopenic purpura.** Diagnostic criteria. Clinical features. Treatment.

24. **Platelet dysfunctions.** Classification. Congenital and acquired platelet dysfunctions. Diagnostic tests. Treatment.
25. **Coagulopathy (I). Classification. General diagnosis. Congenital coagulopathy: haemophilia and Von Willebrand's disease.** Classification and diagnostic criteria. Clinical features. Complications. Treatment. Genetic counselling.
26. **Coagulopathy (II). Acquired coagulopathy: disseminated intravascular coagulation.** Classification. Aetiopathogeny. Clinical features. Treatment. **Vitamin K deficiency. Circulating anticoagulants.**
27. **Thrombosis and pre-thrombotic states.** Risk factors for the development of thrombosis. Deficiencies of protein C, protein S and anti-thrombin III. Prophylaxis. Treatment.
28. **Haemotherapy (I).** Bases of haemotherapy. Blood groups. Organization of a blood bank.
29. **Haemotherapy (II).** Blood components used in haemotherapy. Erythrocyte concentrates, platelet concentrates, plasma, coagulation factors. Indications. Plasmapheresis. Indications and outcomes. Cytapheresis. Indications and outcomes.
30. **Haemotherapy (III).** Main side effects of haemotherapy. Role of haematopoietic colony stimulating factors (erythropoietin, G-CSF, GM-CSF, SCF, thrombopoietin) in haemotherapy.

RELATIONSHIP TO THE SPECIFIC OBJECTIVES		
OBJECTIVES	TOPICS	CLASSES
1. Anomalies revealed by blood tests	1 to 4	1 and 2
2. Anaemia	4 to 11 and 49 to 50	3 to 5 and 28 to 30
3. Other red series changes	12 and 13	6
4. Leukocyte changes	18 to 29 and 52	7, 10, 11, 12, 13, 29 and 30
5. Platelet changes	28, 41, 43 and 44	22 to 24
6. Pancytopenia	14 to 17 and 49, 50, 51 and 53	8, 9 and 21
7. Adenopathy	30 to 40 and 52	14 to 20
8. Haemorrhage	41 to 47	22 to 26 and 29
9. Thrombotic/pre-thrombotic states	48	27

### SCHEDULED CLINICAL TEACHING (SEMINARS)

1. Morphology: study of peripheral blood and bone marrow in normal subjects.
2. Morphology of the lymphatic ganglion. Methods for the morphological study of the lymphatic ganglion.
3. Approaches to the study and diagnosis of anaemia. Case studies.
4. Adenopathy: approaches to the patient with adenopathy.
5. Pancytopenia: methods of study and case studies.
6. Approaches to the patient with granulocytopenia.
7. Imaging techniques in haematopathology: from conventional x-ray to isotopic techniques.
8. Cytogenetics and molecular biology in diseases of the haematopoietic system.
9. Infections in patients with granulocytopenia or immunodepression.
10. Gene therapy in malignant blood diseases.
11. Flow cytofluorimetry in the diagnosis of malignant blood diseases.
12. Approaches to the patient with thrombocytopenia.
13. Laparoscopic surgery: its application to splenectomy.
14. Approaches to the patient with a haemorrhage.
15. Autologous and allogeneic transfusion of blood derivatives.
16. Apheresis techniques: obtaining haematopoietic progenitors from peripheral blood for transplant.

17. Can pre-thrombotic states be detected?
18. Neurological changes in patients with malignant blood diseases.
19. Financial impact of new treatment techniques for malignant blood diseases: haematopoietic progenitor transplants as an example.