

## CLINICAL PHYSIOLOGY AND BIOCHEMISTRY

MODULE	CONTENT	YEAR	TERM	CREDITS	TYPE
MEDICINE AND PHARMACOLOGY	CLINICAL PHYSIOLOGY AND BIOCHEMISTRY	4 <sup>th</sup>	2 <sup>nd</sup> semester	6 ECTS ( 4.5 T+ 1.5 P)	Compulsory
<b>LECTURER(S)</b>			<b>Postal address, telephone nº, e-mail address</b>		
<p>Clinical Physiology</p> <ol style="list-style-type: none"> <li>1. Francisco Lisbona Delgado (A and C)</li> <li>2. M<sup>a</sup> Inmaculada López Aliaga (D)</li> <li>3. Javier Díaz Castro (E)</li> <li>4. M<sup>a</sup> José Muñoz Alférez (E)</li> </ol> <p>Clinical Biochemistry</p> <ol style="list-style-type: none"> <li>1. José Luis Periago Mínguez (A and E)</li> <li>2. M<sup>a</sup> del Mar Sola Zapata (C)</li> <li>3. M<sup>a</sup> Dolores Mesa García (D)</li> </ol>			<p>Department of Physiology, 1<sup>st</sup> Floor, Faculty of Pharmacy, Phone: 958 243879</p> <p>E-MAILS (Phone):</p> <ol style="list-style-type: none"> <li>1. <a href="mailto:flisbona@ugr.es">flisbona@ugr.es</a> (958240678)</li> <li>2. <a href="mailto:milopez@ugr.es">milopez@ugr.es</a> (958243880)</li> <li>3. <a href="mailto:javierdc@ugr.es">javierdc@ugr.es</a> (958243884)</li> <li>4. <a href="mailto:malferez@ugr.es">malferez@ugr.es</a> (959243883)</li> </ol> <p>Department of Biochemistry, 4<sup>st</sup> Floor, Faculty of Pharmacy, Phone: 958 243838</p> <ol style="list-style-type: none"> <li>5. <a href="mailto:mmsola@ugr.es">mmsola@ugr.es</a> (958244978)</li> <li>6. <a href="mailto:mdmesa@ugr.es">mdmesa@ugr.es</a> (958-242335, 958241000 ext 20314)</li> <li>7. <a href="mailto:jperiago@ugr.es">jperiago@ugr.es</a> (958-243839)</li> </ol>		
<b>DEGREE WITHIN WHICH THE SUBJECT IS TAUGHT</b>			<b>TUTORING AND MEETINGS</b>		
Degree in Pharmacy			<p>Teachers of Clinical Physiology:</p> <ul style="list-style-type: none"> <li>▪ Francisco Lisbona Delgado: M, W and F: 9:30-11:30 h.</li> <li>▪ M<sup>a</sup> Inmaculada López Aliaga: T and Th: 12:30-14:30 h.; W: 10.30:12.30 h.</li> <li>▪ Javier Díaz Castro: T and Th: 16.00-18.00; F: 16.00-17.00 y18.00- 19.00 h.</li> <li>▪ M<sup>a</sup> José Muñoz Alférez: M and Th: 9:30-11:30 h. ; W: 10:30-12:30 h.</li> </ul> <p>Teachers of Clinical Biochemistry <a href="http://farmacia.ugr.es/BBM2/index.html">http://farmacia.ugr.es/BBM2/index.html</a></p>		



### PREREQUISITES and/or RECOMMENDATIONS (if necessary)

- It is recommended to have a previous basic knowledge (background knowledge) of Human and Cell Physiology (I and II), Physiopathology, Structural Biochemistry, Metabolic Biochemistry and Human Anatomy.
- A good level of English and Informatics skills are also required.
- Ability to process and to elaborate documents in virtual format and on paper.

### BRIEF ACCOUNT OF THE SUBJECT PROGRAMME (ACCORDING TO THE DEGREE)

Introduction to laboratory diagnosis of common diseases. Clinical Physiology, Clinical Biochemistry and Molecular Pathology.

### GENERAL AND PARTICULAR ABILITIES

#### GENERIC SKILLS:

- **CG9.** To participate in the activities of promotion of the health, prevention of disease, in the individual, familiar and community area; with the integral and multiprofessional vision of the process health - disease.
- **CG10.** To design and to evaluate reagents, methods and analytical clinical technologies, knowing the basic foundations of the clinical analyses and the characteristics and contents of the laboratory diagnosis.
- **CG13.** To develop skills of communication and information, both oral and written, to deal with patients and users of the center where to perform his professional activity. To promote the capacities of work and collaboration in multidisciplinary teams and the related ones to other sanitary professionals.
- **CG15.** To recognize the own limitations and the need to support and update the professional career, giving special importance to the independent learning of new knowledge being based on the scientific available evidence.

#### SPECIFIC SKILLS:

- CE36.** To know and understanding the basic foundations of the clinical analyses, the characteristics and contents of the results of the main clinical laboratory tests.
- CE39.** To know and understanding the technologies and skills used in the design and evaluation of the preclinical and clinical tests.
- CE49.** To know the analytical technologies and skills related to the laboratory diagnostics.

### OBJECTIVES (EXPRESSED IN TERMS OF EXPECTED RESULTS OF THE TEACHING PROGRAMME)

- To integrate the knowledge obtained in the Clinical subjects of Physiology and Biochemistry.
- To interpret the laboratory tests used in the diagnosis and follow-up of common diseases.
- To apply the interpretation of laboratory information in the follow-up of the efficiency and of the therapeutic safety.
- To be able to accomplish of reports with the results of the physiological and biochemical diagnosis of laboratory.
- To introduce the specialization in the clinical matters of Clinical Analyses, Clinical Biochemistry, Microbiology and Clinical Parasitology.

### DETAILED SUBJECT SYLLABUS

#### THEORETICAL PROGRAM

#### BLOCK I. CLINICAL PHYSIOLOGY

##### THEMATIC UNIT I. METHODS OF BLOOD'S EXTRACTION (1.5 h.)

Extraction of arterial, capillary and venous blood. Common errors. Blood components. Obtaining of total blood, serum and plasma. Anticoagulants most commonly used.



THEMATIC UNIT 2. HEMATOPOYETIC ORGANS (1.5 h.)

Blood cells, origin, differentiation and cellular maturation. Morphologic characteristics of the blood cells.

THEMATIC UNIT 3. BASIC HEMATIMETRY

Blood cells count, haematocrit, haemoglobin, erythrocyte indices, leucocitary formula. Stainings in hematología. Automatic Haematology Analyzer. Globular sedimentation velocity.

THEMATIC UNIT 4. INTRODUCTION TO THE STUDY OF THE ERITROCITARY PATHOLOGY (1 h.)

Anemias, classification of anemias for basic hematimetry. Anemias microcytics, macrocytics and normocytic. Physiopatological classification: Regenerative and arregenerative anemias

THEMATIC UNIT 5. MICROCYTIC ANEMIAS (3h.)

Iron deficiency anaemia. Anemia of chronic diseases. Thalassemic syndromes. Sideroblastic anemias.

THEMATIC UNIT 6. MACROCYTIC ANEMIAS (1 h.)

Megaloblastic anemias by vitamin B12 and folic acid deficiency. Non-megaloblastic macrocytic anemias.

THEMATIC UNIT 7. NORMOCYTIC ANAEMIAS (2 h.)

Congenital and acquired hemolytic anemias. Structural hemoglobinopatías. Alterations of the erythrocytary membrane. Aplastic anemia.

THEMATIC UNIT 8. INTRODUCTION TO THE STUDY OF THE LEUKOCITARY FUNCTIONALISM (2 h.)

Functional granulocytophatías. Constitutional anomalies of the leukocytes. Agranulocytosis and neutropenia. Alterations of the mononuclear phagocyte system. Leukemoid reactions.

THEMATIC UNIT 9. CHRONIC MYELOPROLIFERATIVE SYNDROMES (1 h.)

Chronic myeloid leukaemia. Chronic myeloproliferative syndromes with hemo-peripheral expression. T and B-cell chronic lymphocytic leukaemia.

THEMATIC UNIT 10. CLASSIFICATION OF THE ACUTE LEUKAEMIAS (1 h.)

Secondary acute leukaemias. Linfoproliferative syndromes without hemo-peripheral expression. Lymphomas and myelomas.

THEMATIC UNIT 11. HEMOSTASIS: COAGULATION AND FIBRINOLYSIS (1.5 h.)

Elements that intervene in the hemostasis. Platelets. Plasmatic factors of the coagulation and fibrinolytic system. Analytical tests of the exploration of the different components.

THEMATIC UNIT 12. FUNCTIONAL ALTERATIONS OF THE PLATELETS (1.5 h.)

Thrombocytosis and thrombocytopenia. Alterations of coagulation factors. Haemophilia and Von-Willebran's disease. Anticoagulants and fibrinolytics.

THEMATIC UNIT 13. RENAL FUNCTION: PRINCIPLES OF THE RENAL CLEARANCE (1 h.)

Methods to determine the renal clearance. Measures of glomerular filtration, renal blood flow and effective renal plasma flow. Tubular function tests. Dilution and concentration tests.

THEMATIC UNIT 14. EXAMINATION OF THE ACID-BASE BALANCE (1 h.)

Arterial gasometry. Interpretation of information in respiratory and metabolic acidosis. Respiratory and metabolic alkalosis. Effects of compensation.

THEMATIC UNIT 15. CEPHALORAQUID LIQUID (1 h.)

Formation, circulation and composition. Obtaining sample. Cells count and leucocitary formula. Biochemical tests

THEMATIC UNIT 16. SEMINAL FLUID (1 h.)

Formation. Withdrawal of semen. Macroscopic and microscopic examination. Cellular count and tint. Functional tests



## LABORATORY PRACTICE PROGRAM

- Practice 1. Blood cells count: red cells, white cells and platelets
- Practice 2. Hemoglobin determination. Hematocrit. Erythrocyte indices.
- Practice 3. Leucocitary formula.
- Practice 4. Reticulocyte count.

## BLOCK II. CLINICAL BIOCHEMISTRY

### THEMATIC UNIT 1. CLINICAL BIOCHEMISTRY.

Diagnostic semiology. Analytical and biological variability control.

### THEMATIC UNIT 21. MOLECULAR PATHOLOGY AND DIAGNOSTIC TECHNIQUES.

THEMATIC UNIT 31. HYPERGLYCEMIA AND HYPOGLYCEMIA. Diagnosis and monitoring of the diabetic patient.

THEMATIC UNIT 4. LIPOPROTEINS. Evaluation of the atherogenic risk.

THEMATIC UNIT 5. ALTERATIONS OF THE NON-PROTEIN NITROGENOUS METABOLISM: urea, uric and creatinin. Pathological consequences and diagnostic techniques. No-protein nitrogenous and renal function

THEMATIC UNIT 6. DISPROTEINEMIAS AND DIAGNOSTIC TECHNIQUES.

THEMATIC UNIT 7. CLINICAL ENZYMOLOGY.

THEMATIC UNIT 8. BIOCHEMICAL RISK MARKERS OF THE HEPATIC FUNCTION

THEMATIC UNIT 9. TUMORAL BIOCHEMICAL RISK MARKERS

## LABORATORY PRACTICE PROGRAM

- Practice 1. Glucose determination
- Practice 2. Total cholesterol, HDL-cholesterol and triacylglycerides deetermination
- Practice 3. Uric acid, urea and creatinin determination
- Practice 4. GPV and GOT determination

## READING

### FUNDAMENTAL BIBLIOGRAPHY:

- BEUTLE E, LICHTMAN MA, COLLER BS, KIPPS EJ Y SELIGSDHN U. Hematología (Williams). Editorial Marbán. España, 2005.
- LICHTMAN MA, KAUSHANSKY K, KIPPS TJ, PRCHAL JT, LEVI MM. Williams, Manual de Hematología. 8ª Edición. Editorial MC Graw-Hill. Interamericana. 2014.
- MUNDT, L. A. y SHANAHAN, K. GRAFF, Análisis de orina y de los líquidos corporales. Editorial Médica Panamericana, 2011.
- PRIETO VALTUEÑA JM, YUSTE ARA JR. Balcells. La clínica y el laboratorio. 21ª Edición. Editorial Elsevier Masson, Barcelona, 2010.
- RODAK B.F., FRITSMA, KEOHANE. Hematología. Fundamentos y aplicaciones clínicas. 4ª Edición. Editorial Médica Panamericana. 2014.
- RUIZ ARGÜELLES G. J. Fundamentos de Hematología. 5ª Edición. Editorial Médica Panamericana, Madrid, 2014.
- RUIZ REYES G. y RUIZ ARGÜELLES A. Fundamentos de Interpretación Clínica de los Exámenes de Laboratorio. 2ª Edición. Editorial Médica Panamericana.



Madrid, 2010.

- SANS-SABRAFEN J., BESES RAEBEL C., VIVES CORRONS J.L. Hematología Clínica. 5ª Edición. Editorial Elsevier. Barcelona, 2006.
- VIVES J.L., AGUILAR J.L. Manual de Técnicas de Laboratorio en Hematología. 4ª Edición- Editorial Elsevier España. Barcelona, 2014.
- Gaw, Cowan & O' Reilly, Bioquímica Clínica. Ed Harcourt
- Ruiz Reyes & Ruiz Argüelles. Fundamentos de interpretación clínica de los exámenes de laboratorio. Ed Panamericana
- González de Buitrago JM, Arila Ferreiro A, Rodríguez-Segade M & Sánchez Pozo A. Bioquímica Clínica. McGraw-Hill / Interamericana de España
- Sánchez de Medina Contreras F, Sánchez Pozo A & Suárez Ortega MD. Apuntes de Bioquímica Clínica. ICE, Universidad
- A. González. Principios de Bioquímica Clínica y Patología Molecular. Elsevier España 2010

#### COMPLEMENTARY BIBLIOGRAPHY:

- ALTHOF, S. El sedimento urinario: atlas, técnicas de estudio, valoración. Panamericana, 2003.
- Diccionario terminológico de Ciencias Médicas, 12ª ed. Salvat Editores. S.A. Barcelona, 1990
- GIL, J. L. Hematología sin microscopio: el hemograma en la práctica clínica, 1ª ed., Masson, 2003.
- RODAK BF, CARR JH. Atlas de Hematología Clínica. 4ª Edición. Editorial Médica Panamericana. Madrid, 2014.

#### RECOMMENDED INTERNET LINKS

Anemia\_Pathophysiology, Classification, Clinical Investigation <http://www.neosoft.com/~uthman/anemia/anemia.html>

Anemias <http://sprojects.mmip.mcgill.ca/hematology/anemias.htm>

ASH Educational Materials <http://www.hematology.org/education/index.html>

Basic Hematology <http://www.hsc.virginia.edu/medicine/clinical/pathology/educ/innes/text/bheme.html>

<http://web.indstate.edu/thcme/mwking/blood-coagulation.html#intro>

Blood\_Outline <http://www.mc.vanderbilt.edu/histo/blood/>

Bloodline <http://www.bloodline.net/>

Hematology Links - Atlas and Slides <http://cybernovae.com/hematology/atlas-and-slides.htm>

Hematology, MedMark <http://www.medmark.org/hem/hem2.html>

Hematology\_Digital Image Study Sets <http://medocs.ucdavis.edu/IMD/42DA/dib/perph/index.htm>

Hematopathology Index <http://www.medlib.med.utah.edu/WebPath/HEMEHTML/HEMEIDX.html#2>

HemoSurf <http://www.aum.iawf.unibe.ch/vlz/bwl/Haematologie/index.htm>

Introduction to Blood Morphology <http://cer.hs.washington.edu/hemecases/intro/intro.htm>

Metal Complex in the Blood <http://wunmr.wustl.edu/EduDev/LabTutorials/Hemoglobin/MetalComplexinBlood.html>

Pathology\_Hematology Procedures <http://medic.med.uth.tmc.edu/path/00000286.htm>

<http://www.the-aps.org/> The American Physiological Society

<http://physoc.org/> The Physiological Society

<http://www.seccff.org/> Sociedad Española de Ciencias Fisiológicas

<http://www.fepps.org/> Federación Europea de Sociedades de Fisiología

<http://www.biorom.uma.es/indices/index.html> (Página con contenidos relacionados con Bioquímica y especialmente metabolismo. Incluye presentaciones de clase, problemas y preguntas tipo test)

[http://expasy.org/cgi-bin/show\\_thumbnails.pl](http://expasy.org/cgi-bin/show_thumbnails.pl); <http://www.genome.jp/kegg/pathway.html>; <http://www.sigmaaldrich.com/life-science/metabolomics/learning-center/metabolic-pathways.html> (Páginas que contiene información de rutas y mapas metabólicos, clasificados por diferentes tipos de metabolismo)

Información sobre la asignatura puede ser consultada en la página web del Departamento de Bioquímica y Biología Molecular II:

<http://farmacia.ugr.es/BBM2/>.

