CLINICAL PHYSIOLOGY AND BIOCHEMISTRY

Approved by the Council of the Department of Physiology on 22nd May, 2017

Approved by the Council of the Department of Biochemistry on 13th June, 2017

MODULE	CONTENT	YEAR	TERM	CREDITS	TYPE
MEDICINE AND PHARMACOLOGY	CLINICAL PHYSIOLOGY AND BIOCHEMISTRY	4th	2nd semester	6 ECTS (4.5 T+ 1.5 P)	Compulsory

LECTURER(S)	Postal address, telephone nº, e-mail address
Clinical Physiology 1. Francisco Lisbona Delgado (Grupos A y C) 2. Mª Inmaculada López Aliaga (Grupo D) 3. Javier Díaz Castro (Grupo E) 4. Mª José Muñoz Alférez (Grupo E) Clinical Biochemistry 1. Mª del Mar Sola Zapata (Grupos A y C) 2. Mª Dolores Mesa García (Grupo D) 3. José Luis Periago Mínguez (Grupo E)	Department of Physiology, 1st Floor, Faculty of Pharmacy, Phone: 958 243879 E-MAILS (Phone): 1. flisbona@ugr.es (958240678) 2. milopez@ugr.es (958243880) 3. javierdc@ugr.es (958243884) 4. malferez@ugr.es (959243883) Department of Biochemistry, 4st Floor, Faculty of Pharmacy, Phone: 958 243838 1. mmsola@ugr.es (958249478) 2. mdmesa@ugr.es (958-242334, 958241000 ext 20314) 3. jperiago@ugr.es (958-243839)
DEGREE WITHIN WHICH THE SUBJECT IS TAUGHT	**TUTORING AND MEETINGS**
Degree in Pharmacy	http://farmacia.ugr.es/BBM2/index.html • Francisco Lisbona Delgado M: 8.30-9.30 h; T: 8.30-10.30 h; Th: 10.00-13.00 h • Mª Inmaculada López Aliaga 1st s: M,W and F: 10.30-11.30 h and 12.30-13.30 h 2nd s: M: 17.00-19.00 h; Th: 13.30-14.30 h; F: 9.00-12.00 h • Javier Díaz Castro 1st s: M,W and F: 17.00-19.00 h 2nd s: M,W,Th and F: 16.00-17.00 h; T: 16.00-17.00 and 18.00-19.00h • Mª José Muñoz Alférez M,W and F: 10.30-11.30 h and 12.30-13.30 h .

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 1. 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 normocytics. Physiopatological classification: Regenerative and arregenerative anemias
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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 hemoglobinopaties. Alterations of the erythrocytary membrane. Aplastic anemia.

THEMATIC UNIT 8. INTRODUCTION TO THE STUDY OF THE LEUKOCITARY FUNCTIONALISM (2 h.)
Functional granulocytophaties. 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. Erythocyte 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. GPY and GOT determination

SYSTEM FOR ASSESSING THE ACQUISITION OF COMPETENCES AND KNOWLEDGE/EVALUATION CRITERIA

I. Continuous assessment

For students undergoing this system, the qualifications are based on the work they do during the term. Active class participation (theory and practice) and coursework performed by the students (essays, presentations, seminars...) will be assessed. The most significant contribution towards the final mark is from the theory exams.

Two written theory exams will be performed, one at mid-semester on Clinical Physiology, and the other at the end of the semester on Clinical Biochemistry. If a student fails any of these exams, there will be another opportunity to pass it during the final exam. The written exams, at the lecturer´s discretion, will consist on multiple choice, short or essay questions, aimed at assessing the knowledge and skills acquired.

In order to pass the subject, it is required:

1. To have completed the laboratory practice and passed the corresponding exam. If a student has not completed the practice, he/she will be able to take a theoretical-practical exam in the laboratory.
2. To have passed the two written exams (both Clinical Physiology and Clinical Biochemistry). Mean value between the two marks will be calculated provided a minimum score of 4,5 is reached and mean is ≥ 5.

In the final mark, the relative weight of the different parts, once overcome the above limitations, will be:

Departament of Physiology
Practice: 5%; Presentations, essays and seminars: 5%, Attendance and active participation to classes: 5%; Written exam: 35%

Departament of Biochemistry:
Practice: 5 %; Various activities: 5 %; Written exam: 40%

II. Single Final Assessment

According to the Students Assessment and Qualification Policy of the University of Granada (adopted by the Governing Council on Oct 26, 2016), those students who cannot follow the continuous assessment system due to working, health or disability issues (or any other reason appropriately justified) can apply for a Single Final Assessment. For this purpose, the student will submit a formal request to the Director (Head) of the Department, arguing and proving (with documented evidence) the reason for not being able to follow the continuous system. The submission deadline will be 2 weeks after the beginning of the lectures. In extraordinary circumstances, the starting date for counting the 2-week period will be the enrolment date (policy NCG78/9) and, in this case, the student will have to include the proof of enrolment date when making the request. After ten days without the student receiving a written reply from the Director of the Department, it will be understood that the request has been deemed. In case of denial, the student may file, within one month, an appeal to the Rector, who may delegate this task to the Dean or Director of the Centre, exhausting the administrative proceedings.

Students in the Single Final Assessment system will have to take and pass a theory exam (90% of final mark) and a practical exam (10% of final mark) on both parts of the subject /Physiology and Biochemistry).

READING

FUNDAMENTAL BIBLIOGRAPHY:

- BEUTLE E, LICHTMAN MA, COLLER BS, KIPPS EJ Y SELIGSOHN 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. 22 ª Edición. Editorial Elsevier Masson, Barcelona, 2015.
- 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. 3ª Edición. Editorial Médica Panamericana, Madrid, 2017.
- SANS-SABRAFEN J., BESSES RAEBEL C., VIVES CORRONS J.L. Hematología Clínica. 5ª Edición. Editorial Elsevier. Barcelona, 2006.
- STRASINGER S.K. & DI LORENZO M.S. Análisis de orina y de los líquidos corporales. 6ª Edición. Editorial Médica Panamericana, Madrid, 2016.
- 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://oxfordmedicine.com/view/10.1093/med/9780199204854.001.1/med-9780199204854-chapter-220502
- Anemias https://medlineplus.gov/spanish/ency/article/000560.htm
- ASH Educational Materials http://labmed.hallym.ac.kr/hematol/ASH-Edu.htm
- Interactive Basic Hematology https://hemeteam.com/
- The Medical Biochemistry http://web.indstate.edu/thcme/mwking/blood-coagulation.html#intro
- Blood_ Outline https://es.scribd.com/document/106071429/Blood-Outline
- Bloodline http://www.bloodline.net/
- Hematology Links - Atlas and Slides http://www.hematologyatlas.com/principalpage.htm
- Hematology, MedMark http://www.medmark.org/hem/hem2.html
- Hematopathology Index Medscape http://www.medscape.com/index/section_154_0
- HemoSurf http://www.aum.iawf.unibe.ch/vlz/bwl/Haematologie/index.htm
- American Society of Haematology https://www.ashacademy.org/Product/TeachingCasesList

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.feps.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://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/.