DEGREE CURRICULUM

CLINICAL BIOCHEMISTRY

Coordination: HERREROS DANES, JUDIT

Academic year 2020-21

CLINICAL BIOCHEMISTRY 2020-21

Subject's general information

<table>
<tr><td>Subject name</td><td>CLINICAL BIOCHEMISTRY</td></tr>
<tr><td>Code</td><td>101530</td></tr>
<tr><td>Semester</td><td>2nd Q(SEMESTER) CONTINUED EVALUATION</td></tr>
<tr><td>Typology</td><td>
<table>
<tr><th>Degree</th><th>Course</th><th>Character</th><th>Modality</th></tr>
<tr><td>Bachelor's Degree in Biomedical Sciences</td><td>3</td><td>OPTIONAL</td><td>Attendance-based</td></tr>
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<tr><td>Course number of credits (ECTS)</td><td>6</td></tr>
<tr><td>Type of activity, credits, and groups</td><td>
<table>
<tr><th>Activity type</th><td>PRAULA</td><td>TEORIA</td></tr>
<tr><th>Number of credits</th><td>1.2</td><td>4.8</td></tr>
<tr><th>Number of groups</th><td>2</td><td>1</td></tr>
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<tr><td>Coordination</td><td>HERREROS DANES, JUDIT</td></tr>
<tr><td>Department</td><td>BASIC MEDICAL SCIENCES</td></tr>
<tr><td>Important information on data processing</td><td>Consult this link for more information.</td></tr>
<tr><td>Language</td><td>Catalan/Spanish
English (oral presentations of students)</td></tr>
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CLINICAL BIOCHEMISTRY 2020-21

Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
CABISCOL CATALA, ELISA	elisa.cabiscol@udl.cat	3,6	
HERREROS DANES, JUDIT	judit.herreros@udl.cat	3,6	

Subject's extra information

Teachers are fully available for tutoring on the subject and other issues related to the BSc studies, after being contacted by e-mail to fix an appointment.

Learning objectives

Students will be able to describe the biochemical and molecular bases associated to the main metabolic disorders.

Students will be able to assess the analytical parameters associated to normal metabolism, and its diagnostic value in disease in the context of clinical practice.

Students will be able to describe and apply the main analitical techniques in a clinical biochemistry laboratory in Biomedice.

Competences

Module I. Scientific Basis of Life

Applying the principles of inorganic chemistry, organic chemistry and physical chemistry to the study of biomolecules and fundamental biochemical processes.
Understanding the structure and function of biomolecules. Understanding the mechanisms of synthesis and degradation of biomolecules and their regulation.
Integrating molecular and metabolic functions of the human body in human pathology and therapeutic techniques.
Understanding the structure and function of animal cells, as well as their life cycle and the mechanisms that regulate it, and acquire an integrated molecular understanding, the different structural and functional cellular structures and their changes in human disease.
Being able to design simple studies, and analyze and interpret the results according to the objectives.
Understand, critically evaluate and know how to use technologies and sources of clinical and biomedical information to obtain, organize, interpret and communicate clinical and scientific results.
To properly handle basic laboratory material and biochemical techniques.

Module II. Human Biology

Knowing the basics of the disease and the most prevalent human diseases.
Understand the medical language and terminology used in clinical practice.
Interpret a normal blood and urine analysis.
Knowing how to use biochemical, cytogenetic and molecular biology techniques applied to clinical diagnosis.
Knowing the applicability of biochemical, hematological, immunological, microbiological, pathological and imaging techniques.
How to obtain and process a biological sample for the study of different diagnostic procedures.

Know and understand the most common parameters used in clinical biochemistry lab.
Understand and manage clinical documentation procedures.

Module IV. Clinical issues (interdisciplinary module focused on medical problems in human pathologies)

Understanding the molecular, cellular, genetic and epigenetic diseases such as cancer, metabolic diseases, diseases of the nervous system, cardiovascular diseases and related processes such as aging.
Understanding the biological basis of most prevalent human diseases and how to use this knowledge to raise a research hypothesis.

Module VI. Elective Subjects

Contribute to key skill qualifications.
Learn the basic principles and fundamentals of clinical biochemistry used in diagnosis.
Understanding the biochemical processes and their relevance in human pathology.
Understand the applications of clinical biochemistry in the diagnosis and monitoring of diseases.
Learn the basic principles of experimental design, with special attention to the methodology of clinical trials.
Being able to plan a clinical trial, justifying the design, sample selection and data analysis.

Subject contents

1. Introduction to Clinical Biochemistry. Collection and preparation of specimens. Reference values, biological variability. Variability metrology. Precision, accuracy and sensitivity. Detection limit. Interpretation of results.

2. Analytical Methodology. Techniques and general methods (electrophoretic methods, chromatography, spectroscopy). Immunoassays: technique of ELISA and modalities.

3. Water and electrolytes. Alterations in plasma concentration of sodium and potassium. Acid-base balance. Buffer systems. Acidosis and alkalosis. Plasma calcium. Blood gases. Hemoglobin and hemoglobin disorders thalassemia.

4. Glucose homeostasis. Regulatory hormones. Diabetes mellitus (DM): classification and diagnostic criteria. Glucose tolerance test. Gestational diabetes. Symptoms, causes and consequences of hyperglycemia. Possible long-term complications of DM. Treatment of type 1 and 2 DM determination of glucose in biological liquids. Clinical importance of lactate and ketones. Anomalies of intestinal metabolism of carbohydrates: intolerance due to deficiencies in disacaridases. Tests of detection. Inborn errors of metabolism of carbohydrates: glicogenopaties. Abnormalities in the metabolism of galactose: galactosemia. Abnormal metabolism of fructose: fructosúria essential and fructose intolerance.

5. Composition and metabolism of plasma lipoproteins. Separation of lipoproteins. Dyslipidemia. Fredrickson classification. Cholesterol levels and cardiovascular risk. Hypertriglyceridemia. Control of dyslipidemia: criteria for establishing dietary treatments and / or drug. Based therapies in controlling LDL cholesterol, HDL-cholesterol. Relationship with atherosclerosis: basic mechanisms of formation of atherosclerotic plaque. Markers for the diagnosis of heart attack.

6. Plasma proteins: albumin, immunoglobulins, fibrinogen, complement factors. Changes in plasma proteins. Proteinogram. Protein in urine. Coagulation factors. Study of hemostasis and fibrinolysis. Coagulation disorders: von Willebrand disease, vitamin K deficiency and hemophilia.

7. Metabolism of nitrogen compounds: amino acids and nucleotides. Diagnostic value of transaminases and gamma-glutamyltransferase other liver enzymes. Urea cycle defects and abnormalities that cause hyperammonemia. Alterations of metabolism of amino acids and creatine creatinine. Metabolic alterations púriques bases. Urate: removal and determination. Hipouricèmia and hyperuricemia. Congenital disorders of the metabolism of purines. Deficiencies in the metabolism of nucleotides pirimidínics.

8. Iron: absorption, transport and utilization. Control of intracellular iron levels. Disorders of iron metabolism. Hemochromatosis. Control of iron systemic role of hepcidin. Determination of total iron and TIBC: diagnostic value.

Heme synthesis. Alterations synthesis: Porphyria: types and consequences of heme degradation. Bilirubin: education and transportation. Total and direct bilirubin: determination and diagnostic value. Jaundice: pre-hepatic intra-hepatic and post-hepatic baby. Syndromes of bilirubin metabolism.

Methodology

- Lectures. Whose purpose is to present and explain the theoritical content, emphasizing those aspects that will be useful for the training of the student.

- Seminars. The seminars are designed to extend on concepts presented in lectures and/or apply the concepts in solving clinical cases.

- Laboratory. The lab work is intended for students to apply their knowledge in practicing the calcution of biochemical parameters clinically relevant, and to complement the theoretical concepts presented in the lectures. There will be four practicals: 1) a visit to the clinical analysis laboratory of the Hospital Arnau de Vilanova, 2) an study of renal function, 3) obtaining determinations and serum creatinine and creatine kinase activity, and 4) determination of bilirubin and liver transaminases.

Teaching will be face to face unless due to COVID-19 restrictions, in which case lectures/seminars could be virtual.

Lab practices will be priorized to be face to face, in small groups in the lab, but could be substituted by alternative virtual contents if presence of students in the lab is not allowed at some point.

Development plan

Tema 1. Introduction to Clinical Biochemistry. (Judit Herreros)

Tema 2. Analytical Methodology. Immunoassay (Judit Herreros)

Tema 3. Water and electrolites. Acidosis and alkalosis. Hemoglobin (Judit Herreros).

Tema 4. Homeostasis of glucose. Diabetes mellitus (DM). (Elisa Cabiscol).

Tema 5. Metabolism of liporoteins Colesterol-LDL and colesterol-HDL. Aterosclerosis and infarct (Elisa Cabiscol).

Tema 6. Plasma proteins: albumin, immunoglobulins. Proteinograms. Proteins in urine. Coagulation. Hemostasis and fibrinolisis (Judit Herreros y Silvia Picó).

Tema 7. Metabolisme of nitrogen compounds . Diagnostic value of hepatic enzymes . Defects of urea cycle. Creatin and creatinin. Metabolism of purines. Urate. Metabolism of pirimidinic nucleotides (Judit Herreros).

Tema 8. Iron: Absortion, transport and use. Control. Hemocromatosi. Hepcidin. Total iron and TIBC. Sinthesis of hemo group. Bilirrubin, total and direct. Jaundice, types. (Elisa Cabiscol).

Evaluation

-Theory (65%): 1st part: 30%; 2nd part: 35%.

-Exam on seminars and lab practicals (18%).

-Exam on clinical cases (17%)

You can only recover the corresponding part of the theory in a 2nd opportunity exam.

The theory must be passed with a grade > 5 to average with the other parts.

The student who decides to present a recovery exam will be marked with the grades corresponding to the last exam.

Exams will take place face to face but, due to specific reasons, could be virtual.

Bibliography

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