



Universitat de Lleida

DEGREE CURRICULUM
**PATHOLOGY AND
PATHOPHYSIOLOGY**

Coordination: TARRAGONA FORADADA, JORDI

Academic year 2023-24

Subject's general information

Subject name	PATHOLOGY AND PATHOPHYSIOLOGY			
Code	100530			
Semester	PRIMER QUADRIMESTRE			
Typology	Degree	Course	Character	Modality
	Bachelor's Degree in Medicine	3	COMPULSORY	Attendance-based
Course number of credits (ECTS)	6			
Type of activity, credits, and groups	Activity type	PRAULA		TEORIA
	Number of credits	2.4		3.6
	Number of groups	4		1
Coordination	TARRAGONA FORADADA, JORDI			
Department	BASIC MEDICAL SCIENCES			
Teaching load distribution between lectures and independent student work	Classroom hours: 60 Non-classroom hours: 90			
Important information on data processing	Consult this link for more information.			
Language	Catalan, Spanish			
Distribution of credits	Lectures: 36 hours Seminars:: 24 hours			

Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
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Learning objectives

A. General objective

To provide the student with a global knowledge of the morphological and molecular bases in general pathology, as well as to provide the basic technical knowledge of Pathological Anatomy laboratories. The student will have to recognize the basic morphological alterations in the different tissues of the organism and interpret them properly. Likewise, the student will have to recognize the histopathology of the most frequent diseases, their grading and their prognosis.

Competences

Competencies to which it contributes:

- 1.- Indicate the appropriate biopsies and cytologies
- 2.- Know how to obtain the samples for the most common cytological and pathological studies and how to store them properly.
- 3.- Understand a Pathological and/or Cytology report
- 4.- Evaluate information that can be obtained from a clinical autopsy.

Subject contents

PART I: INTRODUCTION (Dr. Jordi Tarragona)

1.- Introduction to Pathology

Historical background. Study methods in human pathology. Role of Pathological in current medicine: surgical pathology (biopsies, surgical specimens, intraoperative biopsies), cytopathology (smears, liquids, fine-needle-aspiration), autopsy pathology, immunohistochemistry, molecular pathology.

Clinicopathological correlation. Clinical-pathological sessions. Importance of experimental pathology.

Educational objectives:

At the end of the lecture, the student must know the characteristics of Pathological Anatomy as a subject and as a medical specialty.

PART II: CELLULAR PATHOLOGY AND METABOLIC DISORDERS (Dr. Jordi Tarragona)

2.- Adaptations of Cellular Growth and Differentiation

Mechanisms of cellular homeostasis. Cellular adaptations of growth and differentiation. Physiological and pathological atrophy. Hypertrophy. Induction of the smooth endoplasmic reticulum. Physiological and pathological hyperplasia. Metaplasia.

3.- Cell Injury (1): Overview. Ischemic and Hypoxic Injury

Causes and mechanisms of cell injury. Reversible and irreversible changes. The "point of no return". Ischemic and hypoxic lesions. Reperfusion cell injury.

4.- Cell Injury (2): Free Radicals, Chemical Injury and Radiation

Cell damage by free radicals. Defensive mechanism. Aging. Chemical injury (drugs, tobacco, industrial agents). Cell injury by radiation (ionizing, ultraviolet and electromagnetic fields)

5.- Cell Injury (3): Necrosis and Apoptosis

Morphology of irreversible cell injury. Types of necrosis. Causes, morphological and molecular changes of apoptosis (programmed cell death)

6.- Cell Injury (4): Subcellular Alterations. Intracellular accumulations of triglycerides and cholesterol.

Subcellular alterations: lysosomes, endoplasmic reticulum, mitochondria, cytoskeleton. Lipid deposits: fatty change (fatty degeneration or metamorphosis). Cell injury by alcohol. Nutritional alterations.

7.- Metabolic disorders of iron and copper. Pigments. Forms of pathologic calcification.

Primary and secondary hemochromatosis. Wilson's disease. Pigments. Dystrophic and metastatic calcification.

Educational objectives:

The student must finish this part knowing the morphological characteristics and molecular alterations of the

different forms of cell injury, adaptation, cell death and intracellular deposit of substances. The student must know the mechanisms of cell injury by hypoxia and free radicals and be able to understand practical examples. He must also know the different forms of necrosis and differentiate them. Concepts of necrosis and apoptosis. At the end of this part, the student must understand the role of apoptosis in different pathologies and know practical examples. The student must know the basics of the main metabolic diseases and the mechanisms of intracellular accumulation.

PART III: ACUTE AND CHRONIC INFLAMMATION. REPAIR (Dr. Jordi Tarragona)

8.- Inflammation (1): Definition and General Features. Changes in vascular flow and caliber and increased vascular permeability

Concept. History. inflammation and repair Acute and chronic inflammation. Exudate and transudate. Hemodynamic changes (vascular phase of acute inflammation). Transient vasoconstriction, arteriolo-capillary-venular vasodilatation (active hyperemia), slowing of blood circulation (stasis) and leukocyte margination. Patterns of increased vascular permeability: 1) early or immediate transient, 2) immediate prolonged, and 3) late prolonged.

9.- Inflammation (2): Changes in cells (Leukocyte recruitment, Chemotaxis and Phagocytosis). Mediators of Inflammation

Margination, rolling and adhesion of polymorphonuclear leukocytes to the vascular endothelium. Cytokines. Cell adhesion molecules. Chemotaxis. Main chemotactic agents. Phagocytosis: recognition (opsonins), engulfment and degradation (H_2O_2 production). O_2 dependent and independent bactericidal mechanisms.

Vasoactive amines: histamine and serotonin. Plasma proteases: kinins, complement and coagulation-fibrinolysis. Arachidonic acid derivatives in inflammation (prostaglandins and thromboxane A₂). Chemical mediators of inflammation produced by neutrophils and monocytes. Other chemical mediators.

10.- Inflammation (3): Patterns of Acute Inflammation. Outcomes

Types of exudate: serous, fibrinous, suppurative or purulent, and hemorrhagic. Abscess, phlegmon, empyema, ulcer, pseudomembranous inflammation and catarrhal. Outcomes of acute inflammation; resolution, suppuration and progression to chronic inflammation.

11.- Chronic inflammation. Granulomatous inflammation

Clinical forms of chronic inflammation. Histological characteristics and mechanism of chronic inflammation. Systemic consequences of inflammation. Granuloma; concept. Types of cells present in granulomas. Types of granulomas.

12.- Tuberculosis (Dra. Pilar Gallel)

Tuberculosis. Pathogenesis. Morphology: Primary Tuberculosis. Secondary Tuberculosis. Progressive pulmonary tuberculosis.

13.- Tissue repair

Concept of tissue regeneration and repair. Repair by connective tissue deposition. Granulation tissue. Scar formation. Molecular aspects of repair. Fracture repair.

Educational objectives:

The student must finish this part knowing the morphological characteristics and molecular alterations of the forms of acute and chronic inflammation and repair. The student must be able to understand practical examples and distinguish the different forms of inflammation.

PART IV: IMMUNOPATHOLOGY (Dra. Pilar Galle)

14.- Diseases of the Immune System. Rejection of Tissue Transplants

15.- Acquired Immunodeficiency Syndrome (AIDS)

16.- Amyloidosis

PART V: HEMODYNAMIC DISORDERS (Dr. Jordi Tarragona)

17.- Hyperhemia, Edema and Hemorrhagic disorders. Thrombosis

18.- Embolism

19.- Ischemia and Infarct

20.- Arteriosclerosis and Hypertensive Vascular Disease

PART VI: NEOPLASIA (Dra. Judit Pallarés, Dr. Jordi Tarragona)

21.- Concept and Nomenclature. Epidemiology of Cancer

22.- Benign and Malignant Neoplasms

23.- Molecular Basis of Cancer (1)

24.- Molecular Basis of Cancer (2)

25.- Molecular Basis of Cancer (3)

26.- Biology of Tumor Growth

27.- Local Invasion and Metastasis

28.- Chemical and Physical Carcinogenesis

29.- Microbial Carcinogenesis. Hormonal Factors.

30.- Benign Epithelial tumors

31.- Malignant Epithelial tumors.

32.- Mesenchymal Tumors. Soft tissue tumors. Sarcomas.

33.- Osteochondrogenous tumors

34.- Neuroectodermal tumors. Melanocytic tumors

35.- Hematopoietic system tumors

36.- Other malignancies. Diagnosis and prognosis of neoplasms

Methodology

Lectures

These will be conducted with all students and are not mandatory. They are intended to present the contents and highlight the most important aspects of Pathology

In the academic year 2023-24 the lectures will be held virtually in classroom.

Seminars

These will be carried out with 1/4 of students. They are mandatory and must be done with the corresponding group. They aim to deep in the contents and applications of the concepts introduced in lectures.

The first seminar will be conducted with all students and will explain the role of the pathologist in the hospital.

The other seminars are one for every part of the subject and consists of 2 parts: image seminar and clinical seminar.

Computer activities

In order to show web resources for finding images and websites in Pathology. They will be conducted in groups of 1/4 students. They are mandatory.

Necropsy

These will be carried out with groups of 4 of students. They are not mandatory

Students will attend autopsies only if health authorities allow students to enter the facility.

Development plan

The lectures will be held between September 2023 and January 2024.

After each thematic block, the corresponding seminars will be held in medium-sized groups: an image interpretation seminar and a clinical-pathological comments seminar based on real cases. Also, in a medium group, practices will be carried out in the computer room halfway through the course to explore online resources related to the subject. The attendance in these seminars are compulsory and are part of the continuous training activities.

During the first weeks the supervised visit to the Pathology Service will be carried out in small groups. The attendance of these visits are compulsory and are part of the ongoing training activities. The visit is linked to an activity that the student will carry out individually.

List of seminars:

Seminar 1: The seminar consists of 4 parts: autopsy pathology, surgical pathology, cytological studies and molecular studies. This seminar will be complemented by a group visit to the Pathological Anatomy service.

Seminar 2: Cell Injury (Image seminar) Dra. Gatius

Seminar 3: Cell Injury (Clinical seminar) Dra. Gatius

Seminar 4: Inflammation (Image seminar) Dra. Abó

Seminar 5: Inflammation (Clinical seminar) Dra. Abó

Seminar 6: Immunopathology (Image seminar) Dra. Gallel

Seminar 7: Immunopathology (Clinical seminar) Dra. Gallel

Seminar 8: Vascular (Image seminar) Dr. Vilardell

Seminar 9: Vascular (Clinical seminar) Dra. Abó

Seminar 10: Cancer (Image seminar) Dra. Gatius

Seminar 11: Cancer (Clinical seminar) Dra. Gatius

Practice in the computer room

Surfing the online resources for the study of Pathology and study of real cases.

Practice taught by Dra. Abó

Evaluation

Midterm Exam 1 (November 2023):

Evaluation with both multiple choice and development questions. 50% of the theoretical content of the subject is evaluated. Wrong answers in multiple choice questions are penalized. 20% of the questions correspond to the evaluation of the content of the seminars and will be done with images. Some of the multiple choice questions will be about seminar number 1.

Midterm Exam 2 (January 2024):

Evaluation with both multiple choice and development questions. 50% of the theoretical content of the subject is evaluated. Wrong answers in multiple choice questions are penalized. Like in the Midterm Exam, 20% of the questions correspond to the evaluation of the content of the seminars and will be done with images.

Second Term Exam (June 2024):

For those who are failed the previous one. Evaluation with 10 development questions,

Parts of the final mark:

Exam 1: 45%

Exam 2: 45%

Attendance at seminars, computer practice and visit to the Service (with the activity): 10%

Alternative evaluation:

In case that a student, for work reasons, has been granted the alternative evaluation by the Center, this will be carried out in a single exam on the same day of the second partial exam, at the end of the semester. This test will have a weight of 90% of the mark. Likewise, the student will have to visit the service with the corresponding activity, which will represent the remaining 10%. The student will be entitled to recovery of the 90% exam.

Bibliography

BASIC REFERENCES:

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Elsevier Saunders 2021

- Kumar, Abbas, Aster. Patología Humana, 10ª Edición. Elsevier. 2018.
- Rosai and Ackerman's Surgical Pathology 11ª Edición Mosby Elsevier 2017
- ROBBINS & COTRAN PATHOLOGIC BASIS OF DISEASE, TENTH EDITION Elsevier, 2021

COMPLEMENTARY REFERENCES:

- Mac Sween RMN and Whaley K. Patología de Muir. Ed. Interamericana McGraw-Hill, 1995.
- Pardo FJ. Anatomía Patológica. Mosby/Doyma, Madrid, 1997.
- Rubin's Pathology: Clinicopathologic Foundations of Medicine Lippincott Williams and Wilkins 7e 2014
- Rubin's Pathology: Mechanisms of Human Disease LIPPINCOTT RAVEN; 8 edición 2019
- Stevens A, Lowe J. Anatomía Patológica. Elsevier España, 2ª edición 2001.

ADDITIONAL MATERIALS:

- Cooke RA, Steward B. Atlas de Anatomía Patológica. Doyma, 1989.
- Lefkowitz JH. Atlas de Histopatología. Doyma, 1992.
- Wheater Histopatología Básica Atlas y texto en color Lowe, J. Young, B. Stevens, A. Cuarta edición Elsevier 2003
- WHEATER Anatomía Patológica. Texto, Atlas y Revisión de Histopatología O'Dowd, G. — Bell, S. — Wright, S. 6ª Edición Elsevier Abril 2020
- ROBBINS & COTRAN ATLAS DE ANATOMÍA PATOLÓGICA Klatt, E.C. 4ª Edición, 2022

RESOURCES AVAILABLE IN THE HEALTH CAMPUS LIBRARY:

- Klatt EC, Robbins SL, Cotran RS, Robbins SL (Stanley L. Atlas de anatomía patológica. 3a ed. Ámsterdam: Elsevier; 2016. https://cercatot.udl.cat/permalink/34CSUC_UDL/ukhc0f/alma991001551599706714
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- Mills SE. Histology for Pathologists. 4th ed. Philadelphia: Wolters Kluwer; 2012. https://cercatot.udl.cat/permalink/34CSUC_UDL/101iije/cdi_askewsholts_vlebooks_9781469845500
- Mitchell RN, Kumar V, Abbas AK, Aster JC, Perkins JA. Compendio de Robbins y Cotran: patología estructural y funcional. 9a ed. Barcelona: Elsevier; 2017. https://cercatot.udl.cat/permalink/34CSUC_UDL/50r6o1/alma991002623779706714