

Academic Year/course: 2021/22

## 28400 - Cytology and histology

### Syllabus Information

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**Academic Year:** 2021/22

**Subject:** 28400 - Cytology and histology

**Faculty / School:** 105 - Facultad de Veterinaria

**Degree:** 451 - Degree in Veterinary Science

**ECTS:** 8.0

**Year:** 1

**Semester:** Annual

**Subject Type:** Basic Education

**Module:**

## 1. General information

### 1.1. Aims of the course

The general goal of "Cytology and Histology" is to study the structure and ultrastructure of cells and tissues and their organization to form the different organs, grouped in turn into systems and apparatus in the animal organism.

The subject is part of the Basic Training Module and continues with the training process started with Anatomy (macroscopic point of view), by developing knowledge of the animal organism at a microscopic level.

### 1.2. Context and importance of this course in the degree

Students will gain a thorough understanding to approach the study of other subjects of the Degree such as Physiology, Pathological Anatomy and other Pathologies

### 1.3. Recommendations to take this course

Basic knowledge of Anatomy, Biology, Chemistry and Biochemistry.

In order to carry out practical activities, safety recommendations must be followed, which must be taken into account. Students have all the information available in the following links, as well as in the ADD courses of each of the subjects:

<https://veterinaria.unizar.es/estudiantes/formacion-prevencion-riesgos-y-seguridad#normas>

<https://veterinaria.unizar.es/prevencion/protocolosespecificosveterinaria>

<http://patologiaanimal.unizar.es/medidas-de-seguridad>

## 2. Learning goals

### 2.1. Competences

On successful completion of this course, students will be able to:

1. Know the structure of cells and identifying their organelles.
2. Understand the functions of these organelles and how they relate to each other in order to carry out all functions of each cell.
3. Know the components and the microscopic organization of the different tissues.
4. Know the microscopic organization of the organs that form apparatuses and systems of an animal organism.
5. Observe and identify cells, tissues and organs at a microscopic level in different histological preparations, recognise and describe the main structural singularities that define them.
6. Communicate their knowledge in a correct and effectively way.
7. Proper management of necessary means for the study of the subject.

### 2.2. Learning goals

If students complete the course successfully, they should be able to

1. Use correctly the basic terminology of Cytology, Histology and Microscopic Anatomy
2. Identify the structural and ultra-structural characteristics of cells.
3. Know the organelles functions and other cellular structures, relating them to each other and understand their necessary coordination for the cell to carry out its tasks.
4. Describe components and characteristics of the different tissues.
5. Know the disposition and microscopic organization of tissues to form the organs, apparatuses and systems of the animals, object of study of the veterinarian professional.
6. Acknowledge the meaning and fundamentals of basic histological sample preparation techniques
7. Recognize and differentiate the basic methods of microscopic staining and observation.
8. Use properly the optical microscope for observation of histological slices.
9. Recognize and differentiating cells, tissues and animal organs under the optical microscope, and how to describe them.
10. Obtain and correct use of bibliographic information related to the subject

### 2.3. Importance of learning goals

In Veterinary Medicine studies, it is necessary to know the animal organism for both health maintenance and disease treatments

## 3. Assessment (1st and 2nd call)

### 3.1. Assessment tasks (description of tasks, marking system and assessment criteria)

The student must demonstrate that has achieved the intended learning outcomes through the following assessment activities

1. Evaluation of theoretical knowledge (60% of the final grade).

1.1. Theoretical exams

The evaluation of learning results number 1, 2, 3, 4, 5 and 10 will be carried out by means of 2 partial exams (1st partial and 2nd partial). The sum of the score obtained from both theoretical exams will represent 60% of the final grade but each partial exam must be passed individually to pass the course. The minimum score necessary to pass the theory exams will be 50% of the total points.

The 1st partial theory exam will be held in January / February. Students who do not pass it will be able to present themselves again in the 1st official call (June).

The 2nd partial theory exam will be held in June together with the 1st official call.

Students who pass any of the theoretical partial exams but who fail to pass the subject in the 1st official call will obtain a failure grade, but the grade will be saved for the 2nd official call (September)

1.2 Continuous evaluation

During the course there will be 15 modules of continuous evaluation of the theoretical part. These written tests will be carried out in each practice session.

To pass a module you must obtain 50% of the possible points. To pass each of the partial exams through the module system, students must pass each of the modules separately. Students who cannot take a continuous assessment module will only be able to recover it if it is for a justified cause, upon presentation of the corresponding written document.

### 2. Practical examinations

Two types of compulsory practical exams will take place:

2.1. Practical examination with images. Histological images will be projected to be identified by the student, this type of examination will take place twice a year and each of them will be marked from 0 to 10 points. Students who have not been able to take any of these exams during the academic year or who have not obtained the required minimum mark (10 out of 20 points), they will have to take it on the day of the final assessment.

There will be 2 types of mandatory practical exams:

2.1. Practical exam with images. It will consist of the projection of histological images that the student must identify. There will be 2 exams of this type during the course, the first coinciding with the first theoretical partial exam and the second in the month of May. Students who have not been able to take any of these exams during the school period or who have not obtained the minimum required grade (10 out of 20 points), must take a new practical exam with images on the day of the final exam. will include all those studied during the course. The score obtained will represent 20% of the final grade

2.2 Practical examination with microscope. In this exam, each student will receive 4 histological preparations that must be observed under the microscope, identifying the tissue or organ in question and making a brief histological description of them. Each preparation will be valued on 5 points. The minimum score necessary to pass this exam will be 10 points. The score obtained will represent 20% of the final grade.

Students who pass any of the 2 practical exams but fail to pass the subject in the first official call will receive the qualification of suspense, but they will save the grade for the second call and if necessary for the next course.

### **Examinations for non-attendance students or those who do not take them on first season**

Non-attendance students will have to take a final assessment, which will consist of a theoretical exam (which has 2 partial exams) and a practical one (images and microscopes). They will also have to undertake an additional practical exam that replaces the practice.

For students who appear in other calls different from the first, the evaluation, assessment criteria and level of demand will be the same as in the first call.

### **Examination Schedule**

Dates and times of the first and second season final exams are publicly available on :

<https://veterinaria.unizar.es/examenesvet>

Dates for partial and practical exams will be released along the academic year.

### **Assessment criteria**

Valuation criteria and requirement levels

To pass the course, it is necessary to carry out at least 85% of the practicals and pass each of the exams separately (first theoretical part, second theoretical part, practical exam with microscope and practical exam with images).

The final mark is obtained by:

\* The average of the theoretical exam marks (up to 60 points).

\* Marks of practical exams (up to 40 points)

### **Marking system:**

According to the national regulation Law 1025/2003, 5th of September which lays down the European system of credits and marking system for the university degree.

0-4,9: FAIL.

5,0-6,9: PASS

7,0-8,9: GOOD (NT).

9,0-10: EXCELLENT (SB).

As the article 158 of the Statutes of the University of Zaragoza lays down, provisional grades will be displayed at least for 7 days and students will be able to review them on the date, time and place provided for that purpose.

## **4. Methodology, learning tasks, syllabus and resources**

### **4.1. Methodological overview**

This subject is included in the common basic training, so that the understanding and assimilation of theoretical and practical knowledge, enable students to continue their training in other subjects taught in the higher courses of the degree.

To achieve this objective, the subject intersperses 60 hours of participatory theoretical classes with 30 hours of practical classes, trying to ensure that the time that elapses from when they acquire theoretical knowledge until they apply it in practice is the minimum possible. There is also a complementary seminar of theoretical-practical training

To support the student's learning, all the general information material (Teaching Guide, exam dates, grades, etc.) as well as didactic material selected by the teachers of the subject of each theoretical topic and each session will be posted on the Digital Teaching Platform

The hours of tutoring in person, which must be previously arranged with the teachers of the subject, will be the channel for dealing with theoretical and / or practical doubts. It also offers the possibility of tutoring by email with the coordinator of the subject

### **4.2. Learning tasks**

The program that is offered to the student to help him to achieve the expected results includes the following activities..

a) Theoretical classes of a face-to-face nature, in which the topics of the theoretical program will be exposed. 55 classes of 50 minutes duration are proposed in which the contents of the program will be explained, for which the teachers will use PowerPoint presentations with images appropriate to the contents.

b) Seminars: At the beginning of the course, a seminar will be held in which the methodology applied to obtain histological preparations will be explained and later electron microscopy images corresponding to the theoretical contents of Cytology will be shown, commenting and discussing them.

c) Laboratory practices: In a coordinated and parallel way to the theoretical teaching, practical teaching will be developed, face-to-face and in small groups, where the student will observe histological preparations of different tissues and organs under the supervision of a light microscope. The unexcused absence from more than 15% of the practices implies that the student will have to take an additional practical exam

d) Continuous evaluation: in each practical session, 10 minutes will be dedicated to taking a written test in which the theoretical part developed in the face-to-face theoretical classes given the previous days will be evaluated

- e) Tutorials: Meeting prior appointment arranged by email with a teacher to consult questions related to the subject.
- f) Hours dedicated to the study of the subject, by students
- g) Carrying out the written tests

### 4.3. Syllabus

#### Introduction

Unit 1. Cytology and Histology concept. Historical perspective. Spanish School of Histology. Histological methods: microscopy, electron microscopy, histochemistry, immunocytochemistry.

#### Cytology

Unit 2. Introduction to cell study. Cell Theory. General concepts: prokaryote and eukaryote cells. Observation of fixed and stained cells.

Unit 3. Plasma membrane: structural model and chemical composition. Properties and functions. Molecular transport. Endocytosis and exocytosis.

Unit 4. Ribosomes. Endoplasmic reticulum: ultrastructure and varieties: granular (rough) and agranular (smooth) endoplasmic reticulum. Functions.

Unit 5. The Golgi complex: ultrastructure. Functions. Cellular secretion. Unit 6. Lysosomes and peroxisomes: ultrastructure. Functions.

Unit 7. The mitochondria: ultrastructure. Functions.

Unit 8. The cytoskeleton: microtubules, microfilaments and intermediate filaments. Ultrastructure and organization. Functions. Cytoplasmic Inclusions. Hyaloplasma.

Unit 9. The nucleus: general characteristics: shape, number, position and general structure. Nuclear envelope. Nuclear pores. Chromatin. Nucleolus. Nucleoplasm.

#### General Histology

Unit 10. Animal Tissues: concept. Tissue differentiation and renovation. Tissue classification. Epithelial tissue. Structural and functional characteristics. Cellular polarity: apical, lateral and basal surfaces. Epithelial classification. Lining epithelia types. Glandular epithelia and glands. Epithelial cell renewal.

Unit 11. Connective tissue: structural and functional characteristics. Classification. Cells and extracellular components. Adipose tissue.

Unit 12. Cartilage: structure. Classification. Hyaline cartilage. Elastic cartilage. Fibrous cartilage. Origin and growth of cartilage.

Unit 13. Bone: general characteristics. Classification. General structure of bones. Cellular and matrix components of Unit 14. The blood: Study techniques. Erythrocytes, leukocytes, platelets. Morphological variations, structure and chemical composition. Differences in various animal species. The bone marrow. Hematopoiesis.

Unit 15. Muscle tissue: Types. Skeletal muscle. Types of muscle fibers. Muscle-tendon junctions. Cardiac muscle. Smooth muscle. Regeneration of muscle tissues.

Unit 16. Nervous tissue: general characteristics. Neurons: structure and ultrastructure. Classification of neurons. Nerve fiber: myelinated and unmyelinated nerve fibers. Degeneration and regeneration of nerve fibers. Interneuron synapses. Neuroglia.

#### Microscopic Anatomy

Unit 17. Nervous system: general organization. Central nervous system: the brain. Structure of isocortex. White matter. Cerebellum. Cellular organization of cerebellar cortex. White matter. Spinal cord: white and gray matter. Meninges. Ependyma. Choroid plexuses. Peripheral nervous system: peripheral nerves. Dorsal root ganglia.

Unit 18. The cardiovascular system: arteries. Arteriolar-venous anastomosis. Capillaries. Chemoreceptors and baroreceptors. Veins. Venous circulation and valves. The heart: cardiac skeleton. Cardiac valves. Lymphatic vessels.

Unit 19. Lymphoid organs: general characteristics. Primary lymphoid organs: the thymus and the bursa of Fabricius. Secondary lymphoid organs: lymph node, the spleen, hemolymph nodes.

Unit 20. The digestive system: the buccal cavity, tongue, teeth, lips and palate. The pharynx. The salivary glands. The digestive tube: general structure: the esophagus, the glandular stomach, the compound stomach, the small intestine, the large intestine. The Peritoneum. The liver and gallbladder. The exocrine pancreas. The avian digestive system.

Unit 21. The Respiratory system: components and structural organization: the nasal cavity, the larynx, the trachea, the lung, the pleura. The Avian respiratory system, and the air

Unit 22. The urinary system: the kidney. Differences among domestic species. General structure. The nephron. Collecting duct system. Juxtglomerular complex. Blood supply of kidney. Lymphatic vessels. Renal pelvis. The ureters. The urinary bladder. The urethrae.

Unit 23. The Endocrine system: peripheral diffuse endocrine system. Hypophysis and epiphysis cerebri. The thyroid, parathyroid and adrenal glands. The endocrine pancreas.

Unit 24. The male reproductive system: general characteristics. The testes: structure and functions. The epididymis. The ductus deferens. The Accessory glands: vesicular, prostate and bulbourethral glands. The penis.

Unit 25. The female reproductive system: the ovary, the oviduct, the uterus and the vagina. The avian reproductive system. The mammary gland.

Unit 26. The integumentary system: the skin: epidermis and dermis. Hair follicle. Hair structure.

Unit 27. The eye: structure of eyeball and eyelid. The ear: general structure.

### 4.4. Course planning and calendar

The timetable and schedule of lectures and practical classes can be found at:

<https://veterinaria.unizar.es/horarios1vet>

The composition of the groups for the practical classes will be published in the unit bulletin board at the beginning of the course.

On the website of the Faculty of Veterinary Medicine (<https://veterinaria.unizar.es/academico/plan-estudios-grado-veterinaria>) detailed information is offered about the different activities programmed for this course and the corresponding deadlines.

#### **4.5. Bibliography and recommended resources**

<http://psfunizar10.unizar.es/br13/egAsignaturas.php?codigo=28400>