

Academic Year/course: 2022/23

28400 - Cytology and histology

Syllabus Information

Academic Year: 2022/23

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.

These approaches and objectives are aligned with the following Sustainable Development Goals (SDGs) of the United Nations 2030 Agenda (<https://www.un.org/sustainabledevelopment/es/>), in such a way that the acquisition of the results of Subject learning provides training and competence to contribute to some extent to its achievement.

? Objective 3: Health and wellness. Provide conditions and make students aware of the importance of maintaining good postural ergonomics when using the microscope

? Objective 4: Quality education

? Objective 5: Equal opportunities in all activities of the subject

? Objective 12: Responsible production and consumption

Make students aware of the importance of preferential use of natural light and turning off electrical equipment when they are not essential

Proper recycling of all paper used in exams

Despite the fact the content of this subject alone does not provide students with direct capacities to contribute to the 2030 Sustainable Development Goals (SDG) Agenda's achievement, they are essential to base the subsequent knowledge of the rest of the degree that is more directly related to the SDG, and, therefore, to the 2030 Agenda.

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.

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.

1.2 Continuous evaluation

During the course, 15 modules of continuous evaluation of the theoretical part will be carried out. These written tests will be carried out in each practice session. Students who cannot attend a module may only recover it if it is for a justified reason, upon presentation of the corresponding written document and only during the sessions in which that module is being carried out. To pass a module you must obtain 50% of the possible points. To pass a theoretical partial exam by the module system, students must separately pass 85% of the modules included in that part of the subject and obtain 50% of the possible points. (6 modules and 14 points in the 1st semester and 7 modules and 16 points in the 2nd semester)

2. Practical examinations

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 and the grade obtained will be the sum of both.

2.2 Practical examination with a microscope. In this exam, each student will receive 4 histological preparations that must be observed under a microscope, identifying the tissue or organ in question and making a brief histological description of them. Each preparation will be valued out of 5 points. The minimum score required to pass each practical exam (images/microscope) will be 10 points out of 20 possible. Students who have not been able to take any of the practical exams with images during the school year or who have not obtained the minimum grade required in any of them may take a new practical microscope or image exam on the days when the 1st and/or 2nd official call

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. This exam will consist of making schematic drawings with written indications of the different components of 4 tissues/organs studied in the practices

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. Hyaloplasm.

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.

PROGRAM OF PRACTICAL CLASSES

Practice 1. Epithelial Tissue (I)

Practice 2. Epithelial Tissue (II)

Practice 3. Connective Tissue

Practice 4. Cartilaginous and Bone Tissues

Practice 5. Muscle Tissue

Practice 6. Nervous System

Practice 7. Circulatory System

Practice 8. Lymphoid Organs

Practice 9. Digestive System I

Practice 10. Digestive System II

Practice 11. Respiratory System

Practice 12. Urinary System

Practice 13. Reproductive System

Practice 14. Review I

Practice 15. Review II

In the reviews, the students will have at their disposal the histological preparations that they have used in the practices and they will be able to ask their doubts to the professor in charge.

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>