Universitat Autònoma de Barcelona

2021/2022

Integrated Laboratory

Code: 102612
ECTS Credits: 3

Degree	Type	Year	Semester
2502445 Veterinary Medicine	OB	1	A

The proposed teaching and assessment methodology that appear in the guide may be subject to changes as a result of the restrictions to face-to-face class attendance imposed by the health authorities.

Contact

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Use of Languages

Principal working language: catalan (cat)
Some groups entirely in English: No
Some groups entirely in Catalan: No
Some groups entirely in Spanish: No

Teachers

Joaquín Ariño Carmona
Josep Maria Folch Albareda
Anna Genescà Garrigosa
Néstor Gómez Trias
Antonio Casamayor Gracia
Yolanda Saco Rodríguez
Marcelo Amills Eras
Teresa Anglada Pons
Maria Gracia Luigi Sierra
Marina Rodriguez Muñoz
Maria Ballester Devis

External teachers

Magí Passols Manzano

Prerequisites

The student must be attending simultaneously or have taken the Bioquímica (102662) and Biologia Animal i Cel·lular (102652) subjects.

It is essential to review and assimilate the documentation available in the spaces of the Virtual Campus regarding safety in laboratories. In addition, practice laboratories can not be accessed without justification of having passed the basic laboratory safety test, available in the Virtual Campus.

The use of the gown and safety goggles will be mandatory, as well as following the regulations regarding the safety elements described in the practice guides.

The use of a dressing gown and, in some practical lessons, the use of safety glasses will be mandatory, as well as following the regulations regarding the safety elements described in the practice guides.

Objectives and Contextualisation

The objectives of the subject are focused on the acquisition of competencies in the framework of the student's practical training: his introduction to practical laboratory work and his familiarization with the most used techniques in the fields of Biochemistry, Molecular Biology, and Cell Biology.

As for the subject of Biochemistry in these practices, some of the theoretical concepts explained in the expositive teaching sessions and in the seminars are applied and extended in the laboratory. In this subject, the student must acquire the knowledge and skills that give him/her a vision as complete as possible of the methods used in the purification and manipulation of proteins and DNA. In order to consolidate the theoretical knowledge of enzymatic kinetics, the student will experimentally determine the kinetic constants of an enzyme. Likewise, the knowledge of metabolism integration will be strengthened through the determination in healthy and diabetic animals of some altered metabolites in this disease.

Also, the student would also acquire the necessary knowledge for the determination of certain biological parameters that will be a reference when establishing clinical diagnoses in his/her future as a veterinarian. Another of the objectives of this subject is to make known to the student the necessary computer tools for obtaining information on the different biological molecules or for the bibliographic search.

The practice of Molecular Genetics applied to domestic species aims to familiarize the student with diagnostic techniques based on the use of molecular markers. From samples of pig blood and goat/cow milk, the student must extract genomic DNA. Subsequently, the diagnosis of porcine stress syndrome is carried out using PCR-RFLP, and the origin of the milk sample (goat or cow) is also inferred using a specific-species PCR based onthe analysis of mitochondrial DNA. The understanding and mastery of these techniques are important from the point of view of the diagnosis of hereditary diseases as well as for the certification of the origin of certain foods or products of pharmaceutical interest.

With regard to the contents related to Cell Biology, the practices in the laboratory focus on the learning of basic techniques specific to this field and the characteristics of the laboratory work. Specifically, the following objectives are set: to consolidate the practice in the use of an optical microscope and the preparation of samples for this type of microscopy, to observe different cell types and cell structures, to learn to interpret images obtained with different types of microscopes, to observe the mitotic division in different types of cells to understand the operation of the mitotic axis and the contractile ring, to observe the meiotic division in germ cells and to understand the processes of meiotic recombination and to observe the fertilization and first stages of embryonic development

Competences

- Analyse, synthesise and resolve problems and make decisions.
- Perform basic analytical techniques and interpret the clinical, biological and chemical results, and interpret the results of tests generated by other laboratories.

Learning Outcomes

1. Analyse, synthesise and resolve problems and make decisions.
2. Apply theoretical and practical experience of different basic biochemical procedures in the study of biological molecules.
3. Demonstrate theoretical and practical experience of different biochemical procedures of concern as a support for diagnosis.

4. Interpret and explain the functions of cells and basic cellular processes by means of practical experience.
5. Use theoretical knowledge and practical experience of different basic methodologies in the study of cells and their functions.

Content

The subject is structured in two types of contents: 1) Biochemistry and Molecular Biology and 2) Cell Biology.

First semester sessions will follow mixed face-to-face and non-face-to-face models.

Biochemistry and Molecular Biology (33h)

* Face-to-face sessions of the first semester.

BQ0: Description of the set of general safety norms in the teaching laboratories of Biochemistry and Biology.

BQ3: Determination of the Km of serum alkaline phosphatase.

BQ5: Metabolic study of diabetes (hepatic glycogen, glucose, and hydroxybutyrate in serum).

BQ6: Study of renal function in dogs: determination of protein/creatinine ratio in urine.

* Non-face-to-face first semester sessions

BQ1: Separation of an amino acid mixture by ion-exchange chromatography (Dowex) as well as its identification by thin-layer chromatography (TLC).

BQ2: Computer applications for the bibliographic search (Pubmed) + gluconeogenesis (computer classroom).

BQ4: Manual proteinogram and use of the different profiles for diagnosis. Session complemented with a face-to-face seminar on the proteinogram-based diagnosis.

BQ7: The Clinical Biochemistry Laboratory (SBCV).

Second-semester sessions

* Sessions BQ8-BQ10 (LI6 in the timetable). Lab: V0-147 and computer room. (3.0h + 2.5h + 1.5h = 7.0h)

BQ8: Transformation of bacteria with plasmid DNA.

BQ9: Plasmidic DNA purification from bacteria (*Miniprep*) and DNA analysis by restriction.

BQ10: Bioinformatics applications.

* Sessions GM1-5 (LI8 in the timetable). Lab: V0-207.

Molecular Genetics applied to domestic species (2h + 2h + 1.5h + 1.5h + 2h = 9h)

Cell Biology. Lab V0-120 (18h)

* Face-to-face first semester sessions

* Session BC1. LI3 in the timetable. Optical microscopy

* Session BC2. LI4 in the timetable. Electron microscopy. The contents of this session will be implemented in a practical classroom format.

* Session BC3. LI5 in the timetable. Mitotic cell division

* Second-semester sessions

* Session BC4. LI7 in the timetable. Fluorescence and confocal microscopy (3h)

* Session BC5. LI9 in the timetable. Meiotic cell division (3h)

* Session BC6. LI10 in the timetable. Fertilization and embryo development (3h).

Unless the requirements enforced by the health authorities demand a prioritization or reduction of these contents.

Methodology

This is a practical subject in which no master lessons are given. Students perform the experimental work individually and under the supervision of the responsible teacher. However, part of the contents will be taught in seminar format or asynchronously online.

The practice Guides, where the protocols of each practice are detailed and the questionnaires of response are presented, will be available in the Virtual Campus of the subject.

Before beginning each practical session the student must have read the protocol and know the objectives of the practice, the fundamentals, and the procedures that must be carried out.

The aim of the practical classes is to complete and reinforce the knowledge acquired in the theoretical classes and seminars of the subjects of Biochemistry and Animal and Cell Biology as well as to acquire and reinforce basic notions of Molecular Genetics. The practical sessions will stimulate the acquisition of skills such as the ability to observe as well as the analysis and interpretation of the results obtained.

At the beginning of each practice session, an introduction will be made explaining the theoretical foundations of the practice to be performed, the operation of the different devices that will be used during the practice, as well as the general safety regulations to be taken into account during its development.
The proposed teaching methodology may experience some modifications depending on the restrictions to face-to-face activities enforced by health authorities.

Annotation: Within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Laboratory practical sessions	51	2.04	1, 2, 3, 4, 5
Type: Autonomous			

Study	24	0.96	1, 2, 3, 4, 5

Assessment

The evaluation system for the acquisition of competencies for this subject is based on continuous assessment based on written tests of different types, which include specific questionnaires and the resolution of problems/cases related to the practices.

Given the practical nature of the subject, attendance at the sessions is mandatory. Unjustified absences may be tolerated up to 10%. In any case, if the total number of absences (including justified and not justified) exceeds 20% of the total of the sessions, the student will be considered as Not Evaluable (No Presented).

The final score of the subject will be obtained exclusively from the weighted average, obtained by the continuous evaluation throughout the course, of the different contents. In order to pass the subject, it is necessary to obtain a final score of 5 o greater, provided that a minimum score of 3 has been obtained in each of the two groups of content. The contents of Biochemistry and Molecular Biology will contribute 66% and those of Cell Biology 34% to the final score.

It may be encouraged, if the teacher deems it appropriate, previous knowledge of the content of the practical sessions, through the procedures that the teachers determine. This factor can represent up to 10% of the score of that practice session.

Cell Biology

The practices will be evaluated through a multiple-choice test of approximately 15 minutes, which will be done in the laboratory at the end of each practice. The six exams will have the same weight and all together will contribute 34% of the final grade of the subject.

Biochemistry and Molecular Genetics

Students will be assessed by short tests, whether multiple-choice test type and/or, in certain sessions, the resolution of problemsthat require a short answer: two tests in the first semester, sessions LI1 (BQ1-BQ3) and LI5 (BQ4 - BQ7), and two in the second quarter, LI6 (BQ8-BQ10), LI8 (GM1-5). The score of the Biochemistry part will be the weighted average of the four tests (24,25: 27,25: 21,25: 27,25). The realization of the tests will be mandatory and will be qualified with "zero" the tests not realized.

Student's assessments may be subject to change as a result of the attendance restrictions imposed by the health authorities. Specifically, the weighting of the tests indicated in this Guide may change to adapt to the practical sessions that can finally be done for each part of the subject.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Short tests at the end of each practice or block of practices. It is included within the described time of the practice session (individual assessment)	Weighted average of the puntuation of the different tests, as described in "Evaluation"	0	0	1, 2, 3, 4, 5

Bibliography

Basic bibliography

* Nelson, D.L., & Cox, M.M. Lehninger Principles of Biochemistry. 5th edition. Freeman ed. 2009.

* Berg, J. M., Tymoczko, J. L. & Stryer, L. Bioquímica. 6ª edició. Ed. Reverté. Barcelona, 2007.
* Griffiths, AJ.F. Genética. 7ª edición. McGraw Hill/Interamericana de España ed. 2008.
* Voet, D., Voet, J.G i Pratt, C.W. Fundamentos de Bioquímica. 2ª edición. Ed. Panamericana. 2007.
* Kathi Canese and Sarah Weis. Chapter "PubMed: The Bibliographic Database" in the The NCBI Handbook. 2nd edition. Bethesda (MD): National Center for Biotechnology Information (US) http://www.ncbi.nlm.nih.gov/books/NBK153385/

Web links

Web pages for the DNA analysis and manipulation.

http://tools.neb.com/NEBcutter2/

http://molbiol-tools.ca/Restriction_endonuclease.htm

Database of biomedical literature

http://www.ncbi.nlm.nih.gov/pubmed/

The bibliography and the web links of the Cell Biology contents are indicated in the protocols of the practices or, where appropriate, in the Teaching Guide of the corresponding theoretical subject.

Software

No special software will be used