Universitat Autònoma de Barcelona

2021/2022

Assisted Reproduction Techniques Applied to the Management of Laboratory Animal Strains

Code: 103975
ECTS Credits: 3

Degree	Type	Year	Semester
2502445 Veterinary Medicine	OT	5	0

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: Yes
Some groups entirely in Spanish: No

Teachers

Manel López Béjar

Josep Santaló Pedro

Prerequisites

Although there are no prerequisites, to guarantee that the students can follow the subject correctly and achieve the proposed learning objectives, it is highly recommended that they have passed the compulsory third year subject *"Reproducció Animal*" and have previous knowledge about reproduction in mammals (gametogenesis, fertilization, preimplantation embryonic development).

It is also recommended that students have taken or are taking the optional subjects of *"Ciència de l'Animal de Laboratori*" and *"Biotecnologia Embrionària Aplicada a la Ramaderia*".

On the other hand, since most sources of information are in English, it is recommended that students have a basic knowledge of this language.

Objectives and Contextualisation

The subject aims to provide the students updated knowledge on the methodologies and procedures of assisted reproduction that are used in laboratory animals, as well as on their practical applications aimed at the expansion, recovery, maintenance and management of strains and lines of mouse, rat and hamster. This knowledge will be applicable in the future by students both in a context of basic research and for the work in facilities that breed or use experimental animals.

In this context, the main learning objectives of the subject are that students, at the end of the subject, will be able to:

– Describe the techniques of assisted reproduction and the procedures for in vitro manipulation of gametes and embryos from laboratory animals.

– Apply these technologies for the recovery, maintenance and management of lines and strains of laboratory animals.

Competences

- Demonstrate generic knowledge of animals, their behaviour and the bases of their identification.

Learning Outcomes

1. Describe the biological characteristics of the different species that are most frequently used in experimentation.

Content

THEORETICAL PROGRAM

BLOCK I: INTRODUCTION

Unit 1. Research with laboratory animals: Generalities.

Unit 2. Reproduction and breeding of laboratory animals.

BLOCK II: ASSISTED REPRODUCTION TECHNIQUES

Unit 3. Collection and culture of preimplantation embryos.

Unit 4. Collection of gametes.

Unit 5. Artificial insemination and in vitro production of embryos (IVM, IVF, ICSI, SCNT).

Unit 6. Embryo transfer and ovary transplantation.

BLOCK III: CRYOPRESERVATION OF GAMETES AND EMBRYOS

Unit 7. General principles of cell cryopreservation.

Unit 8. Cryopreservation of gametes and embryos.

BLOCK IV: PRODUCTION OF GENETICALLY MANIPULATED ANIMALS

Unit 9. Genetic manipulation techniques: Pronuclear DNA microinjection, chimera production, etc.

PRACTICAL PROGRAM

Obtention and manipulation of gametes.

In vitro capacitation of epididymal sperm.

Oocyte in vitro maturation.

In vitro culture of embryos.

Embryo manipulation: cloning by embryo splitting.

Cryopreservation of gametes and embryos.

Surgical techniques: vasectomy, embryo transfer.

Projection of audiovisual tutorials.

Methodology

The subject consists of theoretical and practical classes in the laboratory. The organization and teaching methodology to be followed in these two types of educational activities are described below.

Theoretical classes

The content of the theory program will be taught mainly in the form of master classes with audiovisual support. Presentations used in class will be previously available in the *Campus Virtual*. It is recommended that students regularly consult the books listed in the Bibliography section of this guide and the publications detailed at the end of each unit, in order to consolidate and, if necessary, clarify the contents explained in class. It is also recommended that students consult the links provided in the *Campus Virtual* and in each unit.

In addition to attending classes, students will also have an active role during the course, as they will have to develop on their own some parts of the theoretical program. This independent learning work can be done either individually or in small groups and will focus mainly on consolidating basic knowledge (some already covered in other subjects of the degree) or complementing the information received in class with readings or video views.

On the other hand, the teacher will propose a practical case that the students will have to deliver solved at the end of the subject. The case will be based on a situation that requires the application of assisted reproduction techniques in order to recover, maintain or manage a strain or line of laboratory animals. The objective of this activity is that the students transfer the knowledge acquired throughout the subject to a real situation and decide which actions are the most appropriate to solve the proposed case. The students will have to carry out this work in groups of 2 and each group will have to deliver a written report (following the guidelines provided by the teacher) on the date indicated at the beginning of the course.

Laboratory practical classes

The subject has a very practical character and more than half of the face-to-face hours (13 h) will be dedicated to laboratory practical work. These sessions are designed for the students to carry out some of the basic methodologies explained in class, and thus complement the theoretical training received with an applied aspect. Attendance to practical classes is compulsory and any absence must be duly justified.

The practices will be carried out in groups of 2 students and, throughout the different sessions, groups will have to answer a questionnaire with the results obtained and deliver it at the end of the practices.

It is compulsory for students to bring their own laboratory coat to each practical session and the protocol manual, which will be available on the *Campus Virtual*.

Before the start of the laboratory practices, students must pass the safety and biosafety test, or document that they have previously passed it.

Tutorials

At the request of the students, individual tutorials will be carried out aimed at resolving doubts about the theorical and practical contents.

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 classes	13	0.52	1

Theoretical classes	12	0.48	1
Type: Supervised			
Tutorials	2	0.08	1
Type: Autonomous			
Practical case solving	5	0.2	1
Study	41	1.64	1

Assessment

The evaluation of the subject will consist of the following activities:

1. Test of theoretical contents (individual assessment): In this test, which will be a multiple-choice test, the theoretical contents will be evaluated. The objective of the test is to assess not only that the students have acquired the conceptual knowledge of the subject, but also that they have understood it and know how to integrate, relate and apply this knowledge in certain situations. The weight of this test on the final grade of the subject will be 50% and to have the option of passing the subject it will be necessary to obtain a minimum mark of 4 points (out of 10).
2. Practical case (group assessment): the reports delivered by the working groups will be evaluated by the teacher and will have a weight of 10% on the final grade of the subject. The evaluation will mainly take into account that the students have chosen the most appropriate experimental approach to solve the case and that the choice of the techniques proposed is correctly reasoned.
3. Laboratory questionnaire (group assessment): the questionnaires that the students will complete throughout the laboratory practical sessions will be evaluated by the teacher and will have a weight of 40% on the final grade of the subject.

To be eligible to pass the subject, students will have to take all the assessment activities and attend all the practical sessions. Students will pass the subject only if they obtain a minimum mark of 4 points in the multiple-choice test and a minimum overall grade of 5 points for the weighted average of all the assessment activities.

Students with a mark lower than 4 in the multiple-choice test will have to retake the test. Only students who have previously taken the theoretical content test and have not reached the minimum grade required will be eligible forreassessment. If the mark obtained in the reassessment is again lower than 4 points, the students will not be able to pass the subject and will receive a final grade of 4 points for the subject, regardless of the average grade obtained with the marks of the rest of the assessment activities.

As no minimum pass marks are required for the rest of the assessable activities (practical case and laboratory questionnaire), they cannot be retaken.

Students will be grade as "No Avaluable" (not assessable) if the weighting of all conducted assessable is less than 67% of the final grade.

Repeating students will be able to keep the mark of the laboratory questionnaire obtained in the previous year (provided that they have completed all the laboratory practical sessions). But the rest of the assessment activities will have to be taken again.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Laboratory questionnaire	40	0	0	1

Practical case	10	0	0	1
Test of theoretical contents	50	2	0.08	1

Bibliography

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Hedrich HJ (Ed). The Laboratory Mouse. Elsevier Academic Press. 2nd Edition, 2012.

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Larson MA. Transgenic mouse. Methods and Protocols. Humana Press. 2020.

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Nagy A, Gertsenstein M, Vintersten K, Behringer R. Manipulating the mouse embryo. A Laboratory Manual. Cold Spring Harbor Laboratory Press. 3rd Edition, 2003.

Nakagata N. Reproductive Engineering Techniques in Mice. Technical Manual. Cosmo Bio Co. 3rd Edition, 2015.

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Pease S, Saunders TL. Advanced Protocols for Animal Transgenesis. An ISTT Manual. Springer. 2011.

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Suckow MA, Stevens KA, Wilson RP (Eds). The Laboratory Rabbit, Guinea Pig, Hamster, and other Rodents. Elsevier Academic Press. 1st Edition, 2012.

https://www-sciencedirect-com.are.uab.cat/book/9780123809209/the-laboratory-rabbit-guinea-pig-hamster-and-o

Wassarman PM, Soriano PM. Guide to Techniques in Mouse Development. Part A. Elsevier Academic Press. 2010.

During the course, specific bibliography will be provided for each unit (scientific papers and web links).

Software

No software will be used