Universitat Autònoma de Barcelona

2022/2023

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

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

Other comments on languages

Classes will be in catalan, but most of the suggested bibliography is in English

Teachers

Josep Santalo Pedro

Prerequisites

Although there are no specific prerequisites, to guarantee that the students can follow the subject effectively and achieve the proposed learning objectives, it is highly recommended to 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 currently taking) the optional subjects "*Ciència de l'Animal de Laboratori*" and "*Biotecnologia Embrionària Aplicada a la Ramaderia*".

Additionally, as most sources of information are in English, it is recommended that students have a basic working knowledge of this language.

Objectives and Contextualisation

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

In this context, the main learning objectives of this subject are that students, on its completion, 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 techniques to the generation 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 PROGRAMME

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.

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 MODIFIED ANIMALS

Unit 9. Techniques for the genetic modification of laboratory animals.

PRACTICAL PROGRAMME

Obtention and *in vitro* culture of preimplantation embryos.

Obtention and *in vitro* maturation of oocytes.

Embryo manipulation: embryo splitting.

Embryo cryopreservation.

Embryo transfer to recipient females.

Obtention of sperm and assessment of sperm parameters.

Sperm cryopreservation.

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 programme will be taught mainly in the form of lectures with audiovisual support. Presentations used in class will be previously made available through *Campus virtual*. It is recommended that students regularly consult the works listed in the Bibliography section of this guide, as well as the publications detailed at the end of each unit, in order to consolidate and, if necessary, clarify the content explained in class. It is also recommended that students consult the links provided in *Campus virtual* and in each unit.

In addition to attending classes, students are also required to take an active role during the course, as they will have to develop certain parts of the theoretical programme themselves. This independent-learning work can be done either individually or in small groups and will mainly focus on consolidating basic knowledge (some of which has already been covered in other subjects within the degree) or on complementing the information received in class with further reading or through video content.

Additionally, the lecturer will set out a practical case that students will have to resolve 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 for students to transfer the knowledge acquired throughout the subject to a real situation, and to decide on the actions that are most appropriate for resolving the case. Students are required to carry out this work in groups of 2 and each group will have to submit a written report (following the guidelines provided by the lecturer) bythe deadline indicated at the beginning of the course.

Practical classes (Laboratory)

The subject is highly practical and over half of the face-to-face hours (13 h) will be dedicated to practical work in the laboratory. These sessions are designed for the students to carry out a number of the basic methodologies explained in the lectures, and to thereby complement the theoretical training received through this applied dimension. Attendance of practical classes (termed 'practicals') is compulsory and any absence must be duly justified.

The practicals will be carried out in groups of 2 students and, throughout the various sessions, groups will have to answer a questionnaire with the results obtained and submit this on completion of the practicals.

For all practical sessions, it is compulsory for students to bring their own laboratory coat and the protocol manual, which will be available on *Campus virtual*.

Before the start of the laboratory practicals, students must pass the safety and biosafety test, or provide documentary evidence of having previously passed this test.

Tutorials

At the request of the students, individual tutorials will be held to resolve questions on the theorical and practical content of the subject.

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			
Independent learning and study	40	1.6	1
Practical case solving	6	0.24	1

Assessment

Evaluation of the subject consists of the following activities:

1. Test on theoretical content (individual assessment): Theoretical content is evaluated through a multiple-choice test. The objective of the test is to assess not only students' acquisition of the subject's conceptual knowledge, but also to evaluate their understanding of this knowledge and how to integrate, relate and apply it in certain situations. This test represents 50% of the final grade for the subject. Students are required to obtain a minimum mark of 3,5 points (out of 10) to have the option of passing the subject.
2. Practical case (group assessment): the reports delivered by the working groups will be evaluated by the teacher and represent 10% of the final grade for the subject. Evaluation will mainly consider whether students have chosen the most appropriate experimental approach to resolve the case and whether the choice of the techniques proposed is correctly justified.
3. Laboratory questionnaire (group assessment): the questionnaires that the students are required to complete throughout the laboratory practical sessions will be evaluated by the lecturer and represent 40% of the final grade for the subject.

To be eligible to pass the subject, students must complete all the assessment activities and attend all the practical sessions. A minimum mark of 3,5 points in the multiple-choice test and a minimum overall grade of 5 points for the weighted average of all the assessment activities is required to pass the subject.

Students with a mark lower than 3,5 in the multiple-choice test are required to retake the test. Only those students who have previously taken the test on theoretical content but have not reached the minimum grade required will be eligible for reassessment. If the reassessment mark is lower than 3,5, the studentswill not be able to pass the subject. Their final grade for the subject will be maximum 4, regardless of the average grade obtained through the marks for the other assessment activities.

As there are no minimum pass marks required for the other assessable activities (practical case and laboratory questionnaire), these cannot be retaken.

Students will be graded as "No Avaluable" (Not Assessable) if the weighting of all assessable work carried out is less than 67% of the final grade.

Students who are repeating the subject may keep the mark obtained for the laboratory questionnaire in the previous year (provided that they have completed all the laboratory practical sessions). All other assessment activities must be retaken.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Laboratory questionnaire	40	0	0	1
Practical case	10	0	0	1

Test on theoretical contents	50	2	0.08	1

Bibliography

Benavides FJ, Guénet JL. Manual de Genética de Roedores de Laboratorio. Universidad de Alcalá y SECAL. 2003.

https://secal.es/wp-content/uploads/2014/10/00-GENETICA-indice.pdf.pdf

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

https://www-sciencedirect-com.are.uab.cat/book/9780123820082/the-laboratory-mouse

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

https://link-springer-com.are.uab.cat/book/10.1007%2F978-1-4939-9837-1

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.

https://www.cosmobiousa.com/pages/reproductive-engineering-techniques-in-mice

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

https://link-springer-com.are.uab.cat/book/10.1007/978-3-642-20792-1

Suckow MA, Hankenson FC, Wilson RP, Foley PL (Eds). The Laboratory Rat. Elsevier Academic Press. 3rd Edition, 2019.

https://www-sciencedirect-com.are.uab.cat/book/9780128143384/the-laboratory-rat

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-c

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