Integrated Laboratory for Reproduction Biology

Code: 42949
Credits: 9

2026/2027

Degree programme	Type	Course
Cytogenetics and Reproductive Biology	OP	1

Contact lecturer

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Group languages

You can consult this information at the end of the document.

Prerequisites

This subject has no prerequisites.

Objectives

The module "Integrated Laboratory of Reproductive Biology" aims to give basic tools to students in order to acquire the ability to develop the tasks carried out in Assisted Reproductive Centers and in research laboratories focused in cell culture and reproduction.

In the submodule 1: "Embryonic Stem Cell (ESC) culture" students will acquire the skills necessary to work in a cell culture laboratory. They will learn the rules and they will get used to work in sterile conditions. They will also learn the basic techniques of protein detection and acquire the ability to use standard and inverted microscope and fluorescence microscope. They will learn to differentiate between pluripotent and differentiated ESC.

In the submodule 2: "Fluorescent in vitro hybridization in spermatozoa" students will learn how to analyze the chromosomal abnormalities in sperm from a sample of semen, through the technique of FISH and to make a clinical evaluation.

In the submodule 3: "Oocyte and Embryo culture" students will acquire the skills to work in a laboratory of reproductive biology. They will learn how to obtain and manipulate oocytes and embryos, activate oocytes and isolate blastomeres.

In the submodule 4: "Update in histological and cytological techniques," students will learn the basic techniques of histology such as inclusion, microtomy, staining, and protein detection and to observe the samples obtained.

Finally, in the submodule 5: "Confocal Laser Scanning Microscopy" (CLSM) they will learn the characteristics of this microscope, as well as the advantages and limitations and how to use it.

Learning outcomes

- CA16 (Plan the management of research laboratories and clinical laboratories in the area of reproductive biology, taking into account quality and safety criteria.) Plan the management of research laboratories and clinical laboratories in the area of reproductive biology, taking into account quality and safety criteria.
- CA17 (Design scientific experiments in the field of the reproductive biology laboratory, selecting appropriate methodologies and tools to respond to research hypotheses.) Design scientific experiments in the field of the reproductive biology laboratory, selecting appropriate methodologies and tools to respond to research hypotheses.
- KA21 (Relate the cellular and molecular foundations of reproductive biology with experimental procedures applied in laboratory mammals.) Relate the cellular and molecular foundations of reproductive biology with experimental procedures applied in laboratory mammals.
- SA22 (Apply cell culture and characterisation techniques in the reproductive biology laboratory.) Apply cell culture and characterisation techniques in the reproductive biology laboratory.
- SA23 (Apply the principles of quality, biosafety and traceability when carrying out activities, using resources and monitoring work flows in an integrated reproductive biology laboratory.) Apply the principles of quality, biosafety and traceability when carrying out activities, using resources and monitoring work flows in an integrated reproductive biology laboratory.
- SA24 (Analyse research data in an integrated reproductive biology laboratory.) Analyse research data in an integrated reproductive biology laboratory.
- SA25 (Demonstrate communication skills, both oral and written, to communicate the results obtained in a clinical or research reproductive biology laboratory.) Demonstrate communication skills, both oral and written, to communicate the results obtained in a clinical or research reproductive biology laboratory.

Contents

Submodule 1: embryonic stem cells (ESC) cultures

- STO (feeders) cultures.
- STO inactivation.
- Coculture ESC/STO.
- Detection of pluripotency (immunofluorescence).
- ESC differentiation.
- Detection of differentiation (immunofluorescence)
- Capture and analysis of images of the different cell types and of the immunofluorescence

Submodule 2: Fluorescent in situ hybridization on sperm

- Fluorescent *in situ* hybridization technique in a fixed semen sample
- Evaluation of hybridization quality
- Analysis of chromosomal abnormalities in the sample

Submodule 3: Mouse oocytes and embryos culture

- Mouse embryos collection and culture.
- Embryo partition

- Mouse oocytes collection and in vitro maturation.
- Mouse oocyte activation

Submodule 4: Update on histological and cytological techniques

- Development of histological technique: inclusion and microtomy.
- Staining of histological samples of ovary and/or testicle.
- Flow cytometry and its use in research.
- Microscopic visualization and digital imaging.
- Processing images using Photoshop / Image J - FIJI.

Submodule 5: Confocal laser scanning microscopy

- Basics of Fluorescence and Confocal Microscopy
- Sample preparation for fluorescence
- Capturing the image in Confocal Microscope
- Processing series

Learning activities and methodology

Title	Hours	ECTS	Learning outcomes
Confocal Laser Scanning Microscopy	10	0.4	CA16, SA22, SA23
Update in histological and cytological techniques	20	0.8	CA16, SA22, SA23
How to prepare a Photographic composition	8	0.32	CA17, SA24, SA25
Oocyte and Embryo culture	10	0.4	CA16, SA22, SA23
Personalized tutorials	30	1.2	KA21, SA24
Sperm fluorescent in situ hybridization	5	0.2	CA16, SA22, SA23
How to prepare a laboratory report	10	0.4	SA24, SA25
How to solve problems and case studies	10	0.4	CA17, SA24, SA25
Solve problems and case studies	8	0.32	CA17, KA21, SA25
Embryonic Stem Cell (ESC) culture	15	0.6	CA16, SA22, SA23
Study	73	2.92	CA16, CA17, KA21, SA22, SA23, SA24
Photographic composition using Photoshop software	8	0.32	CA17, KA21, SA25
Laboratory reports	8	0.32	CA17, KA21, SA25

This course is essentially practical. In all submodules except confocal laser scanning microscopy students will work in pairs under the guidance of a teacher.

In the embryonic stem cells culture submodule, students must acquire the ability to work in sterile conditions.

In the FISH submodule, students will learn to process semen samples to apply FISH methodologies and to identify chromosomal abnormalities.

In the mouse embryo culture submodeule, the practical classes are designed to acquire the skills necessary to handle oocytes and embryos.

In the histology submodeule students will become familiar with the techniques used in histology.

Finally, in the scanning laser confocal microscopy submodeule, students must work in groups of approximately 6 people. This practice is carried out in Microscopy Service, using the laser scanning confocal microscopes available in the service.

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.

Assessment

Continuous assessment activities

Title	Weight	Hours	ECTS	Learning outcomes
Delivery reports	67%	2	0.08	CA17, KA21, SA24
Acquiring skills in stem cell culture laboratory	6%	1	0.04	CA16, CA17, SA22, SA23, SA24, SA25
Individual tests	8%	4	0.16	CA16, CA17, KA21, SA24, SA25
Solve problems and case studies	10%	1	0.04	CA16, CA17, KA21, SA23, SA24
Acquiring skills in using a confocal microscope	2%	1	0.04	CA17, KA21, SA22, SA23, SA24, SA25
Acquiring skills in histology techniques	7%	1	0.04	CA17, KA21, SA23, SA24, SA25

This module consists of five submodules, each with a different dedication and therefore a specific percentage within the module. In the following table you will find a summary of the hours of each submodule and its weight in the final mark of the module:

	hours	%
1 ESC cultures	15	25
2 FISH-in spermatozoa	5	8
3 Oocytes and embryos culture	10	17
4 Update in histological and cytological techniques	20	33
5 Confocal laser scanning microscopy	10	17
	60	100

Evaluation activities scheduled:

Submodule 1. Embryonic stem cells culture. This submodule has a weight of 25% of the module. The evaluation system is organized into two sections: 1) attitude and skills acquired in the laboratory (15%) and 2) resolution of a case study (85%)

Submodule 2. Spermatozoa fluorescent ***in situ*** hybridization. This submodule has a weight of 8% of the module. The evaluation will consider the final report explaining the results (100%)

Submodule 3. Oocytes and embryos culture. This submodule has a weight of 17% of the module. The evaluation will consider the final laboratory report (100%)

Submodule 4. Update on histological and cytological techniques. This submodule has a weight of 33% of the module. The evaluation system is organized into three sections: 1) skills acquired in practical sessions (20%),

2) delivery of an individual report and questionnaires (40%) and 3) delivery of a photographic composition using the program Photoshop (40%)

Submodule 5. Confocal laser scanning microscopy. This submodule has a weight of 17% of the module. The evaluation system is organized into three sections: 1) skills acquired in practical sessions (10%) and 2) resolution of a case study 90%)

The final grade will be calculated taking into account the percentage of the different submodules. To pass the module the student must obtain a minimum mark of 5 points and a maximum of 10 possible points. For the different submodules tobe averaged, a minimum grade ≥4 must be obtained in each of the submodules. Scores lower than ≤3,99 in one or more of the submodules will require students to pass a retake an exam of all submodules.

To be eligible for the retake process, the student should have been previously evaluated in a set of activities equaling at least two thirds of the final score of the course or module. Thus, the student will be graded as \"No Avaluable\" if the weighthin of all conducted evaluation activities is less than 67% of the final score.

The faculty responsible for each of the submodules in this practical module will inform the students about how they may use artificial intelligence.

Bibliography

- Barnes, David W. & Mather, Jennie P. (1998). Animal cell culture methods.Academic Press

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- Barnes, David W. [i altres]. (1998). Animal cell culture methods. Academic Press Barn

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- Behringer, Richard. (2014). Manipulating the mouse embryo : a laboratory manual. (4th ed.) Cold Spring Harbor Laboratory Press

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- Freshney, R. Ian. (2010). Culture of animal cells : a manual of basic technique and specialized applications. (6th ed.) Wiley-Blackwell

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- Freshney, R. Ian. (2016). Culture of animal cells : a manual of basic technique and specialized applications. (7th ed.) Wiley-Blackwell

Disponible en línia

- Griffiths, J. B. & Doyle, A. (1998). Cell and tissue culture : laboratory procedures in biotechnology. John Wiley & Sons

Disponible en paper a la biblioteca

- Suvarna, S. Kim & Layton, Christopher & Bancroft, John D. (2013). Bancroft's theory and practice of histological techniques. (7th ed.) Churchill Livingstone Elsevier

Disponible en línia

Software

Free software of image analysis Image J - FIJI.

Imaris Viewer (versió lliure del Imaris; Oxford Instruments)

Course groups and languages

The information provided is provisional until November 30. After this date, you will be able to consult the language of each group through this link. To access the information, you will need to enter the course CODE

Type of teaching	Group	Language	Semester	Shift
(PLABm) Practical laboratories (master)	1	Catalan/Spanish	second semester	morning-mixed
(SEMm) Seminars (master)	1	Catalan	second semester	morning-mixed