

Development, Cell Potency and Differentiation

Code: 42944
ECTS Credits: 6

Degree	Type	Year	Semester
4313782 Cytogenetics and Reproductive Biology	OT	0	1

Contact

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Other comments on languages

Some lectures may be in English

Use of languages

Principal working language: catalan (cat)

Teachers

Carme Nogués Nogués Sanmiquel

Josep Santaló Pedro

Pere Jordi Fàbregas Batlle

External teachers

Josep Maria Canals

Prerequisites

Intermediate-advanced English level is recommended. Some of the lectures may be in English.

Objectives and Contextualisation

This is a lecture-based compulsory module in the Reproductive Biology specialization of the master.

The objective of this module is to provide the students with a solid knowledge of preimplantational and postimplantational embryo development and fetal development in mammals, as well as of the processes of totipotency and cell differentiation that occur during development. This knowledge will allow the students to understand the basis of the pathologies associated with reproduction and of the assisted reproduction and cell therapy techniques. The module will also cover the main legal and ethical aspects related with the application of these technologies.

Skills

- Communicate and justify conclusions clearly and unambiguously to both specialist and non-specialist audiences.
- Continue the learning process, to a large extent autonomously.

- Design experiments, analyse data and interpret findings.
- Identify the ethical dilemmas and apply current laws governing the area of knowledge of the master's degree.
- Integrate knowledge and use it to make judgements in complex situations, with incomplete information, while keeping in mind social and ethical responsibilities.
- Recognise the cellular and molecular bases of reproduction in mammals.
- Solve problems in new or little-known situations within broader (or multidisciplinary) contexts related to the field of study.
- Use acquired knowledge as a basis for originality in the application of ideas, often in a research context.
- Use and manage bibliography or ICT resources in the master's programme, in one's first language and in English.

Learning outcomes

1. Apply current laws on reproductive and regenerative biology.
2. Communicate and justify conclusions clearly and unambiguously to both specialist and non-specialist audiences.
3. Continue the learning process, to a large extent autonomously.
4. Describe the bases of cell totipotency and differentiation processes.
5. Design experiments, analyse data and interpret findings.
6. Identify the cellular bases of normal and pathological embryonic and foetal development.
7. Identify the ethical dilemmas associated with research and clinical practice in reproductive and regenerative biology
8. Integrate knowledge and use it to make judgements in complex situations, with incomplete information, while keeping in mind social and ethical responsibilities.
9. Solve problems in new or little-known situations within broader (or multidisciplinary) contexts related to the field of study.
10. Use acquired knowledge as a basis for originality in the application of ideas, often in a research context.
11. Use and manage bibliography or ICT resources in the master's programme, in one's first language and in English.

Content

Unit 1. Preimplantation embryo development. Zygote activation. Embryonic metabolism. Preimplantation gene expression. Embryo cleavage. Formation of the morula and the blastocyst. Hatching. Implantation.

Unit 2. Postimplantation embryo and fetal development in humans. Embryonic period: bilaminar embryo, trilaminar embryo and essential concepts of organogenesis. Fetal period. Placenta and membranes. Teratology. Practical session of observation of embryonic and fetal images.

Unit 3. Stem cells. Definition and types of stem cells. Culture and characterization of stem cells. Derivation methods. Differentiation. Applications. Ethical and legal issues.

Methodology

This a lecture-based module. Attendance to lectures is compulsory and will be monitored.

Activities

Title	Hours	ECTS	Learning outcomes
Type: Directed			
Lectures	25.5	1.02	1, 4, 7, 6, 8, 9, 2, 10
Type: Autonomous			

Individual study	98.5	3.94	1, 4, 5, 7, 6, 8, 9, 3, 10, 11
Literature searching and reading	20	0.8	5, 6, 8, 9, 3, 10, 11

Evaluation

The evaluation will consist of a multiple-choice test for the contents of Units 1 and 3 (one for each Unit) and in an objective written test for the contents of Unit 2. Evaluation tests are mandatory, and each will have a weight of 30% in the final grade of the module. In all cases, the aim of the tests is to evaluate that the students have acquired the conceptual knowledge of each unit and that they have understood how to integrate this information.

Attendance and participation in class will also be considered in the evaluation (10% of the final grade). Any absence should be properly justified by the student. Non-justified absences will affect the final note of the module as follows: 1 absence -0.5 points; 2 absences -1 point. If the number of non-justified absences is higher than 2, the student will not be able to pass the module.

To pass the module, students must obtain an overall grade equal or higher than 5 points (out of 10). If the grade is lower than 5, students will need to retake the failed test/tests. The retake tests will be similar to the tests of the continuous assessment.

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. Thus, the student will be graded as "No Evaluable" if the weighting of all conducted evaluation activities is less than 67% of the final score.

Evaluation activities

Title	Weighting	Hours	ECTS	Learning outcomes
Lecture attendance and participation	10%	0	0	1, 4, 5, 7, 6, 8, 9, 2, 3, 10, 11
Multiple-choice test Unit 1	30%	2	0.08	4, 5, 6, 8, 9, 2, 3, 10, 11
Multiple-choice test Unit 3	30%	2	0.08	1, 4, 5, 7, 6, 8, 9, 2, 3, 10, 11
Written test Unit 2	30%	2	0.08	4, 5, 6, 8, 9, 2, 3, 10, 11

Bibliography

Basic bibliography:

Carlson BM. Embriología humana y Biología del desarrollo. 5ª edición. Elsevier Science. 2014.

Gilbert SF and Barresi MJF. Developmental Biology. 11th Edition. Sinauer Associates. 2016.

Johnson MH (Eds.). Essential Reproduction. 7th Edition. Wiley-Blackwell. 2013.

Knobil E and Neill JD (Eds.). Encyclopedia of Reproduction. Vol 1-4. Academic Press. 1998.

Atala A and Lanza R (Eds.). Handbook of Stem Cells. Vol 1 and 2. Elsevier Academic Press. 2012.

Specific bibliography:

Research papers recommended in class