Technology of Reproduction

Code: 100760
ECTS Credits: 6

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Degree	Type	Year
2500004 Biology	OT	4

Contact

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Teachers

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Teaching groups languages

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

Prerequisites

There are no prerequisites for taking this course. In spite of this, in order to ensure the proper monitoring of the subject by the student and the achievement of the learning outcomes proposed, it is recommended that the student have some basic knowledge about cell biology and techniques used in this discipline since many of them will appear throughout the development of the agenda and will be considered as already known.

On the other hand, taking into account that the first half of the subject will be taught in English and that in a scientific discipline such as Reproductive Biology it is common to use sources of information in this language, it is highly recommended that students have sufficient knowledge of this language.

Objectives and Contextualisation

Technology of reproduction course aims to provide students with knowledge about cell mechanisms involved in mammalian reproduction, as well as on the practical applications of mammalian gametes and preimplantation embryo manipulation and their repercussions both in the field of human reproduction and livestock production.

The first part of the syllabus is the basic section of the subject and it's focused on providing knowledge about gamete formation, mechanisms of fertilization in mammals and preimplantation embryo development, while offering the necessary background to understand the techniques applied in later thematic blocks. Fertility control, assisted reproduction techniques applied both in humans and animals, and interventions on gametes and embryos are developed in the following sections of the program.

Competences

- Act with ethical responsibility and respect for fundamental rights and duties, diversity and democratic values.
- Apply statistical and computer resources to the interpretation of data.
- Be able to analyse and synthesise
- Isolate, identify and analyse material of biological origin.
- Make changes to methods and processes in the area of knowledge in order to provide innovative responses to society's needs and demands.
- Perform genetic analyses.
- Students must be capable of applying their knowledge to their work or vocation in a professional way and they should have building arguments and problem resolution skills within their area of study.
- Students must be capable of collecting and interpreting relevant data (usually within their area of study) in order to make statements that reflect social, scientific or ethical relevant issues.
- Students must be capable of communicating information, ideas, problems and solutions to both specialised and non-specialised audiences.
- Students must develop the necessary learning skills to undertake further training with a high degree of autonomy.
- Students must have and understand knowledge of an area of study built on the basis of general secondary education, and while it relies on some advanced textbooks it also includes some aspects coming from the forefront of its field of study.
- Take account of social, economic and environmental impacts when operating within one's own area of knowledge.
- Take sex- or gender-based inequalities into consideration when operating within one's own area of knowledge.
- Understand the processes that determine the functioning of living beings in each of their levels of organisation.

Learning Outcomes

1. Analyse a situation and identify its points for improvement.
2. Analyse the sex- or gender-based inequalities and the gender biases present in one's own area of knowledge.
3. Apply statistical and computer resources to the interpretation of data.
4. Be able to analyse and synthesise.
5. Critically analyse the principles, values and procedures that govern the exercise of the profession.
6. Explain and apply the technologies deriving from intervention on gametes and embryos.
7. Obtain, manipulate and culture preimplantation mammal embryos.
8. Perform genetic diagnoses and advise on these.
9. Propose new methods or well-founded alternative solutions.
10. Propose projects and actions that incorporate the gender perspective.
11. Relate the processes of gametogenesis and fertilisation to the functioning of the human reproductive system.
12. Students must be capable of applying their knowledge to their work or vocation in a professional way and they should have building arguments and problem resolution skills within their area of study.
13. Students must be capable of collecting and interpreting relevant data (usually within their area of study) in order to make statements that reflect social, scientific or ethical relevant issues.
14. Students must be capable of communicating information, ideas, problems and solutions to both specialised and non-specialised audiences.
15. Students must develop the necessary learning skills to undertake further training with a high degree of autonomy.
16. Students must have and understand knowledge of an area of study built on the basis of general secondary education, and while it relies on some advanced textbooks it also includes some aspects coming from the forefront of its field of study.
17. Take account of social, economic and environmental impacts when operating within one's own area of knowledge.

Content

Theoretical classes program *

I. Gamete formation and fertilization

Topic 1. Female gametogenesis.

Topic 2. Male gametogenesis.

Topic 3. Sperm maturation. .

Topic 4. Ejaculation.

Topic 5. Sperm capacitation.

Topic 6. Hyperactivity.

Topic 7. Acrosome reaction.

Topic 8. Fertilization.

II. Preimplantation embryo development

Topic 9. Preimplantation embryo development.

Topic 10. Cell differentiation.

III. Fertility control in humans

Topic 11. Negative fertility control.

Topic 12. Human sterility and infertility.

Topic 13. Assisted reproduction techniques (ARTs) I.

Topic 14. ARTs II.

Topic 15. ARTs associated technologies.

Topic 16. Genetic risks associated with ARTs.

IV. Gamete and embryo cryopreservation

Topic 17. Cryopreservation.

V. Fertility control in animals.

Unit 18. Reproduction in animals.

Topic 19. Assisted reproduction techniques.

VI. Embryo manipulation derived technologies.

Topic 20. Transgenesis.

Topic 21. Cloning.

Topic 22. Stem cells and reproduction.

Laboratory practice program*

Male and female gametogenesis

In vitro embryo manipulationand culture

In vitro embryo development

Oocyte *in vitro* maturation

Gamete and embryo freezing

Embryos splitting

Analysis of a human semen sample

Related videos

Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Practical sessions	12	0.48	4, 6, 7, 8, 11
Solving problems sessions	2	0.08	3, 6, 8, 11
Theoretical sessions	40	1.6	4, 6, 8, 11
Type: Supervised			
Tutorials	2	0.08	3, 4, 6, 8, 11
Type: Autonomous			
Solving problems	70	2.8	3, 4, 6, 8, 11
Study	16	0.64	3, 4, 6, 8, 11

Technology of reproduction course incorporates theoretical classes, laboratory practices and classes of problems. The following text describes the organization and teaching methodology that will be followed in these three types of training activities.

Theoretical sessions:

The content of the theory program will be mainly taught by the teacher in form of lectures with audio-visual support. Presentations used in class by the teacher will be previously available on Virtual Campus. It is recommended that students bring this material to class and use it as a support when taking notes. Although it is not essential to extend the contents of the lectures, unless expressly requested by the teacher, it is advised that students regularly consult the books and recommended texts in the Bibliography section of this syllabus in order to consolidate and clarify, if necessary, the contents explained in class.

In addition to the attendance to the classes, the follow-up of the subject will also imply an active role of the student, who will have to develop individually or in groups part of the theory program.

Laboratory practices:

Practical sessions are designed so that the students learn the basic methodologies used in a Biology of reproduction laboratory and complement the theoretical training. Students will do a total of 4 sessions of 3 hours each, working in groups of 2 and, during the practical sessions, they will have to answer a questionnaire.

Practical guidelines will be available on Virtual Campus. During each practical session, students must bring their own practical guidelines and always wear their own lab coat and glasses (when requested to).

Students must complete the laboratory safety and biosecurity questionnaire, or appropriately document they have passed it previously.

Problem sessions

The classes of problems are designed so that the students work in small groups. Its objective is to initiate the student in the reasoning and interpretation of scientific results, as well as in the elaboration and formal proposal of theories and experimental designs that allow to achieve certain objectives proposed to them. On the other hand, they intend to be an instrument for the teacher who can use them to carry out a "guided discovery teaching" strategy, so that the student acquires certain knowledge based on the conclusions that can be drawn from each problem. Finally, it also seeks to familiarize the student with the interpretation of graphs and tables and with the most common notations in scientific literature.

Moreover, since problems are intended to be solved by reduced working groups, the aim is to promote the habit of teamwork and critical argumentation among peers.

Students will do 2 deliveries of 4 problems each. Groups will be composed of between four and six students each.

Tutorials

At students' request, there will be tutorials aimed at solving doubts about the theory content and the solving problem process.

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

Continous Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Delivery of problems	10%	2	0.08	1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17
First theoretical test	30%	1.5	0.06	1, 2, 5, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17
Practical sessions assesment	15%	2	0.08	2, 6, 7, 11
Problem assesment	15%	1	0.04	1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17
Second theoretical test	30%	1.5	0.06	2, 11, 12, 13, 15, 16

To pass the course it will be essential to obtain a final grade of the subject equal to or greater than 5 points (out of 10) and have attended the practical sessions. The scheduled evaluation activities are:

First term theoretical test

Multiple choice test. It will count 30% of the final mark. The first part of the subject taught in the theoretical classes will be evaluated.

Second term theoretical test

Multiple choice test. It will count 30% of the final mark. The second part of the subject taught in the theoretical classes will be evaluated.

In order to eliminate the material from these two theoretical examinations and use the mark obtained to count in the final grade of the subject, students must obtain a mark equal to or greater than 3,5 out of 10 in each one.

Problems assessment

It will count 15% of the final mark. A problem will be assessed individually during the Second term theoretical test or during the Recovery Exam for those students not attending the Second term theoretical test.

Recovery test

There will be a general recovery test for those students who have not passed (<3,5) or have not attended some of the partial tests.

To participate in the recovery, students must have previously been evaluated in a set of activities whose weight equals to a minimum of two thirds of the total grade of the subject or module. Therefore, students will obtain the "Non-Valuable" qualification when the assessment activities carried out have a weighting of less than 67% in the final grade.

The student will have the option of renouncing the mark of any theoretical exam or problem and attend the recovery exam.

Exams reviewing

The review of exams will be done by previousappointment and within the schedule proposed by the teacher.

Exam model

There will be an exam model available to students on Virtual Campus.

Delivery of problems

It will count 10% of the final mark. A group assessment will be carried out correcting 4 out of the 8 problems delivered and the average of the best 3 notes will be taken into account.

Practical sessions assessment

It will count in 15% of the final mark. Laboratory practices will be assessed while carrying them on by answering questions included in the corresponding practical questionnaire. Attendance is mandatory. Students will obtain the "Non-Valuable" qualification when assessment activities carried out have a weighting of less than 67% in the final grade.

Global rating

In order to pass the course students will have to perform the tests of each of the 2 terms tests, as well as the problems assessment and practices and to obtain an overall grade greater than 5 out of 10. Students who do not attain the minimum qualification of 3,5 points in any of the two theoretical partial tests will not be able to pass the course and will receive a maximum final grade of 4 points.

Single assessment

Single assessment consists of a single examination in which the contents of the entire theory programme will be assessed. The test will consist of multiple-choice questions. The mark obtained in this final examination will account for 75% of the final grade for the subject.

The synthesis test will coincide with the same date set in the calendar for the last continuous assessment test and the same recovery system will be applied as for continuous assessment.

In order to use the grade obtained in this synthesis test to average in the final grade of the subject, a grade equal to or greater than 3.5 out of 10 will be required.

The evaluation of the practical activities (PLAB) will follow the same process as continuous evaluation. The grade obtained will represent 15% of the final grade of the subject.

Problem submissions will follow the same procedure as in continuous evaluation. The grade obtained will represent 10% of the final grade of the subject.

Non-valuable: Students will be considered as "Non-valuable" when evaluation activities carried out have a weighting of less than 67% of the final grade.

Bibliography

It is not easy to find texts that can fully cover the variety of topics that will be treated during the course. On the other hand, the contents of many of their blocks make up a new discipline therefore their content do not usually appear in "classical" books. As reference and reference texts, the following books are proposed that cover the contents and various aspects of the subject:

Bajo JM, B. Coroleu B. (Eds.) Fundamentos de Reproducción. Editorial Panamericana. Madrid. 2009.

De Jonge C, Barratt C. (Eds). The sperm cell. Cambridge University Press. New York. 2006

Durfort M, Vidal F. (Eds). Biologia de la Reproducció. Societat Catalana de Biologia. Barcelona. 2009.

Elder K., Dale B. *In vitro* fertilization. (3rd edition). Cambridge University Press. New York. 2011.

Fauser B.C.J.M. (Ed.). Molecular Biology in Reproductive Medicine. The Parthenon Publishing Group. New York. 1999

Gardner D.K. et al. (Eds.). Textbook of assisted Reproductive Techniques. Martin Dunitz Pub. Hampshire. 2001.

Gupta S.K. et al. (Eds.) Gamete Biology. Emerging frontiers in Fertility and Contraceptive Development. Nottingham University Press. Nottingham. 2007.

Hafez B. and Hafez E.S.E. (Eds.).Reproduction in farm animals. 7th edition. Lippincott Williams and Wilkins. USA. 2000.

Harper J. (Ed.) Preimplantation Genetic Diagnosis. (2nd Edition). Cambridge University Press. New York (USA).2009.

Houdebine L.M. (Ed.). Transgenic animals. Generationand use. Harwood Academic Publishers. Amsterdam. 1997.

Johnson M.H. and Everitt B.J. (Eds.) Essential Reproduction. 5th Edition. Blackwell Science. Oxford. 2005.

Knobil E. and Neill J.D. (Eds.). "Encyclopedia of Reproduction". Vol 1-4. Academic Press. San Diego (CA), USA. 1998.

Lanza R. Et al. (Eds.) Handbook of Stem Cells. Excerpts. Elsevier Academic Press. Amsterdam. 2004.

Lanza R. Et al. (Eds.) Handbook of Stem Cells. Vol 1 i 2. Elsevier Academic Press. Amsterdam. 2004.

Matorras R, Hernández J. (Eds.). Estudio y tratamiento de la pareja estéril. Adalia. Madrid. 2007.

Nadal J. (Ed.). Donación de ovocitos. Momento Médico Iberoamericana. Madrid. 2010.

Remohí J., Pellicer A., Simón C., Navarro J. (Eds.). Reproducción Humana. 2ª Edición. McGraw Hill-Interamericana. Madrid. 2002.

Remohí J., Romero J.L., Pellicer A., Simón C., Navarro J. (Eds.). Manual práctico de esterilidad y reproducción humana. McGraw Hill-Interamericana. Madrid. 2000.

Thibault C., Levasseur M.C., Hunter R.H.F. (Eds.) Reproduction in Mammals and Man. Ellipses, Paris. 1993.

Wolf D.P. and Zelinski-Wooten M. (Eds.). Assisted fertilization and nuclear transfer in mammals. Humana Press. New Jersey. USA. 2001.

Along the course, some recomendations on specific bibliography refering to those topics to be prepared by the students will be suggested.

Extra problems to be solved by the students can be foundin:

Santaló J., Vidal F. Biologia de la Reproducció. Problemes. Servei de Publicacions de la Universitat Autònoma de Barcelona. Col. Materials, vol 63, 3ª edició. 2010

Software

No aplies

Language list

Name	Group	Language	Semester	Turn
(PAUL) Classroom practices	441	Catalan	first semester	morning-mixed
(PLAB) Practical laboratories	441	Catalan/Spanish	first semester	afternoon
(PLAB) Practical laboratories	442	Catalan/Spanish	first semester	afternoon
(PLAB) Practical laboratories	443	Catalan/Spanish	first semester	afternoon
(TE) Theory	44	English	first semester	morning-mixed