

**Reproduction-Associated Technology**

Code: 42946  
ECTS Credits: 12

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

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**Teachers**

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**Use of Languages**

Principal working language: catalan (cat)

**External teachers**

Aïda Pujol

Carles Giménez

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Mark Grossmann

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**Prerequisites**

The prerequisites for taking the Reproduction-Associated Technology module are common to the admission requirements for being admitted to the Official Master's Degree in Cytogenetics and Reproductive Biology.

In addition, since most scientific information sources are in English, it is advisable to have a good grounding in this language.

## Objectives and Contextualisation

This is a compulsory module within the specialisation of Reproductive Biology. It provides further insights into the most common methodologies used in the assisted reproduction area.

The contents of this course are organised in three main blocks:

- Submodule 1. Genetic diagnostic methods in human gametes and embryos. This section describes the currently available cytogenetic and molecular methods for analysing human gametes and embryos. The usefulness of these techniques will be discussed, together with their limitations and diagnostic goals. A glimpse into the future prospects in this area will also be included.
- Submodule 2. Immunological causes of human infertility. This section describes the factors that determine the appearance of immunological processes of human infertility.
- Submodule 3. Human and animal reproduction-associated technologies. This section includes a description of the most commonly used techniques in both human and animal reproduction, as well as their ethical and legal aspects.

## Competences

- 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 origin of infertility in humans in order to recommend the appropriate assisted reproduction treatment (Specialisation in Reproductive Biology).
- 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 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. Design experiments, analyse data and interpret findings.
5. Identify and describe the cellular bases responsible for infertility processes in humans.
6. Identify the ethical dilemmas associated with reproductive biology techniques in the clinical field and the field of animal production.
7. Integrate knowledge and use it to make judgements in complex situations, with incomplete information, while keeping in mind social and ethical responsibilities.
8. Recognise genetic diagnosis techniques associated with assisted human reproduction laboratories.
9. Recognise techniques of assisted human reproduction and their indications.
10. Solve problems in new or little-known situations within broader (or multidisciplinary) contexts related to the field of study.
11. Use acquired knowledge as a basis for originality in the application of ideas, often in a research context.
12. Use and manage bibliography or ICT resources in the master's programme, in one's first language and in English.

## Content

## SUBMODULE 1: Genetic diagnostic methods in human gametes and embryos

### 1.1- Cytogenetic and molecular methodologies for human gametes analysis

1.1.1- Cytogenetic and molecular methods for the analysis of spermatocytes and testicular biopsies. Diagnostic utility and limitations.

- Classical approaches
- Immunofluorescence studies
- Fluorescence *in situ* hybridization (FISH) studies

1.1.2- Cytogenetic and molecular methods for the analysis of sperm. Diagnostic utility and limitations

- Chromosome-banding - Hamster test
- Sperm DNA Fragmentation
- Sperm FISH studies
  - FISH studies in reorganization carriers
  - FISH studies in carriers of numerical anomalies
  - FISH studies in infertile individuals with normal karyotype

1.1.3- Cytogenetic and molecular methods for the analysis of oocytes. Diagnostic utility and limitations

- FISH studies for aneuploidy detection
- FISH studies for structural anomalies detection
- Clinical cases

1.2- Cytogenetic and molecular methods for embryo analysis.

- General aspects of [Preimplantation genetic diagnosis](#) (PGD)
- PGD techniques

1.3- New developments and future perspectives in the analysis of human gametes and embryos

- Transcriptome studies
- Methylome studies

## SUBMODULE 2: Immunological causes of human infertility

2.1- Immunological infertility causes related to the male reproductive system

2.2- Immunological infertility causes related to the female reproductive system

## SUBMODULE 3: Human and animal reproduction-associated Technologies

3.1- Human reproduction-associated Technologies

- Basic semen analysis
- Embryo transfer
- *In vitro* fertilization (IVF)
- Intracytoplasmic sperm injection (ICSI)

- Embryo assessment

### 3.2- Risks associated to Assisted Reproductive Technology (ART)

- Genetic risks in ART

- Epigenetic risks in ART

### 3.3- Freezing technologies

- Gonadal tissue freezing

- Gamete freezing

- Embryo freezing

### 3.4- Animal reproduction-associated Technologies

- Artificial insemination

- Embryo transfer

- *In vitro* embryo production

- *In vivo* embryo production

- Gamete and embryo Freezing

- Embryo commercialization

- Transgenesis

- Cloning: embryo splitting and nuclear transfer

### 3.5- Ethical and legal aspects of Assisted Reproductive Technology

- Legal aspects of the use of human embryos for research

- Ethical aspects of the use of human embryos for research

## Methodology

The content of this program will be taught mainly in the form of formal lectures with audio-visual support. Lecturers will be teachers from the Autonomous University of Barcelona but also external collaborators with high expertise in the topics of the theory program.

Teachers will make supplementary audio-visual material available to the students through the Moodle classroom of the subject, to help them follow the lectures.

In relation to some specific contents, students will be asked to actively participate in the class execution. These activities may consist in the elaboration of oral presentations based on specific research papers, the organization of debates to discuss particular aspects of the contents, the resolution of practical exercises,...

## Activities

Title	Hours	ECTS	Learning Outcomes
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Type: Directed

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Theoretical classes	62	2.48	1, 4, 6, 5, 7, 10, 2, 8, 9, 11
Type: Autonomous			
Individual study	194	7.76	4, 6, 5, 7, 10, 3, 8, 9, 11, 12
Scientific papers assessment for oral presentation	40	1.6	1, 4, 6, 5, 7, 10, 2, 3, 8, 9, 11, 12

## Assessment

The assessment of the module will be based on two criteria:

### 1-Class attendance

Attendance at the theory classes of this module is compulsory and accounts for 30% of the final grade.

Unjustified\* absences will be penalised according to the following criteria:

- Missing 4-8 hours of class will imply a 5% reduction of the class attendance mark.
- Missing 8-12 hours of class will imply a 25% reduction of the class attendance mark.
- Missing 12-16 hours of class will imply a 50% reduction of the class attendance mark.
- Missing >16 hours of class (this is equivalent to missing >25% of the classes) will imply failing the module.

\* ONLY the following will be considered as justified absences: illness, death of first-degree relatives, and accident UPON PRESENTATION OF PROOF.

### 2- Theory contents

The contents of the three submodules will be evaluated separately. The contribution of each of the marks obtained to the final grade for the module will be proportional to the weight of the contents: submodule 1 accounts for 30%, submodule 2 accounts for 10%, and submodule 3 accounts for 30%.

The contents of Submodule 1 (*Genetic diagnostic methods in human gametes and embryos*) and 3 (*Human and animal reproduction-associated technologies*) will be evaluated by two separate interim tests. Each of these tests will consist of a set of questions about the respective contents, which the students will have to answer individually on completing the corresponding submodule. The objective of these tests is not only to evaluate the acquisition of the corresponding concepts by the students but also their ability to interrelate and integrate them.

The contents of Submodule 2 (*Immunological causes of human infertility*) will be evaluated through oral presentation and discussion of certain specific scientific papers. This set of papers will be provided to the students by the teachers responsible for the corresponding submodule.

Students will have to obtain a minimum mark of  $\geq 4$  points (out of 10) as a weighted mean of the several evaluations performed in the three Submodules in order to include them mark in the final grade for the module (that is, to add it to the mark obtained for class attendance).

### Reassessment

In the event of not achieving  $\geq 4$  points (out of 10) as a weighted mean of the several evaluations performed in the three Submodules, the student will be able to take a resit exam that will include contents related to the corresponding evaluable parts. To be eligible for this process, the student should have been previously evaluated in a set of activities that make up at least two thirds of the final mark for the course or module.

In the following table there are described all the activities that will be assessed:

ACTIVITY	WEIGHT IN THE FINAL MARK	MINIMUM REQUIREMENTS
Class attendance	30%	>75% class attendance
Submodule 1: Interim test	30%	Minimum mark of $\geq 4$ points (out of 10) as a weighted mean of the three parts
Submodule 2: Scientific papers presentation and discussion	10%	
Submodule 3: Interim test	30%	

To sum up, in order to pass the module, it is necessary:

- to attend >75% of the classes
- to get  $\geq 4$  as a weighted average mark for the three evaluable parts with regard to theory
- and finally, an overall mark of  $\geq 5$  points out of 10 for all evaluations received

#### OTHER ASPECTS TO CONSIDER

Students will be considered "not assessable" if the combined weight of all the evaluation activities they have done is less than 67% of the final mark.

Students who engage in misconduct (plagiarism, copying, personation, etc.) in an assessment activity will receive a mark of "0" for the activity in question. In the case of misconduct in more than one assessment activity, the students involved will be given a final mark of "0" for the subject.

In cases of justified absence from an interim test (ONLY the following will be considered as justified absences: illness, death of first-degree relatives, and accident UPON PRESENTATION OF PROOF), students will be entitled to take the test on an alternative date. This change will be organised by the master's degree coordinator and the module coordinator.

### Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Class attendance	30%	0	0	10, 2, 3, 12
Partial test related to the contents of Submodule 1	30%	2	0.08	1, 4, 6, 5, 7, 10, 8, 9, 11
Partial test related to the contents of Submodule 3	30%	2	0.08	1, 4, 6, 5, 7, 10, 8, 9, 11
Presentation of scientific papers related to the contents of Submodule 2	10%	0	0	1, 4, 5, 7, 10, 2, 8, 9, 11, 12

### Bibliography

Bibliography related to specific contents of the module will be provided by the corresponding teachers upon request.