

**Embryo Biotechnology Applied to Livestock**

Code: 103971  
ECTS Credits: 3

Degree	Type	Year	Semester
2502445 Veterinary Medicine	OT	5	0

### Contact

Name: Maria Dolors Izquierdo Tugas

Email: Dolors.Izquierdo@uab.cat

### Use of Languages

Principal working language: spanish (spa)

Some groups entirely in English: No

Some groups entirely in Catalan: No

Some groups entirely in Spanish: No

### Teachers

Maria Teresa Paramio Nieto

Maria Dolors Izquierdo Tugas

Jaume Gardela Santacruz

Mateo Ruiz Conca

Manuel Álvarez Rodríguez

### Prerequisites

Although there are no official prerequisites, it is highly recommended that the student has acquired the knowledge of the Animal Reproduction subject of 3<sup>rd</sup> course.

### Objectives and Contextualisation

This optional subject of 5th veterinary course aims to train students in new ones Technologies based on assisted reproduction techniques that can significantly affect the classical animal production but also to new productions derived from transgenic and clonic animals, and their strong repercussions on the maintenance and conservation of endangered animals.

There will also be some topics based on the impact of stem cell production in the new veterinary medicine.

### Competences

- Analyse, synthesise and resolve problems and make decisions.
- Comunicar la informació obtinguda durant l'exercici professional de manera fluïda, oralment i per escrit, amb altres col·legues, autoritats i la societat en general.
- Handle the correct protocols and technologies used to modify and optimise different animal production systems.
- Seek and manage information related with professional activity

## Learning Outcomes

1. Analyse, synthesise and resolve problems and make decisions.
2. Apply the concepts of biotechnology to the improvement of livestock.
3. Communicate information obtained during professional exercise in a fluid manner, orally and in writing, with other colleagues, authorities and society in general.
4. Seek and manage information related with professional activity

## Content

1. Impact of embryonic biotechnology on classic Animal Production

2. *In vitro* production of embryos.

Maturation "in vitro" of the oocyte. Systems and methodologies of the MIV. Anomalies obtained with the MIV in comparison with maturation "in vivo". In vitro capacitation of sperm. Systems and methodologies of the selection and sperm capacitation. Preparation of sperm for ICSI (Intracitoplasmic Sperm Injection). "In vitro" fertilization. Systems and methodologies of the IVF. Principals anomalies of IVF. The "in vitro" culture of embryos: Systems and methodologies of the CIV. Differential characteristics of embryos obtained "in vitro" vs. "in vivo".

3. *Cryopreservation of gametes and embryos.*

Criobiology. Freezing and vitrification. Limitations on the freezing of oocytes and embryos. New applications of Cryopreservation of oocytes.

4. *Sexing of embryos and sperm. Use of FISH and PCR techniques for sexage.*

5. *Cloning of embryos.*

Methodologies used for the production of clones: nuclear transfer and embryonic bisection

6. *Production of Stem Cells*

Totipotent, pluripotent and multipotent cells. Embryonic, fetal and adult stem cells. Perspectives of use.

7. *Transgenic animals.*

Reproductive technologies used in the creation of transgenic animals. Efficacy in the production of transgenic animals. Objetivos de las transgénesis en: porcino, cabrum, ovino, bovino y pájaros

8. *Use of embryonic biotechnologies in the recovery of endangered species and breeds.*

*Laboratory Practices Program:*

- a. In vitro embryo production: 4 hours
- b. Evaluation and classification of embryos: 2 hours.
- c. Recovery and freezing of rabbit embryos: 3 hours
- d. Defrosting and transfer of embryos: 2 hours
- e. Flushing uterine vacuum: 2 hours

## Methodology

The subject of "Embryonic Biotechnology Applied to Livestock" consists of theoretical classes, laboratory practices and seminars. The following describes the organization and teaching methodology that is will continue in these three types of training activities.

*Theoretical lessons:*

The content of the theory program will be taught mainly by the teacher as master classes with audiovisual support. Presentations used in class by the teacher will be previously available at the "Campus Virtual" of the subject. It is recommended that students print this material and take it to class, to use it as a support when it comes to taking notes. Although it is not essential to extend the contents of the classes taught by the teacher, unless expressly requested by the latter, it is recommended that students regularly consult the books and recommended texts in the Bibliography section of this teaching guide in order to consolidate and clarify, if necessary, the contents explained in class. Besides of the attendance to the classes, the follow-up of the subject will also imply an active role of the student, who you will have to develop individually or by teams part of the theory program.

*Laboratory practices:*

The practical classes are designed so that the students learn the basic methodologies employed in the embryonic biotechnology laboratory and complement the theoretical training. The students will do a total of 6 sessions of 2 and 3 hours each, up to a total of 12 hours working in groups of 3 and, during the practical lessons, they will have to answer a questionnaire. The practical guideline will be available on the "Campus Virtual". In each practical session the student must take their own lab coat and the practice script. The student must complete the safety and biosecurity questionnaire in laboratories, or the document that certified that they have passed it previously. Attendance is mandatory.

*Assay of self-learning:*

The mission of the case study is to promote the capacity for analysis, reasoning and solving problems. The students will have to solve a problem of a real situation.

*Tutorials:*

At therequest of the students there will be tutorials aimed at solving doubts about the contents of theory and the preparation of the oral presentation.

**Activities**

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Practical Lessons	13	0.52	1
Theory lessons	13	0.52	2
Type: Supervised			
Tutorial	1	0.04	1, 4, 3
Type: Autonomous			
Assay of self-learning preparation	11	0.44	1, 2, 4
Study	36	1.44	2

**Assessment**

To pass the subject 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 practices. The scheduled evaluation activities are:

#### *Theoretical exam*

It will count 50% of the final mark. The subject taught in the theoretical classes and laboratory will be evaluated.

#### *Assay of self-learning*

It will count 20% of the final mark.

#### *Evaluation of laboratory sessions*

It will count 30% of the final mark. The laboratory practices will be evaluated during its execution through the responses recorded in the corresponding questionnaires of practices.

#### *Re-examinations*

There will be a review of the subject's re-examinations for those students who have not passed it (> 5,0).

NOT EVALUABLES: Students not present for the examination or in laboratory practices and seminars.

### **Assessment Activities**

Title	Weighting	Hours	ECTS	Learning Outcomes
Assay of self-learning	20%	0	0	1, 2, 4, 3
Exam	50%	1	0.04	2
Laboratory	30%	0	0	1

### **Bibliography**

Elder K, Dale B. In Vitro Fertilization. Cambridge University Press. 2000.

Fausser BC. Molecular Biology in Reproductive Medecine. Ed. Parthenon Publishing. 1999

Gordon I. Laboratory Production of Cattle Embryos. CAB International. 1994.

Gordon I. Reproductive Technologies in Farm Animals. CABI Publishing. 2004.

Murray JD, Anderson GB, Oberbauer AM, Mc Gloughlin MM. Transgenics Animals in Agriculture. Ed. CAB Publishing. 1999

Trounson AO, Gardner DK. Handbook of In Vitro Fertilization. CRC Press LLC. 2000.

Atles del desenvolupament embrionari preimplantacional dels mamífers domèstics.

<http://videosdigitals.uab.es/cr-vet/www/21197/atlas/inicio.html>

Knobil and Neill's Physiology of Reproduction (Third Edition)

<http://www.sciencedirect.com/science/book/9780125154000#ancPT6>

Website of different journals related to reproduction biotechnology where they are continuously published revisions and recent scientific events on this topic of such research activity.

