

Embryo Biotechnology Applied to Livestock

Code: 103971
ECTS Credits: 3

Degree	Type	Year	Semester
2502445 Veterinary Medicine	OT	5	0

The proposed teaching and assessment methodology that appear in the guide may be subject to changes as a result of the restrictions to face-to-face class attendance imposed by the health authorities.

Contact

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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

Manel López Béjar
Maria Teresa Paramio Nieto
Dolors Izquierdo Tugas
Jaume Gardela Santacruz
Mònica Ferrer Roda
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 3rd 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
- b. Evaluation and classification of embryos
- c. Flushing uterine vacuum
- d. Recovery and freezing of rabbit embryos
- e. Defrosting and transfer of embryos

Depending on the restrictions imposed by the health authorities due to the evolution of the pandemic, the contents of the subject may be reduced or prioritized.

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. Remember that this course the subject will be taught in a semi-presential format.

Theoretical lessons:

The content of the theory program will be taught non-presential format. The material will be available in the Virtual Campus of the subject and sessions of resolution of doubts will be carried out, by Teams, in days and hours programmed.

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.

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. During the practical lessons, which will be carried out in person at the faculty, the students will have to answer an evaluable 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.

The proposed teaching methodology may experience some modifications depending on the restrictions to face-to-face activities enforced by health authorities.

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.

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.

Assy 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.

Student's assessment may experience some modifications depending on the restrictions to face-to-face activities enforced by health authorities.

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

Atles del desenvolupament embrionari preimplantacional dels mamífers domèstics.
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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. 2003.
<https://www-cabi-org.are.uab.cat/cabebooks/ebook/20033162568>

Gordon I. Reproductive Technologies in Farm Animals. CABI Publishing. 2004.
<https://www-cabi-org.are.uab.cat/cabebooks/ebook/20043190616>

Knobil and Neill's Physiology of Reproduction (Third Edition)
<http://www.sciencedirect.com/science/book/9780125154000#ancPT6>

Pinkert CA. Transgenics Animal technology. Ed. Academic Press. 1994.
<https://www-sciencedirect-com.are.uab.cat/book/9780125571654/transgenic-animal-technology>

Sakkas et al. Gamete and embryo selection: genomics, metabolomics and morphological assessment. Ed. SpringerLink. 2014. <https://link-springer-com.are.uab.cat/book/10.1007%2F978-1-4939-0989-6>

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

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.

Software

It does not need it