

Professional Master's Degree  
Biology and Technology of  
Reproduction in Mammals





## Professional Master's Degree Biology and Technology of Reproduction in Mammals

- » Modality: online
- » Duration: 12 months
- » Certificate: TECH Global University
- » Credits: 60 ECTS
- » Schedule: at your own pace
- » Exams: online

Website: [www.techtute.com/us/veterinary-medicine/professional-master-degree/master-biology-technology-reproduction-mammals](http://www.techtute.com/us/veterinary-medicine/professional-master-degree/master-biology-technology-reproduction-mammals)

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# 01

# Introduction

The program in Biology and Technology in Mammal Reproduction is a comprehensive specialization that, first of all, delves into the physiological and endocrinological bases of the different species of domestic mammals and, secondly, into the techniques and protocols that can be developed for genetic improvement and obtaining germplasm; in addition to delving into the use and operation of the equipment currently available.



A close-up photograph of a dog's head, showing its fur and ear, positioned in the bottom-left corner of the page. The dog's fur is light brown and appears soft and slightly damp. The background is dark and out of focus.

“

*Veterinarians must continue their training to adapt to new developments in this field”*

From the earliest data on animal reproduction in Egyptian hieroglyphs, through to the ancient veterinarians and to the present day, humankind has always been interested in the study of animal reproduction to increase populations and obtain better yields.

Animal reproduction has evolved exponentially in recent decades and its current development means that technologies implemented a few years ago are now obsolete. Combining technique, science and human genius brings results that are identical to natural reproduction.

The Professional Master's Degree in Biology and Technology in Mammal Reproduction is developed to expand upon the current knowledge of the physiological and pathological mechanisms of natural reproduction, as well as the specialization in the different techniques of assisted reproduction available for the different species of domestic mammals.

This intensive program includes very new topics in the field of Animal Reproduction, such as sperm sexing in mammals, which are beginning to be applied at a commercial level after years of research. It also covers other topics in genetics that are still under research but are being worked on for inclusion in the current market, such as embryo genotyping by biopsy and CRISPR/CAS. In addition, the teaching team is actively developing the most up to date techniques in assisted reproduction biotechnologies, making the genetic material from different species of international zotechnical interest available to the market.

This **Professional Master's Degree in Biology and Technology of Reproduction in Mammals** contains the most complete and up-to-date scientific program on the market.

The most important features include:

- ♦ Case studies presented by experts in Biology and Technology of Reproduction in Mammals
- ♦ The graphic, schematic, and practical contents with which they are created, provide scientific and practical information on the disciplines that are essential for professional development
- ♦ Latest development in Biology and Technology of Reproduction in Mammals
- ♦ Practical exercises where self assessment can be used to improve learning
- ♦ Special emphasis on innovative methodologies in Biology and Technology of Reproduction in Mammals
- ♦ Theoretical lessons, questions to the expert, debate forums on controversial topics, and individual reflection assignments
- ♦ Content that is accessible from any fixed or portable device with an Internet connection



*Don't miss the opportunity to take this Professional Master's Degree in Biology and Technology of Reproduction in Mammals with us. It's the perfect opportunity to advance in your career"*

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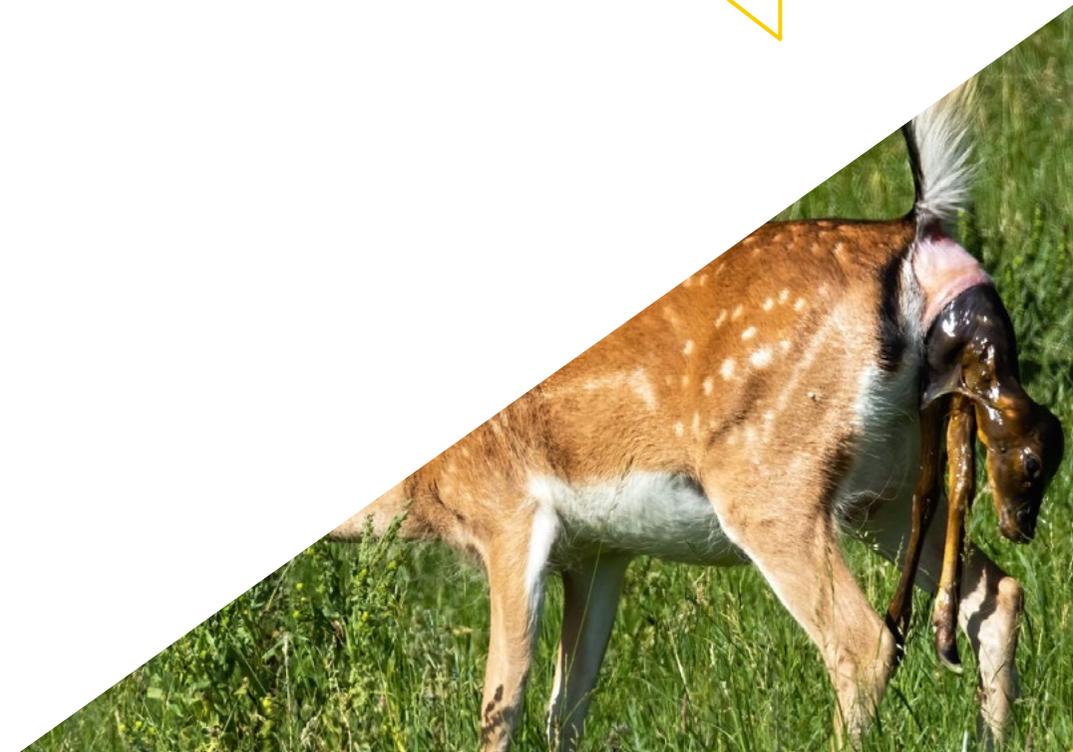
*This Professional Master's Degree is the best investment you can make when choosing a refresher program to update your knowledge in Biology and Technology of Reproduction in Mammals”*

The multimedia content, developed with the latest educational technology, will provide the professional with situated and contextual learning, i.e., a simulated environment that will provide immersive training programmed to learn in real situations.

This program is designed around Problem-Based Learning, whereby the specialist must try to solve the different professional practice situations that arise throughout the program. For this purpose, the professional will be assisted by a novel interactive video system developed by renowned and experienced experts in Mammalian Reproductive Biology and Technology.

*This program comes with the best educational material, providing you with a contextual approach that will facilitate your learning.*

*This 100% online program will allow you to balance your studies with your professional work while increasing your knowledge in this field.*



02

# Objectives

The program in Biology and Technology of Reproduction in Mammals is oriented to facilitate the performance of the veterinary professional with the latest advances and most innovative treatments in the sector.



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*This is the best option to learn about the latest advances in Biology and Technology of Reproduction in Mammals”*



## General objectives

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- ♦ Examine all reproductive methods existing in nature and their evolution
- ♦ Develop knowledge of all the anatomical structures of the reproductive system of different mammals
- ♦ Establish the essential knowledge of the interconnection between the CNS and the hypothalamic-pituitary axis
- ♦ Analyze the hormonal interconnections of mammal reproduction
- ♦ Determine the onset of sexual activity as a method of improving production systems
- ♦ Establish the basis of embryonic development before, during and after implantation
- ♦ Examine the origin and development of reproductive organogenesis
- ♦ Rationale for genetic screening for sex determination and detection of reproductive chromosomal abnormalities
- ♦ Analyze the possible causes of embryonic death
- ♦ Analyze the whole mechanism of hormonal regulation of reproductive activity in the male
- ♦ Examine the anatomy of the accessory glands and their functions in each species of domestic mammals
- ♦ Determine the different ejaculates of domestic mammals
- ♦ Examine all reproductive pathologies and sexually transmitted diseases
- ♦ Analyze the physiology of reproduction in females
- ♦ Establish the specific and concrete differences between the estrous cycle and the sexual cycle in different mammalian females
- ♦ Define the pathologies that affect reproduction programs in females
- ♦ Establish the complete process of fertilization and what happens around this phenomenon
- ♦ Evaluate the factors involved in fertilization disturbances
- ♦ Compile placental systems in different species of domestic mammals
- ♦ Learn the fundamentals of gestational diagnosis methods
- ♦ Specify the stages of labor, its physiology and precursor signs
- ♦ Define the methods of examination and clinical monitoring of mammalian parturition preparation
- ♦ Examine mammary gland function, lactogenic hormones and milk composition in different species of domestic mammals
- ♦ Establish working protocols for sperm extraction, evaluation, processing and cryopreservation
- ♦ Specify practical methods for determining stallion fertility in clinics and farms (spermiograms)
- ♦ Examine artificial insemination methods and programs in different species of domestic mammals
- ♦ Identify the importance of embryo transfer as a methodology for germplasm banking and genetic improvement
- ♦ Examine the development of follicular puncture (OPU), in vitro fertilization (IVF) and intracytoplasmic sperm injection (ICSI) as application techniques in embryo implantation and genetic improvement programs
- ♦ Specify the importance of sexual differentiation in mammals and its application in progeny testing programs
- ♦ Evaluate sex selection techniques in both embryos and spermatozoa
- ♦ Develop knowledge of the alterations caused by the application of these techniques in pathologies that may affect sex determination
- ♦ Analyze the use of the latest reproductive technologies in genetic selection programs
- ♦ Develop a comprehensive study of new reproductive technologies and their effectiveness in their technical application
- ♦ Specify the epigenetic alterations in animal reproduction and the bioethical aspects of their application in animals



## Specific objectives

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### **Module 1. Introduction to the Reproduction of Domestic Mammals Anatomy and Endocrinology**

- ◆ Analyze the methods of sexual and asexual reproduction
- ◆ Deepen knowledge of the specific anatomical bases of each species
- ◆ Establish the pattern of CNS interconnection and its relationships with reproduction
- ◆ Identify release factors and growth factors related to reproduction
- ◆ Determine all hormones involved in reproduction
- ◆ Develop knowledge of the neuroendocrine activity of the hypothalamic-pituitary axis
- ◆ Establish sexual behavioral changes at the onset of puberty

### **Module 2. Embryogenesis and Reproductive Tract Development**

- ◆ Determine microscopically and histologically the morphology of the embryo in its different stages of development
- ◆ Examine the anatomical, cellular and hormonal aspects that occur during blastocyst implantation and possible abnormalities
- ◆ Determine the successive steps from progenesis to organogenesis
- ◆ Analyze the spermatogenic and seminiferous cycle of the different domestic males, as well as their spermatogenic wave
- ◆ Develop knowledge of the dynamics of follicular growth, as well as the regulatory mechanisms for the production of mature oocytes
- ◆ Examine the major abnormalities that occur in the sex chromosomes
- ◆ Acquire in-depth knowledge of the development of apoptosis in the embryo

### Module 3. Male Reproduction

- ♦ Examine the hormonal changes generated during puberty in the male
- ♦ Define the variations produced in male fertility by circadian rhythms
- ♦ Establish the conditions and activity of enzymes involved in testicular function at their specific receptors
- ♦ Evaluate the activity of antihormones
- ♦ Specify the morphological, physiological and maturation mechanisms of spermatozoa
- ♦ Learn the fundamentals of medical nomenclature in sperm assessment
- ♦ Analyze the anatomical and physical action of flagellar sperm movement
- ♦ Compile protocols for diagnosis and treatment of venereal diseases

### Module 4. Female Reproduction

- ♦ Demonstrate the onset of sexual activity in females and the functioning of the hypothalamic-pituitary-gonadal axis
- ♦ Develop the scientific mechanisms of follicular surges in the sexual cycle
- ♦ Identify hormonal factors for growth and regulation of oocyte maturation
- ♦ Examine and establish the importance of the corpus luteum as an endocrine organ in female reproduction
- ♦ Substantiate the importance of the uterus and its physiology in the development of gestation
- ♦ Evaluate postpartum reproductive activity of females
- ♦ Compile methods of diagnosis and treatment of reproductive pathologies in females





### **Module 5. Fertilization and Gestation**

- ♦ Examine gametic migrations
- ♦ Develop knowledge of the events prior to fertilization: sperm capacitation, acrosome reaction and gametic conjugation
- ♦ Demonstrate the importance of pellucid membrane function
- ♦ Specify the mechanisms of oocyte activation after fertilization
- ♦ Examine the factors involved in the processes that alter fertilization
- ♦ Establish the endocrine function of the placenta and the regulation of placental hormones
- ♦ Generate action protocols for embryo reabsorption and miscarriages

### **Module 6. Labor and Lactation**

- ♦ Analyze pelvic diameters and circumferences in different domestic females
- ♦ Substantiate the events during the stages of childbirth
- ♦ Evaluate external and internal factors affecting the dynamics of childbirth
- ♦ Establish calving induction treatments in different domestic females
- ♦ Develop knowledge of puerperal control guidelines
- ♦ Compile the different performances of the physiology of childbirth, as well as anesthesia and obstetric surgery in different species
- ♦ Establish newborn care protocols (neonatology)
- ♦ Specify the process of mammogenesis and lactogenesis based on the physiology of lactation
- ♦ Define milk quality conditions and milk control programs

### Module 7. Reproductive Biotechnologies in Males

- ◆ Present the methods of macroscopic, microscopic and seminal quality assessment
- ◆ Evaluate the compositions and functionality of the different diluents, as well as the methodology for the calculation of seminal doses
- ◆ Examine the critical points in the processing, maintenance and cryopreservation of spermatozoa
- ◆ Establish quality management systems in semen freezing centers
- ◆ Compile the design of a stallion assessment system
- ◆ Identify all genetic diseases transmissible by spermatozoa
- ◆ Propose the creation of germplasm banks for the conservation of animal genetic resources

### Module 8. Reproductive Biotechnologies in Females

- ◆ Analyze synchronization protocols for fixed-time artificial insemination (FTAI)
- ◆ Substantiate the effects of hormones in the IATF programs
- ◆ Evaluate the issues involved in an embryo transfer program
- ◆ Present superovulation and synchronization protocols in embryo donors
- ◆ Establish systems for handling and valuation of embryos at commercial level
- ◆ Compile the different methods of embryo and oocyte preservation
- ◆ Develop OPU programs as an alternative methodology to embryo transfer
- ◆ Analyze the assessment criteria for embryo implantation in recipients



**Module 9. Selection of Sex in Mammals**

- ♦ Evaluate the importance of sex selection in breeding programs
- ♦ Develop knowledge of the methods of embryo sexing currently in use
- ♦ Demonstrate the scientific basis of the different techniques of sperm sex selection
- ♦ Analyze the different advantages and disadvantages of the different sperm sexing techniques in mammalian males
- ♦ Identify pathologies that can affect sex, as well as flagellar mutations and alterations
- ♦ Learn the fundamentals of sperm sexing efficacy techniques

**Module 10. Latest Advances in Reproductive Technologies**

- ♦ Examine MOET, BLUP and Genomics methods for their implementation in selection programs
- ♦ Establish the technique of oocyte collection in impuberant females and its effective application as a shortening of the generation interval
- ♦ Determine the methods of animal cloning and their technical application
- ♦ Propose the different embryo biopsy techniques for preimplantational genetic diagnosis
- ♦ Establish the characteristics of transgenic animals
- ♦ Learn about the application of primordial embryonic cells in animal production
- ♦ Substantiate the mechanism of action in the application of the CRISPR technique



*Update your knowledge through the program in Biology and Technology of Reproduction in Mammals”*

# 03 Skills

Once this program has been completed, the professional will have acquired the skills required for a quality and up-to-date practise based on the most innovative teaching methodology.



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*This program will help you acquire the skills you need to excel in your daily work”*



## General skills

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- ♦ Develop knowledge of all the anatomical structures of the reproductive system of different mammals
- ♦ Analyze the hormonal interconnections of mammal reproduction
- ♦ Rationale for genetic screening for sex determination and detection of reproductive chromosomal abnormalities
- ♦ Analyze the physiology of reproduction in females
- ♦ Establish the specific and concrete differences between the estrous cycle and the sexual cycle in different mammalian females
- ♦ Learn about the fundamentals of gestational diagnosis methods
- ♦ Establish working protocols for sperm extraction, evaluation, processing and cryopreservation
- ♦ Identify the importance of embryo transfer as a methodology for germplasm banking and genetic improvement
- ♦ Evaluate sex selection techniques in both embryos and spermatozoa
- ♦ Develop knowledge of the alterations caused by the application of these techniques in pathologies that may affect sex determination
- ♦ Analyze the use of the latest reproductive technologies in genetic selection programs
- ♦ Develop a comprehensive study of new reproductive technologies and their effectiveness in their technical application





## Specific skills

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- ◆ Identify release factors and growth factors related to reproduction
- ◆ Analyze the spermatogenic and seminiferous cycle of the different domestic males, as well as their spermatogenic wave
- ◆ Fundamentals of medical nomenclature in sperm assessment
- ◆ Substantiate the importance of the uterus and its physiology in the development of gestation
- ◆ Examining gametic migrations
- ◆ Evaluate external and internal factors affecting the dynamics of childbirth
- ◆ Identify all genetic diseases transmissible by spermatozoa
- ◆ Develop OPU programs as an alternative methodology to embryo transfer
- ◆ Fundamentals of sperm sexing efficacy techniques
- ◆ Substantiate the mechanism of action in the application of the CRISPR technique



*This program is the best option you can find to specialize in Biology and Technology of Reproduction in Mammals to help you make more accurate diagnoses”*

# 04

# Course Management

The program includes in its teaching staff leading experts in Biology and Technology of Reproduction in Mammals who contribute to this program the experience of their work. They are world renowned doctors from different countries with proven theoretical and practical professional experience.





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*Our faculty, experts in Biology and Technology of Reproduction in Mammals, will help you achieve success in your profession”*

## International Guest Director

Considered as a true reference in animal care, Dr. Pouya Dini is a prestigious **Veterinarian** highly specialized in the field of **Mammalian Reproduction Technology**. In this sense, he has a **comprehensive approach** based on the personalization of health to offer a first class clinical assistance to different species.

During his extensive professional career, he has been part of renowned veterinary organizations such as the UC Davis Veterinary Hospital located in the United States. Thus, his work has focused on providing **excellent clinical care** to a variety of species: from common pets such as dogs to exotic animals including birds. Thanks to this, he has been able to efficiently treat different pathologies ranging from **Respiratory Infections** or **Gastrointestinal Diseases** to **Cardiovascular Diseases**. In this way, it has optimized the quality of life of a variety of fauna. In tune with this, it has developed innovative **preventive care protocols**, boosting the overall long-term welfare of the animals.

In his commitment to excellence, he regularly updates his knowledge to stay at the forefront of the latest advances in **Veterinary Medicine**. This has allowed him to develop advanced technical skills to incorporate emerging technological tools such as Diagnostic Imaging Systems, Telemedicine and even sophisticated Artificial Intelligence techniques into his daily practice. As a result, he has been able to design and implement more precise and less invasive therapies to significantly optimize outcomes for conditions such as Musculoskeletal Injuries.

He has also balanced this facet with his role as a **Clinical Researcher**. In fact, he has an extensive scientific production on subjects such as **Gene Expression** in the equine placenta, **Reproductive Biotechnology** or the impact of cumulus cells in the in vitro maturation process to predict fertilization in horses.



## Dr. Dini, Pouya

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- Director of Assisted Reproductive Technology at UC Davis Veterinary Hospital, United States
- Specialist in Reproductive Biotechnology.
- Clinical Researcher at Gluck Equine Research Center, United States  
Expert in Equine Placenta
- Author of multiple scientific articles on Mammalian Reproductive Technologies
- Doctor of Philosophy with specialization in Equine Health, Ghent University
- Doctorate in Veterinary Medicine from Islamic Azad University
- Clinical internship at Gluck Equine Research Center
- Award for “Doctoral Thesis of the Year” by Ghent University
- Member of: European College of Animal Reproduction and American College of Theriogenology



*Thanks to TECH, you will be able to learn with the best professionals in the world”*

## Management



### Dr. Gomez Peinado, Antonio

- Coordinator of Obstetrics and Reproduction at Alfonso X El Sabio University, Faculty of Veterinary Medicine
- Degree in Veterinary Medicine
- PhD in Alfonso X El Sabio University Faculty of Veterinary Medicine - Professor of Animal Production



### Dr. Gómez Rodríguez, Elisa

- Professor of Veterinary Medicine at the Alfonso X El Sabio University
- Has worked in the development of assisted reproduction techniques at the " Spanish Institute of Animal Genetics and Reproduction" (IEGRA) in Talavera de la Reina, Toledo
- Degree in Veterinary Medicine, Complutense University Madrid
- Postgraduate course "Assisted Reproduction in Cattle Taught by IEGRA, UAX and HUMEKO, Talavera de la Reina
- Course on "Bovine Reproductive Ultrasound" Taught by Dr. Giovanni Gnemmi (HUMEKO), Talavera de la Reina



## Professors

### Mr. Pinto González, Agustín

- ◆ Veterinarian of the Spanish Institute of Animal Genetics and Reproduction
- ◆ Sani Lidia's Veterinarian
- ◆ Degree in Veterinary Medicine
- ◆ Specialization in Animal Reproduction at IEGRA
- ◆ IEGRA's Diploma in Artificial Insemination in Cattle

### Dr. Peris Frau, Patricia

- ◆ Postdoctoral fellow in charge of the UCLM research project entitled: "Improvements in Sperm Conservation of Different Species" In the Animal Health and Biotechnology Research Group (SaBio, IREC, UCLM)
- ◆ Degree in Veterinary Medicine from the University of Murcia
- ◆ Doctorate in Agricultural and Environmental Sciences with international mention from the University of Castilla La Mancha
- ◆ Member of the research team of the National Project entitled: "Increased in vitro embryo procurement in small ruminants through modification in the in vitro fertilization protocol" (AGL2017-89017-R)
- ◆ Clinical Veterinarian at Animal Care Hospital Douglas, Cork, Ireland

# 05

# Structure and Content

The structure of the contents has been designed by the best professionals in the field of Biology and Technology of Reproduction in Mammals, who have extensive experience and recognized prestige in the profession, backed by the volume of cases they have reviewed, studied and diagnosed, and who have extensive knowledge of new technologies applied to veterinary medicine.



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*This Professional Master's Degree in Biology and Technology of Reproduction in Mammals contains the most complete and up-to-date scientific program on the market”*

**Module 1. Introduction to the Reproduction of Domestic Mammals  
Anatomy and Endocrinology**

- 1.1. Review of Reproductive Methods in Nature and Their Evolution to Mammals
  - 1.1.1. Reproduction in Animals, Evolution and Development of Reproductive Changes in Nature
  - 1.1.2. Asexual Reproduction in Animals
  - 1.1.3. Sexual Reproduction: Mating and Sexual Behavior
  - 1.1.4. The Different Reproductive Systems and Their Application in Animal and Human Research
- 1.2. Anatomy of the Female Genital Tract
  - 1.2.1. Genital Organs of the Cow
  - 1.2.2. Genital Organs of the Mare
  - 1.2.3. Genital Organs of the Sow
  - 1.2.4. Genital Organs of the Sheep
  - 1.2.5. Genital Organs of the Goat
  - 1.2.6. Genital Organs of the Female Dog
- 1.3. Anatomy of the Male Genital Tract
  - 1.3.1. Genital Organs of the Bull
  - 1.3.2. Genital Organs of the Horse
  - 1.3.3. Genital Organs of the Boar
  - 1.3.4. Genital Organs of the Ram
  - 1.3.5. Genital Organs of the Male Goat
  - 1.3.6. Genital Organs of the Dog
- 1.4. The Central Nervous System (CNS) and Its Relationship to Animal Reproduction
  - 1.4.1. Introduction
  - 1.4.2. Nervous Bases of Sexual Behavior
  - 1.4.3. Regulation of Pituitary Gonadotropin Secretion by the Nervous System
  - 1.4.4. Regulation of the Onset of Sexual Activity by the CNS
  - 1.4.5. Effects of Hormones on CNS Development and Differentiation
- 1.5. The Hypothalamic-Pituitary System
  - 1.5.1. Hypothalamic-Pituitary System Morphology
  - 1.5.2. Metabolic Mechanisms of the Release Factors
  - 1.5.3. Structure and Function of the Pituitary Gland
  - 1.5.4. Hormone-Releasing Hormones: Adenohypophysis and Neurohypophysis
- 1.6. Gonadotropins and Their Regulation
  - 1.6.1. Chemical Structure of Gonadotropins
  - 1.6.2. Physiological Characteristics of Gonadotropins
  - 1.6.3. Biosynthesis, Metabolism and Catabolism of Gonadotropins
  - 1.6.4. Regulation of FSH and LH Secretion
- 1.7. Steroidogenesis and Progesteronemia: Their Enzymes and Genomic Regulation
  - 1.7.1. Steroidogenesis, Biosynthesis, Metabolism and Catabolism
  - 1.7.2. Progesteronemia, Biosynthesis, Metabolism and Catabolism
  - 1.7.3. Androgens, Biosynthesis, Metabolism and Catabolism
  - 1.7.4. Intervention of Genomics and Epigenetics in the Changes of Gonadal Hormone Enzyme Activity
- 1.8. Growth Factors in the Reproduction of Mammals
  - 1.8.1. Growth Factors and Their Implication in Reproduction
  - 1.8.2. Action Mechanism of the Growth Factors
  - 1.8.3. Types of Growth Factors Related to Reproduction
- 1.9. Hormones Involved in Reproduction
  - 1.9.1. Placental Hormones: ECG, HCG, Placental Lactogens
  - 1.9.2. Prostaglandins, Biosynthesis and Metabolic Activities
  - 1.9.3. Neurohypophyseal Hormones
  - 1.9.4. Gonadal Hormones
  - 1.9.5. Synthetic Hormones
- 1.10. Sexual Behavior Onset of Reproductive Activity in Young Animals
  - 1.10.1. Ecology and Animal Reproductive Behavior in Reproduction
  - 1.10.2. Prepubertal Period in Domestic Animals
  - 1.10.3. Puberty
  - 1.10.4. Postpubertal Period
  - 1.10.5. Specific Methodologies and Treatments for Altering the Onset of Sexual Activity



## Module 2. Embryogenesis and Reproductive Tract Development

- 2.1. Embryology
  - 2.1.1. Study of Embryonic Morphology
  - 2.1.2. Biochemical and Molecular Aspects of the Embryo before Implantation
  - 2.1.3. Embryo Development During Preimplantation
- 2.2. Blastocyst Development and Implantation
  - 2.2.1. Blastogenesis
  - 2.2.2. Anatomical and Cellular Aspects of Implantation
  - 2.2.3. Receptors and Hormonal Control in Implantation
  - 2.2.4. Implantation Anomalies
- 2.3. Origin and Development of the Reproductive Organs: Organogenesis
  - 2.3.1. Progenesis
  - 2.3.2. Development, Maturation and Structure of Male Sex Cells
  - 2.3.3. Development, Maturation and Structure of Female Sex Cells
  - 2.3.4. Organogenesis
- 2.4. Sex Differentiation Genetic Controls for Sex Determination
  - 2.4.1. Introduction
  - 2.4.2. Y Chromosome Genetics
  - 2.4.3. X Chromosome Genetics
  - 2.4.4. Sex Determination Pathologies
- 2.5. Male Gonad Structural and Functional Histology
  - 2.5.1. Testicular Histology
  - 2.5.2. Spermiocytogenesis
  - 2.5.3. Sertoli Cells
  - 2.5.4. Leydig Cells
  - 2.5.5. Vascular and Nervous System of the Testicle
  - 2.5.6. Regulation of Testicular Functions
- 2.6. Spermiogenesis
  - 2.6.1. Spermiogenesis
  - 2.6.2. Spermiogenesis
  - 2.6.3. Spermatogenic and Seminiferous Epithelial Cycle
  - 2.6.4. Spermatogenic Wave
  - 2.6.5. Endocrine Control of Spermatogenesis

- 2.7. Female Gonad Structural and Functional Histology
  - 2.7.1. Histology of the Ovary
  - 2.7.2. Vascular and Nervous System
  - 2.7.3. Stages of Follicular Development
  - 2.7.4. Stages of Follicular Atresia
- 2.8. Oocytogenesis
  - 2.8.1. Folliculogenesis
  - 2.8.2. Follicular Growth Dynamics
  - 2.8.3. Regulation of the Number of Follicles Capable of Ovulation
  - 2.8.4. Oocyte Maturation
- 2.9. Chromosomal and Genetic Abnormalities in the Embryonic Development Period
  - 2.9.2. Genetic Basis of Ovarian and Testicular Differentiation
  - 2.9.3. Developmental Abnormalities of the Male and Female Reproductive System
  - 2.9.4. Gonadal Dysgenesis and Primary Ovarian Failure
  - 2.9.5. Hermaphroditism and Pseudohermaphroditism
- 2.10. Blockage of Embryonic Development
  - 2.10.1. Introduction
  - 2.10.2. Apoptosis in Embryonic Development
  - 2.10.3. Factors Causing a Blockage in Embryonic Development

### Module 3. Male Reproduction

- 3.1. Regulation of Gonadal Activities
  - 3.1.1. Regulation of FSH Synthesis and Secretion in Males
  - 3.1.2. Regulation of LH Synthesis and Secretion in Males
  - 3.1.3. Pulsatile Release of GnRH and Its Control
  - 3.1.4. Puberty and Testicular Development
  - 3.1.5. Circadian Rhythms and Their Interaction in Male Fertility
- 3.2. Testicular Steroidogenic Function
  - 3.2.1. Steroidogenesis in Males
  - 3.2.2. Enzymes and Genomic Regulation of Testicular Function
  - 3.2.3. Steroid Hormone Receptors Involved in Male Reproduction
  - 3.2.4. Receptors and Their Nuclear Action
  - 3.2.5. Antihormones

- 3.3. Accessory Glands
  - 3.3.1. Ampullae of Henle in Different Species of Domestic Mammals
  - 3.3.2. Seminal Vesicles in the Different Species of Domestic Mammals
  - 3.3.3. Prostate in Different Species of Domestic Mammals
  - 3.3.4. Bulbourethral Glands in Different Species of Domestic Mammals
- 3.4. Spermatozoa Biology
  - 3.4.1. Sperm Morphology
  - 3.4.2. Comparison of Spermatozoa in Domestic Animals
  - 3.4.3. Sperm Physiology
  - 3.4.4. Sperm Maturation
  - 3.4.5. Study of the Spermatozoa by Electron Microscopy
- 3.5. Ejaculates in the Different Species of Domestic Mammals
  - 3.5.1. Ejaculate Composition
  - 3.5.2. Variation in Ejaculate Composition among Domestic Mammal Species
  - 3.5.3. Medical Nomenclature in Sperm Assessment
  - 3.5.4. Alteration in Ejaculates as a Function of Nutritional Systems
- 3.6. Control of Spermatogenesis
  - 3.6.1. Endocrine Control of Spermatogenesis
  - 3.6.2. Initiation of Spermatogenesis in the Young Male
  - 3.6.3. Duration of Spermatogenesis in Mammals
  - 3.6.4. Sperm Chromosomal Abnormalities and the Consequences on Reproduction
- 3.7. Study of Sperm and Flagellar Movement
  - 3.7.1. Functional Anatomy of the Flagellum
  - 3.7.2. Sperm Motility
  - 3.7.3. Variations in Sperm Motility
  - 3.7.4. Sperm Transport Changes in Sperm Motility During Transport
- 3.8. Congenital Testicular Malformations
  - 3.8.1. Chromosomal Abnormalities
  - 3.8.2. Genetic Abnormalities
  - 3.8.3. Embryological Diagnosis of Genetic Abnormalities at the Testicular Level in Mammals

- 3.9. Reproductive Pathologies in Males
  - 3.9.1. Testicular Torsion
  - 3.9.2. Testicular Neoplasms
  - 3.9.3. Abnormalities of the Vas Deferens and Accessory Glands
  - 3.9.4. Abnormalities of the Penis and Foreskin
  - 3.9.5. Orchitis
  - 3.9.6. Seminal Vesiculitis
  - 3.9.7. Epididymitis
- 3.10. Venereal Diseases in Mammals
  - 3.10.1. Sexually Transmitted Bacterial Diseases in Females and Males
  - 3.10.2. Sexually Transmitted Viral Diseases in Females and Males
  - 3.10.3. Sexually Transmitted Parasitic Diseases in Females and Males
  - 3.10.4. Transmission, Prevention and Control Mechanisms

## Module 4. Female Reproduction

- 4.1. Reproductive Physiology in Females
  - 4.1.1. Onset of Sexual Activity in Females
  - 4.1.2. Hypothalamic-Pituitary-Gonadal Axis
  - 4.1.3. Hormone Control Feedback System
  - 4.1.4. Intervention of Photoperiod in Female Reproductive Physiology
- 4.2. Estrous Cycle and Sexual Cycle Follicular Waves
  - 4.2.1. Estrous Cycle and Sexual Cycle in the Cow
  - 4.2.2. Estrous Cycle and Sexual Cycle in the Mare
  - 4.2.3. Estrous Cycle and Sexual Cycle in Sows
  - 4.2.4. Estrous Cycle and Sexual Cycle in the Goat
  - 4.2.5. Estrous Cycle and Sexual Cycle in Sheep
  - 4.2.6. Estrous Cycle and Sexual Cycle in Female Dogs
- 4.3. Oocyte Maturation and Ovulation
  - 4.3.1. Nuclear Maturation of the Oocyte
  - 4.3.2. Cytoplasmic Maturation of the Oocyte
  - 4.3.3. Hormones and Growth Factors in the Regulation of Oocyte Maturation
  - 4.3.4. Phenomenology of Ovulation
  - 4.3.5. Ovulation Disorders
- 4.4. Corpus Luteum Histology and Pathophysiology
  - 4.4.1. Luteal Cells Histology of the Corpus Luteum
  - 4.4.2. Morphological and Functional Evolution of the Corpus Luteum
  - 4.4.3. Luteolysis
  - 4.4.4. Pathophysiology of the Corpus Luteum
- 4.5. The Uterus and Preparation for Pregnancy
  - 4.5.1. The Uterus as an Organ of Gestation Reception
  - 4.5.2. Histological and Physiological Study of the Uterus
  - 4.5.3. Changes Produced in the Uterus from the Beginning of Gestation to Its Termination
  - 4.5.4. Uterine Pathophysiology
- 4.6. Beginning of Postpartum Reproductive Activity
  - 4.6.1. Physiological Conditions Occurring after Childbirth
  - 4.6.2. Recovery of Hypothalamic-Pituitary Activity
  - 4.6.3. Structural Changes of the Gonads in the Postpartum Period
  - 4.6.4. Etiological and Therapeutic Study of Postpartum Anestrus
  - 4.6.5. Fertility-Related Postpartum Incidences
- 4.7. Oocyte Biology and Pathology
  - 4.7.1. Oocyte Morphology
  - 4.7.2. Impact of Nutrition on Oocyte Quality
  - 4.7.3. Alterations in Oocyte Gene Expression
- 4.8. Reproductive Pathologies in Females
  - 4.8.1. Extrinsic Factors Affecting Reproduction in Females
  - 4.8.2. Congenital and Fetal Disorders
  - 4.8.3. Infectious Infertility
  - 4.8.4. Physical and Chromosomal Abnormalities
  - 4.8.5. Hormonal Disorders
- 4.9. Chromosomal Behavior and Achromatic Spindle Formation in Mammalian Oocytes
  - 4.9.1. Introduction
  - 4.9.2. Formation of Achromatic Spindle in Metaphase I and Metaphase II
  - 4.9.3. Chromosome Dynamics and Segregation During Metaphase I and Metaphase II
- 4.10. In Vivo and In Vitro Follicle and Oocyte Metabolism
  - 4.10.1. Relationships between Follicular Cells and the Oocyte
  - 4.10.2. Metabolism of Primordial Follicles and Oocytes
  - 4.10.3. Metabolism of Growing Follicles and Oocytes
  - 4.10.4. Metabolism During the Perioviulatory Period

## Module 5. Fertilization and Gestation

- 5.1. Phenomenology of Fertilization
  - 5.1.1. Gametic Migration of Spermatozoa
  - 5.1.2. Gametic Migration of the Egg
  - 5.1.3. Study of Gamete Fertility Time Prior to Fertilization
  - 5.1.4. Processes Occurring Prior to Fertilization: Sperm Capacitation, Acrosome Reaction and Gametic Conjugation
- 5.2. Structure and Function of the Pellucid Membrane
  - 5.2.1. Origin, Formation and Structure of the Pellucid Zone
  - 5.2.2. Molecular Characteristics of Pellucid Zone Glycoproteins
  - 5.2.3. Cortical Granules and Their Reaction at the Pellucid Membrane
  - 5.2.4. Spermatozoa-Pellucid Zone Binding Models
- 5.3. Development of Oocyte Activity after Fertilization
  - 5.3.1. Union and Penetration to the Pellucid Zone
  - 5.3.2. Union and Fusion of the Spermatozoon to the Oocyte Cell Membrane
  - 5.3.3. Prevention of Polyspermia
  - 5.3.4. Egg Metabolic Activation
  - 5.3.5. Sperm Nucleus Decondensation (Male Pronucleus)
- 5.4. Pathophysiology of Fertilization
  - 5.4.1. Factors Involved in Fertilization Disruption
  - 5.4.2. Polyspermia
  - 5.4.3. Monozygotic Twins
  - 5.4.4. Interspecific Hybrids
  - 5.4.5. The Chimeras
- 5.5. Study of Placental Systems in Domestic Animals
  - 5.5.1. Comparative Anatomy and Histology of the Placenta in Mammals
  - 5.5.2. The Placenta in Cows
  - 5.5.3. The Placenta in Sheep
  - 5.5.4. The Placenta in Mares
  - 5.5.5. The Placenta in Goats
  - 5.5.6. The Placenta in Female Dogs
  - 5.5.7. The Placenta in Sow
- 5.6. Placental Endocrinology
  - 5.6.1. Endocrine Function of the Placenta
  - 5.6.2. Hormones Produced by the Placenta, Specific to the Species
  - 5.6.3. Placental Lactogens
  - 5.6.4. Prolactin
  - 5.6.5. Regulation of all Placental Hormones in Mammals
- 5.7. Characteristics of Fetal Development in Domestic Species
  - 5.7.1. Fetal Development in Cows
  - 5.7.2. Fetal Development in Mares
  - 5.7.3. Fetal Development in Sheep
  - 5.7.4. Fetal Development in Goats
  - 5.7.5. Fetal Development in Female Dogs
  - 5.7.6. Fetal Development in Sows
- 5.8. Methods of Gestation Diagnosis in Domestic Females
  - 5.8.1. Study of all Methods of Gestation in Mammals
  - 5.8.2. Diagnosis of Pregnancy in Cows
  - 5.8.3. Diagnosis of Pregnancy in Mares
  - 5.8.4. Diagnosis of Pregnancy in Sheep
  - 5.8.5. Diagnosis of Pregnancy in Goats
  - 5.8.6. Diagnosis of Pregnancy in Female Dogs
  - 5.8.7. Diagnosis of Pregnancy in Sows
- 5.9. Gestation Interruption Embryonic Resorptions and Miscarriages
  - 5.9.1. Pharmacological Methods of Pregnancy Termination
  - 5.9.2. Determination of Embryonic Resorptions in Mammals
  - 5.9.3. Miscarriage: How Does It Develop and Its Main Causes?
  - 5.9.4. Necropsies of Aborted Fetuses, Sample Collection for Analysis and Specific Treatments
  - 5.9.5. Placental Apoptosis in Venereal Diseases
- 5.10. Mammalian Gestational Immunology
  - 5.10.1. Embryo Antigenicity
  - 5.10.2. Immune Changes During Pregnancy
  - 5.10.3. Immune Pathologies of Reproduction
  - 5.10.4. Alteration of Immune-Mediated Growth Factor

**Module 6. Labor and Lactation**

- 6.1. Labor: Stages Physiology of Labor
  - 6.1.1. Definition of Labor and Its Phases
  - 6.1.2. Late Gestational Hormonal Changes and Effect on Myometrial Activation
  - 6.1.3. Prostaglandins at the End of Gestation and Their Physiological Activity
  - 6.1.4. The Peripheral Nervous System and Its Mediators in Childbirth
- 6.2. Precursor Signs of Parturition in Different Female Mammals
  - 6.2.1. Signs of Approaching Parturition in Different Females
  - 6.2.2. Relaxation of the Pubic Symphysis, Cervix, and Medial and External Tract of the Reproductive System
  - 6.2.3. Study of the Hypothalamic-Pituitary-Cortico-Adrenal Axis of the Fetus and the Determination of the Onset of Labor
  - 6.2.4. Influence of External Factors on the Onset of Labor
  - 6.2.5. Induction of Parturition in Different Females Pharmacological Aspects
- 6.3. Pelvimetry Labor Neonatology
  - 6.3.1. Study of the Anatomy of the Pelvis in Mammals
  - 6.3.2. Pelvic Diameters and Circumferences in Females
  - 6.3.3. Events During the Stages of Childbirth
  - 6.3.4. Care of the Mother after Labor
  - 6.3.5. Care of Newborns
- 6.4. Fetal Presentation and Positions Labor Technique
  - 6.4.1. Methods of Examination and Clinical Follow-Up in Preparation for Mammalian Parturition
  - 6.4.2. Fetal Presentations and Positions in Females
  - 6.4.3. Diagnosis and Mechanisms of Clinical Action in Childbirth
- 6.5. The Puerperium in Females
  - 6.5.1. Puerperal Period, Early Phase
  - 6.5.2. Puerperal Period, Late Phase
  - 6.5.3. Guidelines for Puerperal Control
  - 6.5.4. Cycles of Lochia Elimination in Females
- 6.6. Pathophysiology of Labor Obstetrics
  - 6.6.1. Labor Propaedeutics
  - 6.6.2. Study of Obstetric Material in Different Females
  - 6.6.3. Obstetric Anesthesia in Different Females
  - 6.6.4. Bloodless Obstetric Interventions
  - 6.6.5. Bloody Obstetric Interventions
- 6.7. Mammary Gland Development Mammogenesis
  - 6.7.1. Anatomy of the Mammary Gland in Different Female Mammals
  - 6.7.2. Vascularization and Innervation of the Udder
  - 6.7.3. Mammogenesis, Fetal Period and Postnatal Period
  - 6.7.4. Hormonal Control of Mammary Gland Growth
- 6.8. Functioning of the Mammary Gland Lactogenesis
  - 6.8.1. Lactation Physiology
  - 6.8.2. Lactogenic Hormones During Gestation and Labor Mechanism of Action
  - 6.8.3. Lactation
  - 6.8.4. Neuroendocrine Reflex of Lactal Ejection
- 6.9. Colostrum and Milk Production
  - 6.9.1. Composition of Milk in Different Females
  - 6.9.2. Composition of Colostrum in Different Females
  - 6.9.3. Influence of External Factors on Milk Production
  - 6.9.4. Management of Females for the Initiation of Milk Productive Activity
- 6.10. Pathologies in Lactation Mammitis
  - 6.10.1. Control of Reproductive Aptitude in Lactation: Lactational Anestrus
  - 6.10.2. Milk Quality
  - 6.10.3. Markers of Udder Inflammation
  - 6.10.4. Mammitis and Control Programs
  - 6.10.5. Mechanical Milking and Animal Welfare Conditions

## Module 7. Reproductive Biotechnologies in Males

- 7.1. Control and Sanitary Regulations for the Selection of Donors Venereal Diseases
  - 7.1.1. Introduction
  - 7.1.2. Animal Health Risks and Their Impact on International Trade
  - 7.1.3. Legal and Institutional Framework of Global Agricultural Trade
- 7.2. Methods of Semen Collection in Different Species of Domestic Mammals
  - 7.2.1. Semen Extraction Using Artificial Vagina in Different Species of Domestic Mammals
  - 7.2.2. Extraction of Semen by Electroejaculation in Different Species of Domestic Mammals
  - 7.2.3. Postmortem Semen Collection in Different Species of Domestic Mammals
  - 7.2.4. How Does the Method of Semen Collection Affect the Quality of the Ejaculate?
- 7.3. Sperm Assessment Specific Parameters and Methods to Determine Semen Quality
  - 7.3.1. Macroscopic Assessment of the Ejaculate
  - 7.3.2. Microscopic Assessment of the Ejaculate
  - 7.3.3. Existing Methods for Semen Quality Assessment
- 7.4. Processing and Maintenance of Spermatozoa in Different Mammalian Species
  - 7.4.1. Composition and Functionality of the Diluent
  - 7.4.2. Differences in the Composition of Diluents in Different Species of Domestic Mammals
  - 7.4.3. Methodology for Calculating the Number of Seminal Doses
  - 7.4.4. Straw Packaging and Printing Criteria
  - 7.4.5. Critical Points During Processing and Maintenance of Spermatozoa
- 7.5. Sperm Cryopreservation
  - 7.5.1. Introduction
  - 7.5.2. Types of Cryoprotectants Used in Sperm Cryopreservation and Their Function
  - 7.5.3. Sperm Cryopreservation Methods
  - 7.5.4. Differences in Patterns of Sperm Cryopreservation in Different Species of Domestic Mammals
- 7.6. Quality Management System in Semen Freezing Centers
  - 7.6.1. Pre-Marketing Quality Management System for Seminal Doses
  - 7.6.2. Internal Data Management System for the Control of Seminal Dose in a Reproductive Center

- 7.6.3. Quality Management Systems in Sperm Freezing Centers by the Ark
- 7.7. Methods of Determining the Fertility of Stallions Individually and on Farms
  - 7.7.1. Complete Study of Physical Capabilities for Riding and Sexual Libido
  - 7.7.2. Hormonal and Health Analyses
  - 7.7.3. Evaluation of the Reproductive System of the Stallion
  - 7.7.4. Therapeutic Methods to Improve Fertility in a Stallion
- 7.8. Genetic Characteristics of Stallions (Progeny Testing) and Guidelines for Marketing of Frozen Semen Doses
  - 7.8.1. Design of an Animal Assessment System
  - 7.8.2. Assess the Genetic Performance of an Individual
  - 7.8.3. Genomic Assessment
- 7.9. Study of Genetic Diseases Transmissible by Spermatozoa
  - 7.9.1. Introduction
  - 7.9.2. Peripheral Blood Karyotype
  - 7.9.3. Study of Meiosis in Testicular Tissue
  - 7.9.4. Study of the Spermatozoon
  - 7.9.5. Genetic Analysis of the Stallion to Detect Communicable Diseases
- 7.10. Establishment of Germplasm Banks for the Conservation of Animal Genetic Resources
  - 7.10.1. Germplasm Bank Quality Management Systems
  - 7.10.2. Importance of a Germplasm Bank

## Module 8. Reproductive Biotechnologies in Females

- 8.1. Artificial Insemination in Ruminant Females
  - 8.1.1. Evolution of Artificial Insemination Methodologies in Females
  - 8.1.2. Heat Detection Methods
  - 8.1.3. Artificial Insemination in Cows
  - 8.1.4. Artificial Insemination in Sheep
  - 8.1.5. Artificial Insemination in Goats
- 8.2. Artificial Insemination in Mare, Sows and Female Dogs
  - 8.2.1. Artificial Insemination in Mares
  - 8.2.2. Artificial Insemination in Sows
  - 8.2.3. Artificial Insemination in Female Dogs
- 8.3. Fixed-Time Artificial Insemination Programs (FTAI)

- 8.3.1. Functions, Advantages and Disadvantages of FTAI
- 8.3.2. FTAI Methods
- 8.3.3. Prostaglandin in Estrus Synchronization
- 8.3.4. Ovsynch, Cosynch y Presynch
- 8.3.5. Double-Ovsynch, G6G, Ovsynch-PMSG, and Resynchronization
- 8.3.6. Effect of Estrogens for Synchronization
- 8.3.7. Study of Progesterone in Synchronization Programs
- 8.4. Embryo Transfer Donor and Recipient Selection and Management
  - 8.4.1. Importance of Embryo Transfer in Different Species of Domestic Mammals
  - 8.4.2. Reproductive Interest Criteria for Donor Selection
  - 8.4.3. Criteria for the Selection of Recipients
  - 8.4.4. Preparation and Handling of Donors and Recipients
- 8.5. Embryo Transfer Superovulation and Embryo Collection Techniques
  - 8.5.1. Superovulatory Treatments in Different Species of Domestic Mammals
  - 8.5.2. Artificial Insemination During the Development of a E.T
  - 8.5.3. Preparation of the Donor for E.T
  - 8.5.4. Embryo Recovery Techniques in Different Species of Domestic Mammals
- 8.6. Handling and Commercial Evaluation of Embryos
  - 8.6.1. Isolation of Embryos
  - 8.6.2. Embryo Search and Handling Means Used
  - 8.6.3. Embryo Classification
  - 8.6.4. Embryo Washing
  - 8.6.5. Straw Preparation for Transfer or Transport
  - 8.6.6. Physicochemical Conditions for Embryo Maintenance
  - 8.6.7. Basic Equipment and Materials Used
- 8.7. Follicular Puncture (OPU)
  - 8.7.1. Principles of the Technique
  - 8.7.2. Preparation of OPU Females for OPU: Stimulation or Nonstimulation
  - 8.7.3. Methodology of the OPU Technique
- 8.8 In Vitro Fertilization and Intracytoplasmic Sperm Injection (ICSI)
  - 8.8.1. Procurement and Selection of COCS
  - 8.8.2. In Vitro Maturation (IVM)
  - 8.8.3. Conventional in Vitro Fertilization (IVF)

- 8.8.4. Intracytoplasmic Sperm Injection (ICSI)
- 8.8.5. In Vitro Culture (IVC)
- 8.9. Embryo Implantation in Recipients
  - 8.9.1. Receiver Synchronization Protocols
  - 8.9.2. Recipient Assessment Criteria Following Synchronization Protocols
  - 8.9.3. Embryo Implantation Technique and Equipment Required
- 8.10. Oocyte and Embryo Cryopreservation
  - 8.10.1. Introduction
  - 8.10.2. Embryo and Oocyte Preservation Methods
  - 8.10.3. Cryopreservation Techniques
  - 8.10.4. Comparison of Embryos Produced In Vitro and In Vivo Embryo Assessment for Freezing and Techniques of Choice

## Module 9. Selection of Sex in Mammals

- 9.1. Sex Selection in Genetic Improvement
  - 9.1.1. Sexual Differentiation in Mammals
  - 9.1.2. Sex Selection in Progeny Tests
- 9.2. Embryo Sex Identification
  - 9.2.1. Methods of Sex Detection in Embryos
  - 9.2.2. Invasive Methods, Cytogenetic Analysis and PCR
  - 9.2.3. Non-Invasive, Antigenic and Immunofluorescence Methods
  - 9.2.4. Control of Sex by Speed Difference in Embryonic Development
- 9.3. Sperm Sex Selection Techniques: Immunological Methods
  - 9.3.1. Membrane Proteins of the X and Y Spermatozoa
  - 9.3.2. Monoclonal and Polyclonal Anti-H-Y Antibodies
  - 9.3.3. X- and Y-Sperm Specific Membrane Markers
  - 9.3.4. Identification of Sex-Specific Proteins (SSP)
- 9.4. Sperm Sex Selection Techniques: Methods Based on Physical Differences
  - 9.4.1. Study of the Physical Differences between X and Y Spermatozoa
  - 9.4.2. PH Sensitivity
  - 9.4.3. Differences Electric Charges
  - 9.4.4. Differences in the Size of the Sperm Head Nucleus

- 9.5. Sperm Sex Selection Techniques: Methods Based on DNA Content
  - 9.5.1. Study of DNA Content in Different Mammals
  - 9.5.2. Sex Selection by Flow Cytometry
  - 9.5.3. Efficiency of the Flow Cytometry Technique
- 9.6. Sperm Sex Selection Techniques: Methods Based on Cytochrome Filters
  - 9.6.1. What Are Cytochromic Filters?
  - 9.6.2. Density Difference Techniques
  - 9.6.3. Use of Cytochromes and Density Differences in the Separation of X and Y Sperm
  - 9.6.4. Efficiency of This Technique
- 9.7. Sperm Sex Selection Techniques: Differences in Migration Speed
  - 9.7.1. Differences in X and Y Sperm Velocity
  - 9.7.2. Culture Media for Sperm Separation by Migration Speed
  - 9.7.3. Efficiency of This Technique
- 9.8. Comparative Study of Different Sperm Separation Techniques
  - 9.8.1. Advantages and Disadvantages of Using the Different Sexing Techniques
  - 9.8.2. Assessment of Sexing Techniques in Different Mammalian Species
  - 9.8.3. Proper Choice of Sexing Technique for Livestock Farms
- 9.9. Morphokinetic Alterations in Sperm Obtained from Sexing Techniques
  - 9.9.1. Sex Determination Pathologies
  - 9.9.2. Cytogenetic Analysis of the Y Chromosome
  - 9.9.3. Genes Carried on the Y Chromosome
  - 9.9.4. Mutations
  - 9.9.5. Flagellar Alterations in the Sexed Doses
- 9.10. Techniques for the Detection of Sperm Sexing Efficiency
  - 9.10.1. Ultrasound Sex Detection
  - 9.10.2. Quantitative PCR
  - 9.10.3. Fluorescence In Situ Hybridization (FISH)
  - 9.10.4. Other techniques

## Module 10. Latest Advances in Reproductive Technologies

- 10.1. Assistance of the Latest Reproductive Technologies in Breeding Programs
  - 10.1.1. Genetic Manipulation Concept and Historical Introduction
  - 10.1.2. Promoters and Gene Expression
  - 10.1.3. Mammalian Cell Transformation Systems
  - 10.1.4. Application Methods in Genetic Improvement: MOET, BLUP and Genomics
- 10.2. Oocyte Collection in Impuberant Females
  - 10.2.1. Donor Selection and Preparation
  - 10.2.2. Ovarian Stimulation Protocols
  - 10.2.3. OPU Technique
  - 10.2.4. Differences between Prepubertal and Adult Females in the Results of Oocyte Retrieval and In Vitro Embryo Production (IVP)
- 10.3. Cloning of Animals of Zootechnical Interest
  - 10.3.1. Introduction and Phases of the Cell Cycle
  - 10.3.2. Methodology of Cloning by Means of Nuclear Transfer
  - 10.3.3. Cloning Application and Effectiveness
- 10.4. Preimplantational Genetic Diagnosis
  - 10.4.1. Introduction
  - 10.4.2. Assisted Hatching
  - 10.4.3. Embryo Biopsy
  - 10.4.4. Applications and Methods of Preimplantational Genetic Diagnosis in Domestic Mammals
- 10.5. Applied Genomics and Proteomics in Genetic Programs
  - 10.5.1. Introduction and Application of Genomics and Proteomics in Veterinary Medicine
  - 10.5.2. Genetic Polymorphisms
  - 10.5.3. Construction of Genetic Maps
  - 10.5.4. Genome Projects and Manipulation
- 10.6. Transgenesis
  - 10.6.1. Introduction
  - 10.6.2. Transgenesis Applications in Domestic Mammals
  - 10.6.3. Gene Transfer Techniques
  - 10.6.4. Characteristics of Transgenic Animals



- 10.7. Primordial Embryonic Cells
  - 10.7.1. Introduction
  - 10.7.2. Pluripotent Embryonic Cell Lines
  - 10.7.3. Embryonic Primordial Cells and Genetic Modification
  - 10.7.4. Application of Primordial Embryonic Cells in Animal Production
- 10.8. Epigenetic Alterations in Animal Reproduction
  - 10.8.1. Introduction and Main Types of Epigenetic Information
  - 10.8.2. Genomic Imprinting Disorders and Assisted Reproduction
  - 10.8.3. Epigenetic Alterations
  - 10.8.4. Epigenetics and Its Intergenerational Responses
  - 10.8.5. Alterations in Normal Oocyte Physiology and Etiology of Imprinting Alterations in Assisted Reproductive Techniques
- 10.9. CRISPR/CAS
  - 10.9.1. Introduction
  - 10.9.2. Structure and Mechanism of Action
  - 10.9.3. Application of the CRISPR/CAS Technique in Animal and Human Models Clinical Trials
  - 10.9.4. The Present and Future of Gene Editing

“ *This specialization will allow you to comfortably advance in your career*”

# 06 Methodology

This academic program offers students a different way of learning. Our methodology uses a cyclical learning approach: **Relearning**.

This teaching system is used, for example, in the most prestigious medical schools in the world, and major publications such as the **New England Journal of Medicine** have considered it to be one of the most effective.





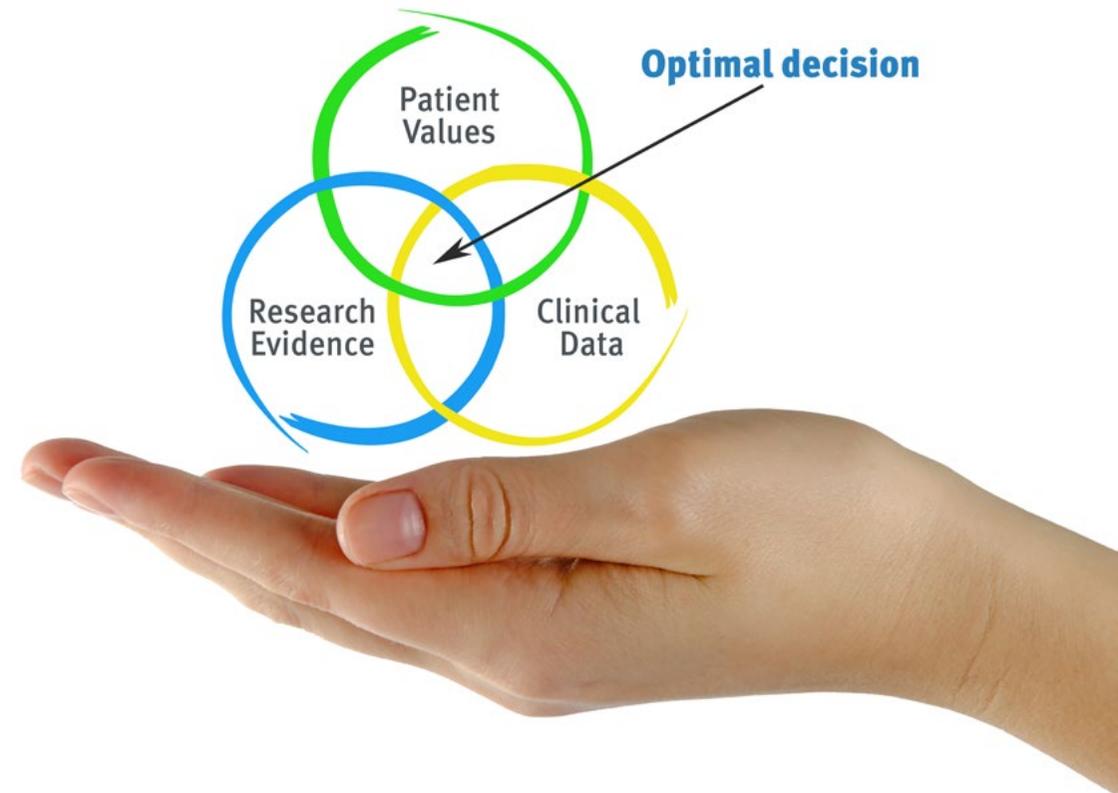
“

*Discover Relearning, a system that abandons conventional linear learning, to take you through cyclical teaching systems: a way of learning that has proven to be extremely effective, especially in subjects that require memorization”*

## At TECH we use the Case Method

What should a professional do in a given situation? Throughout the program you will be presented with multiple simulated clinical cases based on real patients, where you will have to investigate, establish hypotheses and, finally, resolve the situation. There is an abundance of scientific evidence on the effectiveness of the method. Specialists learn better, faster, and more sustainably over time.

*With TECH you will experience a way of learning that is shaking the foundations of traditional universities around the world.*



According to Dr. Gérvas, the clinical case is the annotated presentation of a patient, or group of patients, which becomes a "case", an example or model that illustrates some peculiar clinical component, either because of its teaching power or because of its uniqueness or rarity. It is essential that the case is based on current professional life, in an attempt to recreate the actual conditions in a veterinarian's professional practice.

“

*Did you know that this method was developed in 1912, at Harvard, for law students? The case method consisted of presenting students with real-life, complex situations for them to make decisions and justify their decisions on how to solve them. In 1924, Harvard adopted it as a standard teaching method”*

The effectiveness of the method is justified by four fundamental achievements:

1. Veterinarians who follow this method not only manage to assimilate concepts, but also develop their mental capacity through exercises to evaluate real situations and knowledge application
2. Learning is solidly translated into practical skills that allow the student to better integrate into the real world.
3. Ideas and concepts are understood more efficiently, given that the example situations are based on real-life.
4. The feeling that the effort invested is effective becomes a very important motivation for veterinarians, which translates into a greater interest in learning and an increase in the time dedicated to working on the course.



## Relearning Methodology

At TECH we enhance the case method with the best 100% online teaching methodology available: Relearning.

This university is the first in the world to combine the study of clinical cases with a 100% online learning system based on repetition, combining a minimum of 8 different elements in each lesson, a real revolution with respect to the mere study and analysis of cases.



*Veterinarians will learn through real cases and by resolving complex situations in simulated learning environments. These simulations are developed using state-of-the-art software to facilitate immersive learning.*

At the forefront of world teaching, the Relearning method has managed to improve the overall satisfaction levels of professionals who complete their studies, with respect to the quality indicators of the best online university (Columbia University).

With this methodology more than 65,000 veterinarians have been trained with unprecedented success in all clinical specialties, regardless of the surgical load. Our teaching method is developed in a highly demanding environment, where the students have a high socio-economic profile and an average age of 43.5 years.

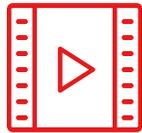
*Relearning will allow you to learn with less effort and better performance, involving you more in your training, developing a critical mindset, defending arguments, and contrasting opinions: a direct equation for success.*

In our program, learning is not a linear process, but rather a spiral (learn, unlearn, forget, and re-learn). Therefore, we combine each of these elements concentrically.

The overall score obtained by TECH's learning system is 8.01, according to the highest international standards.



This program offers the best educational material, prepared with professionals in mind:



#### Study Material

All teaching material is produced by the specialists who teach the course, specifically for the course, so that the teaching content is highly specific and precise.

These contents are then applied to the audiovisual format, to create the TECH online working method. All this, with the latest techniques that offer high quality pieces in each and every one of the materials that are made available to the student.



#### Latest Techniques and Procedures on Video

TECH introduces students to the latest techniques, the latest educational advances and to the forefront of current and procedures of veterinary techniques. All of this in direct contact with students and explained in detail so as to aid their assimilation and understanding. And best of all, you can watch the videos as many times as you like.



#### Interactive Summaries

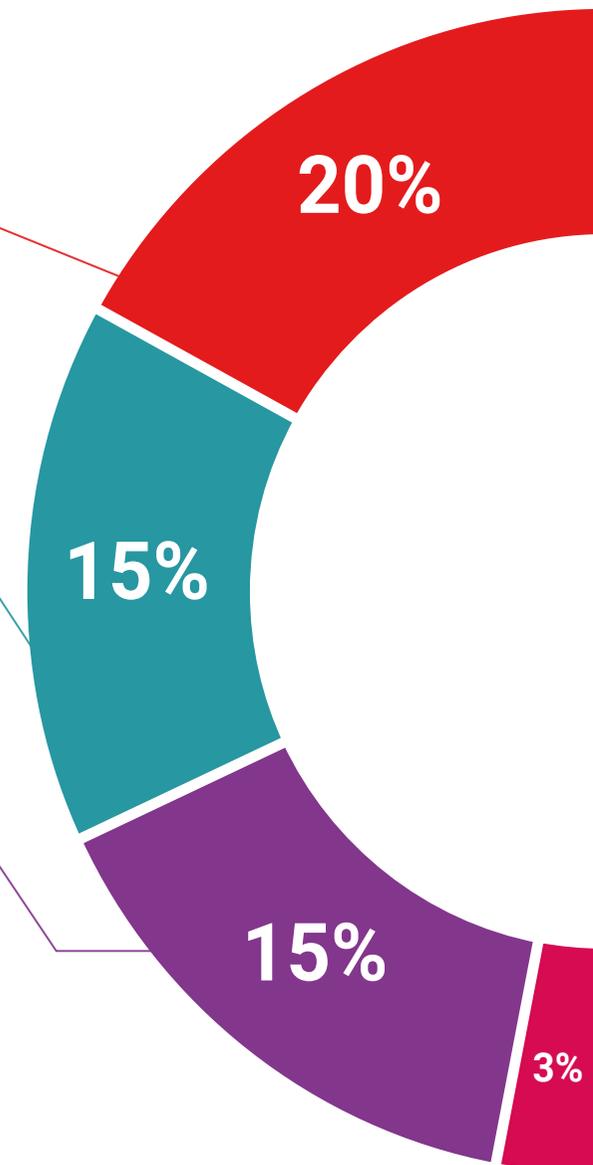
The TECH team presents the contents attractively and dynamically in multimedia lessons that include audio, videos, images, diagrams, and concept maps in order to reinforce knowledge.

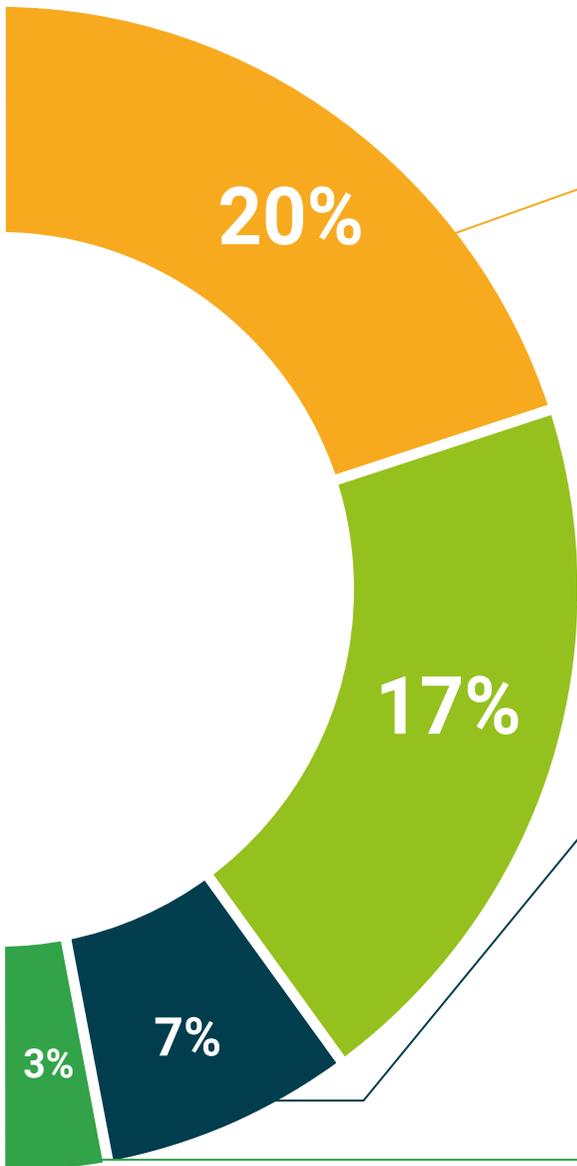
This exclusive educational system for presenting multimedia content was awarded by Microsoft as a "European Success Story".



#### Additional Reading

Recent articles, consensus documents and international guidelines, among others. In TECH's virtual library, students will have access to everything they need to complete their course.





#### Expert-Led Case Studies and Case Analysis

Effective learning ought to be contextual. Therefore, TECH presents real cases in which the expert will guide students, focusing on and solving the different situations: a clear and direct way to achieve the highest degree of understanding.



#### Testing & Retesting

We periodically evaluate and re-evaluate students' knowledge throughout the program, through assessment and self-assessment activities and exercises, so that they can see how they are achieving their goals.



#### Classes

There is scientific evidence suggesting that observing third-party experts can be useful.  
Learning from an Expert strengthens knowledge and memory, and generates confidence in future difficult decisions.



#### Quick Action Guides

TECH offers the most relevant contents of the course in the form of worksheets or quick action guides. A synthetic, practical, and effective way to help students progress in their learning.



07

# Certificate

The Professional Master's Degree in Biology and Technology of Reproduction in Mammals guarantees you, in addition to the most rigorous and up-to-date training, access to a Professional Master's Degree issued by TECH Global University.



“

*Successfully complete this program  
and receive your university degree  
without travel or laborious paperwork”*

This program will allow you to obtain your **Professional Master's Degree diploma in Biology and Technology of Reproduction in Mammals** endorsed by **TECH Global University**, the world's largest online university.

**TECH Global University** is an official European University publicly recognized by the Government of Andorra ([official bulletin](#)). Andorra is part of the European Higher Education Area (EHEA) since 2003. The EHEA is an initiative promoted by the European Union that aims to organize the international training framework and harmonize the higher education systems of the member countries of this space. The project promotes common values, the implementation of collaborative tools and strengthening its quality assurance mechanisms to enhance collaboration and mobility among students, researchers and academics.

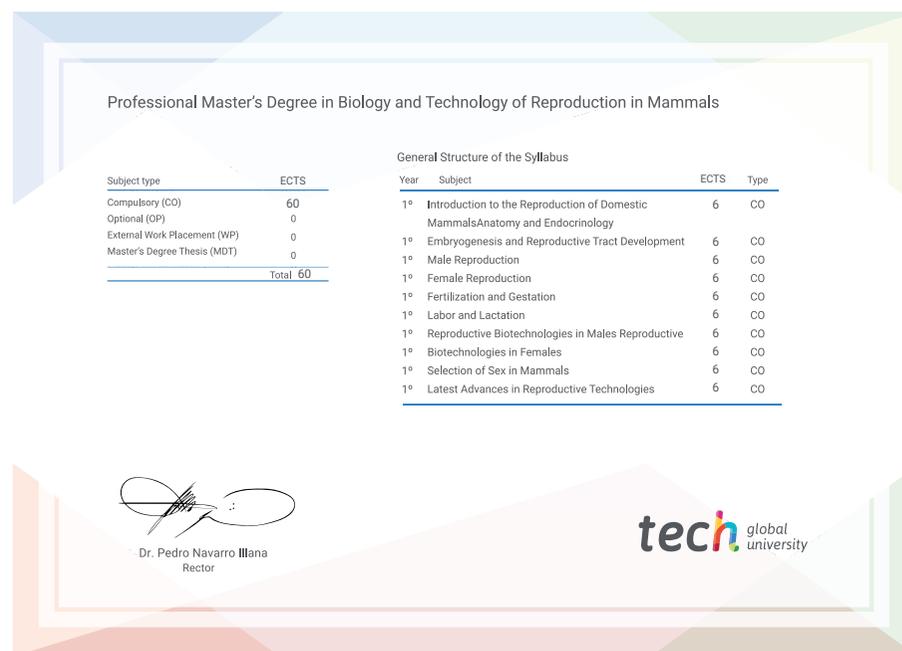
This **TECH Global University** title is a European program of continuing education and professional updating that guarantees the acquisition of competencies in its area of knowledge, providing a high curricular value to the student who completes the program.

Title: **Professional Master's Degree in Biology and Technology of Reproduction in Mammals**

Modality: **online**

Duration: **12 months**

Accreditation: **60 ECTS**



\*Apostille Convention. In the event that the student wishes to have their paper diploma issued with an apostille, TECH Global University will make the necessary arrangements to obtain it, at an additional cost.

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personalized service innovation  
knowledge present  
online training  
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classroom



## Professional Master's Degree

Biology and Technology of Reproduction in Mammals

- » Modality: online
- » Duration: 12 months
- » Certificate: TECH Global University
- » Credits: 60 ECTS
- » Schedule: at your own pace
- » Exams: online

# Professional Master's Degree

## Biology and Technology of Reproduction in Mammals

