

Hybrid Professional Master's Degree

Biology and Technology of Reproduction in Mammals





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

Modality: Hybrid (Online + Clinical Internship)

Duration: 12 months

Certificate: TECH Global University

60 + 5 ECTS Credits

Website: www.techtute.com/us/veterinary-medicine/hybrid-professional-master-degree/hybrid-professional-master-degree-biology-technology-reproduction-mammals

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01

Introduction

In recent years there have been notable advances in gene editing such as CRISPR, which has revolutionized mammalian biology and reproduction, as well as techniques for embryo transfer and in vitro fertilization. Given the continuous achievements in this field, veterinary professionals must be up to date in order to integrate the most effective methodology in reproduction in Mammals into their practice. Therefore, this degree is born, which perfectly combines a theoretical framework 100% online with a first level practical internship of 3 weeks duration in a specialized and distinguished veterinary center in this field. An unique academic experience that answers the real needs of veterinary professionals.





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*Get a complete update on Mammalian
Reproductive Biology and Technology in
just 12 months"*

Continued research in the field of Reproduction in Mammals has allowed the development of much more accurate techniques, understanding of genetics and tools to make precise changes in animal's DNA. For this reason, it is necessary for veterinarians to be aware of the advances in this field, its benefits, as well as other disadvantages such as the outbreak of emerging diseases.

Faced with this reality, TECH has designed this Hybrid Professional Master's Degree in Biology and Technology of Reproduction in Mammals, which offers veterinarians an update through a syllabus developed by real experts in this field.

In this way, it will delve into the most rigorous and recent scientific literature in this field, as well as delve into the advances in reproductive biotechnology in males and females, sex selection in mammals or the latest advances in reproductive techniques or bioethics and the debates that arise in the face of new horizons.

Once this process is completed, graduates will enter a stay in a prestigious center that will allow them to perform a 100% practical update, under the mentoring of professionals with extensive experience in the field of Reproduction in Mammals. Undoubtedly, a unique opportunity to apply the concepts addressed, in a first level clinical space and with real patients.



With this program you will be up to date in the application of the CRISPR/CAS technique in animal models"

This **Hybrid 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:

- ◆ Development of more than 100 clinical cases presented by veterinary experts in Human Reproduction
- ◆ The graphic, schematic, and practical contents with which they are created, provide scientific and practical information on the disciplines that are essential for professional practice
- ◆ Patient assessment and monitoring, the latest international recommendations on embryo transfer, artificial insemination, or creation of embryo banks
- ◆ Integral action plans for birth and lactation techniques
- ◆ Presentation of practical workshops on procedures diagnosis, and treatment techniques
- ◆ Algorithm-based interactive learning system for decision-making in the presented clinical situations
- ◆ Practical clinical guides on approaching different pathologies
- ◆ With a special emphasis on evidence-based medicine and research methodologies in Reproduction in Mammals
- ◆ All of this will be complemented by theoretical lessons, questions to the expert, debate forums on controversial topics, and individual reflection assignments
- ◆ Content that is available from any fixed or portable device with an Internet connection
- ◆ Furthermore, you will be able to carry out a clinical internship in one of the best veterinary centers

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Take an intensive 3-week internship in a prestigious center and update your technical skills for embryo transfer”

In this proposal for a Professional Master's Degree, of a professionalizing nature and Hybrid learning modality, the program is aimed at updating veterinary professionals who perform their functions in centers specialized in Reproduction in Mammals, and who require a high level of qualification. The content is based on the latest scientific evidence and is organized in a didactic way to integrate theoretical knowledge into nursing practice. The theoretical-practical elements allow professionals to update their knowledge and help them to make the right decisions in patient care.

Thanks to the multimedia content, developed with the latest educational technology, veterinary professionals will benefit from situated and contextual learning, i.e., a simulated environment that will provide immersive learning programmed to train in real situations. This program is designed around Problem-Based Learning, whereby the physician must try to solve the different professional practice situations that arise during the course. For this purpose, the students will be assisted by an innovative interactive video system created by renowned and experienced experts.

This Hybrid Professional Master's Degree will allow you to update your skills in birth and lactation techniques in mammals.

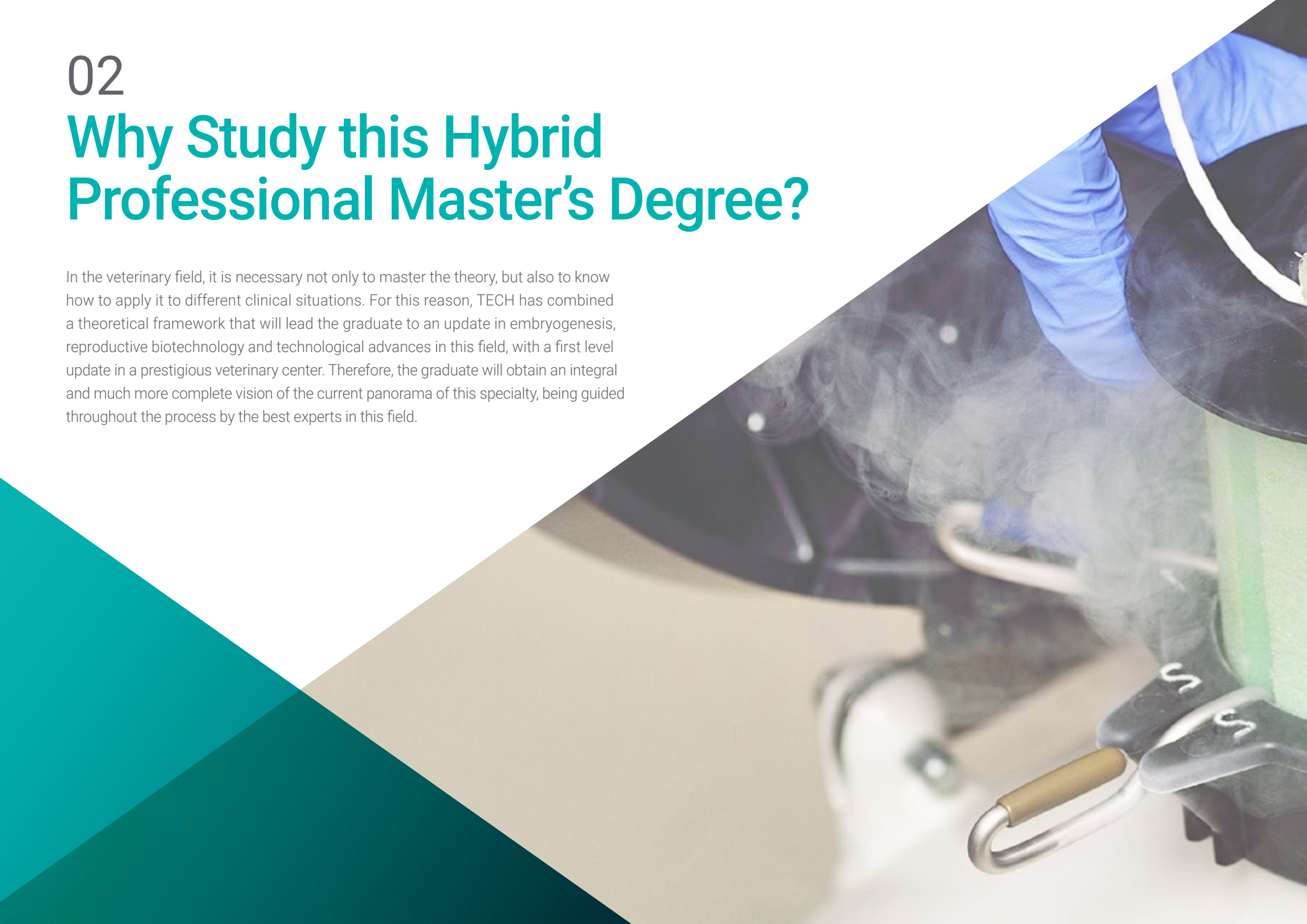
Face future challenges in reproduction in mammals with greater guarantees thanks to TECH.



02

Why Study this Hybrid Professional Master's Degree?

In the veterinary field, it is necessary not only to master the theory, but also to know how to apply it to different clinical situations. For this reason, TECH has combined a theoretical framework that will lead the graduate to an update in embryogenesis, reproductive biotechnology and technological advances in this field, with a first level update in a prestigious veterinary center. Therefore, the graduate will obtain an integral and much more complete vision of the current panorama of this specialty, being guided throughout the process by the best experts in this field.





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TECH is the only university that offers you the possibility of getting into real clinical environments through an exceptional practical internship"

1. Updating from the Latest Technology Available

The area of Reproduction in Mammals has experienced important advances that go hand in hand with biological knowledge and the implementation of the most advanced and precise technology. For this reason, this degree includes the updating of theoretical and practical knowledge, which involves bringing the graduate closer to the most advanced equipment in this field. In this way, students will get a real up-to-date from the guidance of authentic specialists.

2. Gaining In-depth Knowledge from the Experience of Top Specialists

During this 1,620-hour process, graduates will have at their disposal an excellent teaching team versed in Human Reproduction. Likewise, during the 3 weeks of the Internship you will be guided by excellent professionals who have the experience and mastery of the most current techniques used in this field. In this way, the graduate will be able to verify, from the first day, the most important procedures currently used in this specialty.

3. Entering First-Class Clinical Environments

TECH carries out a meticulous selection process of all the teachers that belong to its program, as well as the centers where the graduate will have the opportunity to take the 100% practical phase. Thanks to this, the veterinarian will have guaranteed access to a prestigious clinical environment in the field of Reproduction in Mammals. As a result, they will be able to experience the day-to-day work in a demanding, rigorous and exhaustive area, where they will apply of the latest scientific evidence.





4. Combining the Best Theory with State-of-the-Art Practice

TECH has made a strong commitment to offer quality degrees that provide a real response to the professionals needs. For this reason, it has designed this program that consists of a methodology that unites the most advanced and current theory with a first level practical phase. In this way, graduates will obtain an update that will allow them to be at the forefront of the most sophisticated procedures in Reproduction of Mammals.

5. Expanding the Boundaries of Knowledge

This academic institution offers graduates the possibility of a practical internship not only in leading-edge centers, but also surrounded by specialists with an extensive national and international trajectory. In this way, you will get up to date with the best experts in Mammalian Reproductive Biology and Technology, thereby expanding your possibilities of action in this field.



*You will have full practical immersion
at the center of your choice"*

03 Objectives

The main purpose of this Hybrid Professional Master's Degree is to offer graduates an update of their technical skills and abilities for the application of the most effective procedures in Reproduction in Mammals. For this purpose, it has innovative teaching material (multimedia pills, detailed videos, case studies), prepared by an excellent teaching team, and a practical phase that undoubtedly completes this update.



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Update your knowledge in a real scenario, with the maximum scientific rigor of a veterinary center that is at the technological forefront in Reproduction in Mammals"



General Objective

- The general objective of the Hybrid Professional Master's Degree in Biology and Technology of Reproduction in Mammals is to ensure that the professional updates the diagnostic and therapeutic procedures of the specialty in an exclusively practical way, through an internship in a specialized veterinary center with wide prestige in the field. In this way, the graduate will approach the main interventions carried out in reproductive matters, as well as the storage and conversation of embryos of different breeds



Incorporate into your clinical practice, the most effective methods for the performance of artificial insemination"





Specific Objectives

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

- ♦ Analyze the methods of sexual and asexual reproduction
- ♦ Deepen in 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 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 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
- ♦ Deepen in 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
- ♦ 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

- ♦ Examining gametic migrations
- ♦ Develop 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 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 mammatogenesis and lactogenesis based on the physiology of lactation
- ♦ Define milk quality conditions and milk control programs

Module 7. Reproductive Biotechnologies in Males

- ♦ Develop national, European and international sanitary requirements for the trade of germplasmic material
- ♦ 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
- ♦ Establishing a bioethical review of sex selection in mammals
- ♦ Develop 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
- ♦ 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
- ♦ Application of primordial embryonic cells in animal production
- ♦ Substantiate the mechanism of action in the application of the CRISPR technique

04 Skills

One of the objectives set with this Hybrid Professional Master's Degree is to increase the action field of veterinary professionals in the area of Reproduction in Mammals. To this end, this program will lead the graduate to be aware of the most effective methods used in artificial insemination, in vitro fertilization or the sperm sex selection technique, among others. All this, guided by teachers with an extensive experience in this field.



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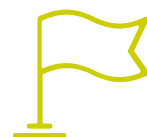
With this program you will be up to date in in vitro fertilization techniques and oocyte and embryo cryopreservation”



General Skills

- ♦ Develop 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
- ♦ 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 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

- ◆ 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



Throughout the 1620 teaching hours you will obtain the most complete update in Technology of Reproduction in Mammals"

05

Course Management

In sake of offering quality Certificate, TECH carry it out selection process meticulous of each and every one of the teachers who make up the programs. In this way, the graduate will have the guarantee of access to the most exhaustive information, provided by authentic experts. Also, thanks to its proximity, you will be able to resolve any questions you may have about the content of 12-month duration of's of this Hybrid Professional Master



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*Leading professionals in the area of
Reproduction in Mammals will be in charge of
providing you with the most current information”*

Management



Dr. Gomez Peinado, Antonio

- Director Veterinarian of the Spanish Institute of Animal Genetics and Reproduction(IGREA)
- Coordinator of Obstetrics and Reproduction at the Faculty of Veterinary Medicine, Alfonso X El Sabio University
- Doctor in Veterinary Medicine from Alfonso X El Sabio University
- Degree in Veterinary Medicine



Dr. Gómez Rodríguez, Elisa

- Director Veterinarian of the Spanish Institute of Animal Genetics and Reproduction(IEGRA)
- Teacher of Veterinary Medicine at the Alfonso X El Sabio University
- Degree in Veterinary Medicine, Complutense University Madrid



Professors

Dr. Pinto González, Agustín

- ◆ Expert Veterinarian in Animal Reproduction
- ◆ Veterinarian of the Spanish Institute of Animal Genetics and Reproduction(IEGRA)
- ◆ Sani Lidia's Veterinarian
- ◆ Specialization university in Animal Reproduction at IEGRA
- ◆ IEGRA's University Diploma from Artificial Insemination in Cattle

Dr. Peris Frau, Patricia

- ◆ Expert Researcher in Reproductive Biotechnology
- ◆ Researcher in Reproductive Biotechnology and Animal Health at the Hunting Resources Research Institute
- ◆ Postdoctoral Researcher in Animal Health and Reproduction at INIA
- ◆ Researcher's Degree in Molecular Biology and Reproductive Biotechnologies from the University of Castilla-La Mancha
- ◆ Veterinarian from different clinics
- ◆ Teacher in university studies and of Postgraduate
- ◆ Doctorate in cell biology and from the University of Castilla-La Mancha
- ◆ Degree in Veterinary Medicine from the University of Murcia
- ◆ Master's Degree in High School Education Compulsory, High School and Vocational Training) from the University of BORRARCastilla-La Mancha

06

Educational Plan

The syllabus of this educational option takes the veterinarian on a journey through the most current information on the reproduction of domestic mammals, the process of parturition and lactation, as well as the incorporation of the latest technology to promote the reproduction of species. All this, in addition, Cone innovative teaching resources that can be accessed 24 hours a day, from any electronic device with an Internet connection. In addition, you will finish this proposal with an internship that will allow you to integrate all the concepts covered in the theoretical phase.



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Thanks to the Relearning method, you will consolidate the most complex concepts in a simple way and without investing a great amount of study hours"

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. Post-Puberty 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
 - 2.9.1. Genetic Basis of Ovarian and Testicular Differentiation
 - 2.9.2. Developmental Abnormalities of the Male and Female Reproductive System
 - 2.9.3. Gonadal Dysgenesis and Primary Ovarian Failure
 - 2.9.4. 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 I
 - 4.9.3. Chromosome Dynamics and Segregation During Metaphase I and Metaphase II

- 4.10. Follicle and Oocyte Metabolism in Vivo and In Vitro
 - 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 Perioovulatory 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. Abortion, 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
 - 7.1.4. National, European and International Sanitary Requirements for the Trade of Germoplasmic Material in Different Species
- 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 for the Movement of Seminal Dose at the National Level
 - 7.6.4. 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. Regulations for the Creation of a Germplasm Bank
 - 7.10.2. Germplasm Bank Quality Management Systems
 - 7.10.3. 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 Non-stimulation
 - 8.7.3. Methodology of the OPU Technique
- 8.8. In Vitro Fertilization and Intracytoplasmic Sperm Injection
 - 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
 - 9.1.3. Bioethics in Mammalian Sex Selection
- 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. Different 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. 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. CPR Techniques
 - 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
- 10.10. Bioethics in Mammalian Reproduction
 - 10.10.1. What Is Bioethics?
 - 10.10.2. Ethical and Moral Aspects in the Manipulation of Animal Embryos
 - 10.10.3. Interferences in Genetic Manipulation and Benefits to the Human Species
 - 10.10.4. Biotechnologies: New Horizons



You have at your disposal a wide range of educational resources, housed in a virtual library, accessible 24 hours a day"

07

Clinical Internship

After passing the online theoretical period, the program includes a practical training period in a reference clinical center. Graduates will have at their disposal the support of a tutor who will accompany them during the whole process, both in the preparation and in the development of the clinical practice, thereby getting an unique experience that will transform the way they apply their praxis in this specialty.



“

Do your clinical internship in one of the best veterinary centers specialized in Technology of Reproduction in Mammals"

The period of the Internship Program in Biology and Technology of Reproduction in Mammals consists of a practical internship in a prestigious veterinary center. In this way, the graduate will be able to access a 3-week internship, from Monday to Friday, with 8-hour consecutive days with the best experts in the field. Therefore, you will verify with real clinical cases, the methodologies and procedures used through the most advanced equipment and under strict safety and quality standards.

This internship proposal is based on activities aimed at the development and improvement of competencies. For this reason, the veterinarian will be involved, from day one, in the most advanced procedures in the field of Reproduction in Mammals. A process where they will be accompanied by experts in this field with extensive experience in in vitro fertilization, insemination, storage and conservation of embryos, as well as in advising breeders.

It is undoubtedly an opportunity to update knowledge in an environment that is distinguished by innovation, by the strong commitment to the most advanced technology and the encouragement of professionals in this area. TECH thereby proposes a new way of understanding and integrating the processes of reproduction in animals, and turns a veterinary clinic into the ideal teaching scenario for this disruptive educational experience.

The practical part will be carried out with the active participation of the student performing the activities and procedures of each area of competence (learning to learn and learning to do), with the accompaniment and guidance of teachers and other fellow trainees that facilitate teamwork and multidisciplinary integration as transversal competencies for veterinary praxis (learning to be and learning to relate).

The procedures described below will form the basis of the practical part of the internship, and their implementation is subject to both the suitability of the patients and the availability of the center and its workload, with the proposed activities being as follows:



Incorporate the most advanced methodological advances in animal reproduction thanks to TECH"



Module	Practical Activity
Assisted Reproduction Techniques	Collaborate in the performance of the techniques used for artificial insemination or IVF
	Collect and evaluate reproductive samples, such as semen or ovarian cells
	Apply semen preparation techniques, handling of insemination catheters and correct placement of semen in the female reproductive tract
	Participate in embryo transfers
Selection of Sex in Mammals	Participate in the performance of techniques used for sex selection in mammals, such as the separation of spermatozoa by centrifugation, the use of molecular markers or the use of specific artificial insemination techniques to select the sex of the embryo
	Apply the different protocols, equipment used and ethical considerations associated with sex selection in mammals
	Collaborate on appropriate collection methods
	Process samples and quality criteria necessary for an accurate result in mammalian sex selection
Advice to Livestock Breeders	Visit different livestock farms to inform about the different reproduction processes, according to the health status of the animal
	Evaluate the health status of the animals and carry out a sanitary planning
	Collaborate in estrus synchronization protocols, perform artificial inseminations and monitor the reproductive cycles of animals
	Carrying out analysis of production records of livestock farms
Fertility testing	Collect semen samples, vaginal swabs or blood samples
	Participate in the evaluation of semen by microscopic analysis and identify possible abnormalities and evaluate semen quality
	Assist in the interpretation of hormonal analysis results
	Provide support in the performance of reproductive ultrasound scans in animals to evaluate the status of reproductive organs, detect abnormalities and confirm the presence of gestation

Civil Liability Insurance

This institution's main concern is to guarantee the safety of the trainees and other collaborating agents involved in the internship process at the company. Among the measures dedicated to achieve this is the response to any incident that may occur during the entire teaching-learning process.

To this end, this entity commits to purchasing a civil liability insurance policy to cover any eventuality that may arise during the course of the internship at the center.

This liability policy for interns will have broad coverage and will be taken out prior to the start of the internship program period. That way professionals will not have to worry in case of having to face an unexpected situation and will be covered until the end of the internship program at the center.



General Conditions of the Internship Program

The general terms and conditions of the internship program agreement shall be as follows:

1. TUTOR: During the Hybrid Professional Master's Degree, students will be assigned with two tutors who will accompany them throughout the process, answering any doubts and questions that may arise. On the one hand, there will be a professional tutor belonging to the internship center who will have the purpose of guiding and supporting the student at all times. On the other hand, they will also be assigned with an academic tutor whose mission will be to coordinate and help the students during the whole process, solving doubts and facilitating everything they may need. In this way, the student will be accompanied and will be able to discuss any doubts that may arise, both clinical and academic.

2. DURATION: The internship program will have a duration of three continuous weeks, in 8-hour days, 5 days a week. The days of attendance and the schedule will be the responsibility of the center and the professional will be informed well in advance so that they can make the appropriate arrangements.

3. ABSENCE: If the student does not show up on the start date of the Hybrid Professional Master's Degree, they will lose the right to it, without the possibility of reimbursement or change of dates. Absence for more than two days from the internship, without justification or a medical reason, will result in the professional's withdrawal from the internship, therefore, automatic termination of the internship. Any problems that may arise during the course of the internship must be urgently reported to the academic tutor.

4. CERTIFICATION: Professionals who pass the Hybrid Professional Master's Degree will receive a certificate accrediting their stay at the center.

5. EMPLOYMENT RELATIONSHIP: the Hybrid Professional Master's Degree shall not constitute an employment relationship of any kind.

6. PRIOR EDUCATION: Some centers may require a certificate of prior education for the Hybrid Professional Master's Degree. In these cases, it will be necessary to submit it to the TECH internship department so that the assignment of the chosen center can be confirmed.

7. DOES NOT INCLUDE: The Hybrid Professional Master's Degree will not include any element not described in the present conditions. Therefore, it does not include accommodation, transportation to the city where the internship takes place, visas or any other items not listed

However, students may consult with their academic tutor for any questions or recommendations in this regard. The academic tutor will provide the student with all the necessary information to facilitate the procedures in any case.

08

Where Can I Do the Clinical Internship?

TECH has made a selection of the best veterinary centers specialized in Reproduction in Mammals. Therefore, graduates will have before them a first class space that will open a wide range of possibilities by observing the most advanced procedures and technology used. Likewise, this will allow them to perfect their skills and develop them in any other veterinary center and anywhere in the world.





“

Complete your theoretical update with the best practical internship in a distinguished veterinary center in the field of Animal Reproduction”

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The student will be able to complete the practical part of this Hybrid Professional Master's Degree at the following centers:



Veterinary-medicine

Embriovet

Country: Spain
City: La Coruña

Address: P8-IA Polígono Industrial de Piadela, 15300 Betanzos, A Coruña

Embriovet offers customers the most complete embryo transfer services, genetic counseling and marketing

Related internship programs:

- Biology and Technology of Reproduction in Mammals



Veterinary-medicine

AGAR Veterinarios equinos

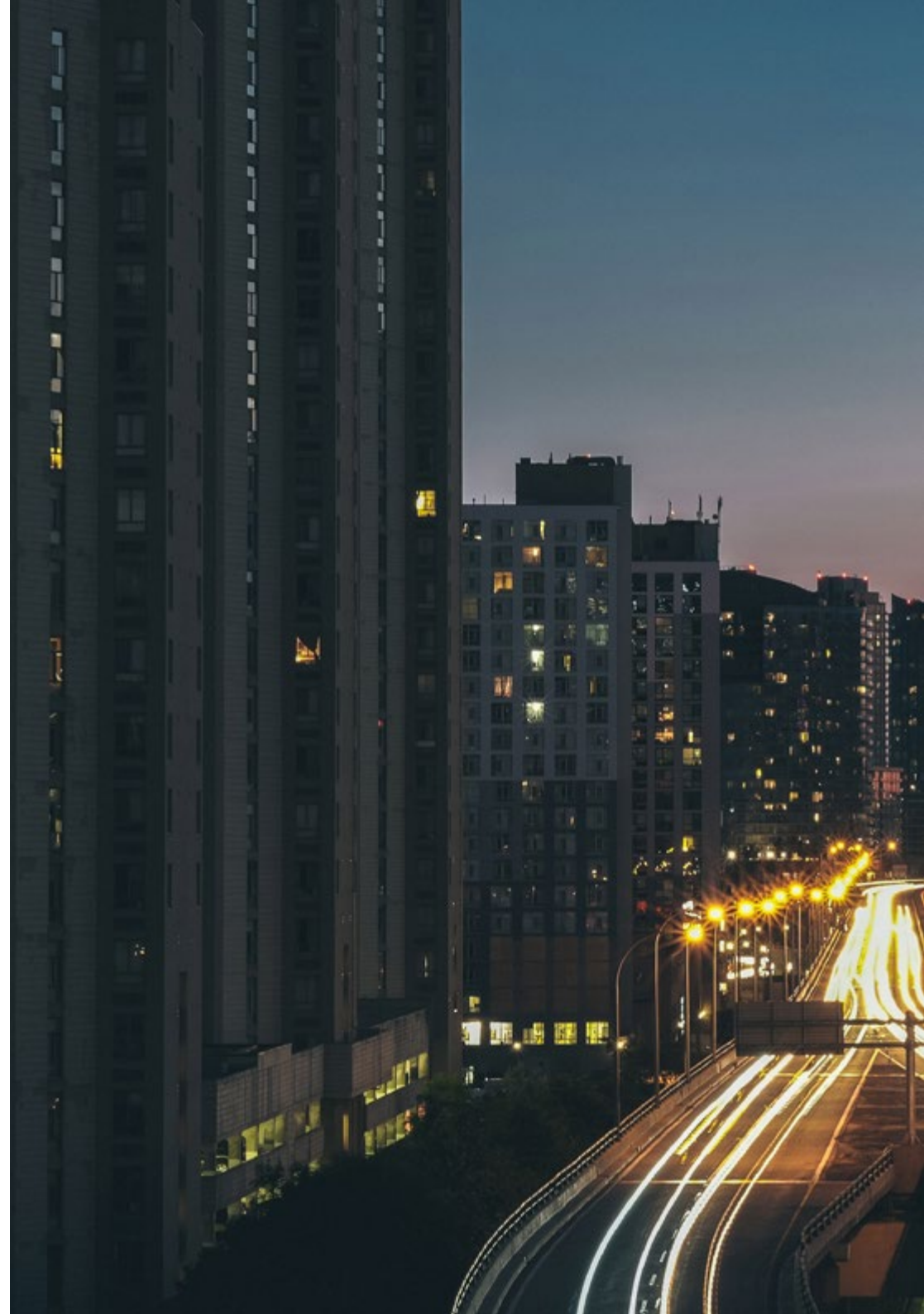
Country: Spain
City: Asturias

Address: Barrio Belmonte, 33590 Boquerizo, Asturias

Equine Veterinary Services in Asturias and Cantabria

Related internship programs:

- Internal Medicine in Large Species
- Equine Medicine and Surgery





“

Make the most of this opportunity to surround yourself with expert professionals and learn from their work methodology”

09

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. Gervas, 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

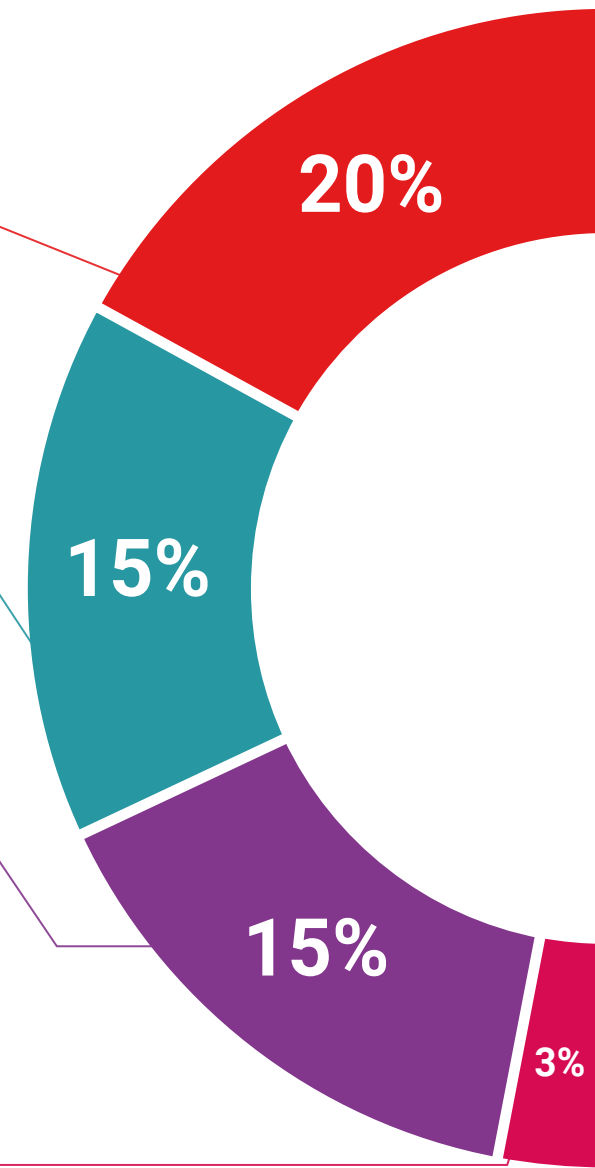
The TECH team presents the contents attractively and dynamically in multimedia lessons that include audio, videos, images, diagrams, and concept maps in order to reinforce knowledge.

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.



10 Certificate

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



“

Successfully complete this program and receive your university qualification without having to travel or fill out laborious paperwork"

This program will allow you to obtain your **Hybrid 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.

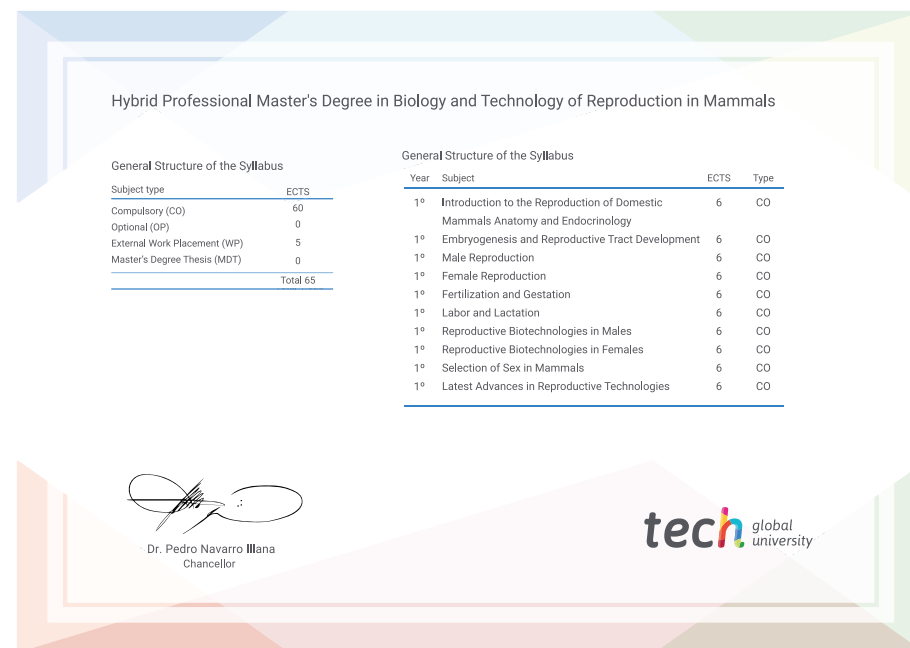
Title: **Hybrid Professional Master's Degree in Biology and Technology of Reproduction in Mammals**

Course Modality: **Hybrid (Online + Clinical Internship)**

Duration: **12 months**

Certificate: **TECH Global University**

Recognition: **60 + 5 ECTS Credits**



*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.



Hybrid Professional Master's Degree

Biology and Technology of Reproduction in Mammals

Modality: Hybrid (Online + Clinical Internship)

Duration: 12 months

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Hybrid Professional Master's Degree

Biology and Technology of Reproduction in Mammals