

# Master's Degree

## Veterinary Pharmacology





## Master's Degree Veterinary Pharmacology

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

Website: [www.techtute.com/us/pharmacy/master-degree/master-veterinary-pharmacology](http://www.techtute.com/us/pharmacy/master-degree/master-veterinary-pharmacology)

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# 01

# Introduction

Veterinary Pharmacology is the science in charge of the search for and adaptation of medicines capable of solving animal health problems. It is a branch of veterinary sciences that aims to improve current outcomes in the prevention and treatment of disease at the veterinary level through pharmacological strategies. With this high-level program, the professional will specialize in this sector, under the guidance of prestigious professionals with years of experience in the field. It is a unique opportunity to specialize and stand out in a sector with a high demand for professionals.





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*Succeed with the best and acquire the knowledge and skills you need to embark on the Veterinary Pharmacology industry”*

The Master's Degree covers all the current developments in the pharmacological field applicable in clinical practice. Veterinary Pharmacology should promote research into new drugs, new indications for drugs already on the market and new therapeutic strategies. On the other hand, the correct use of the drugs available at any given time for established indications should be considered. It is important to interpret the kinetics of drugs from the time they enter the body until they are eliminated. As well as the analysis of the correlation between the effects of drugs and the concentration of their free fraction in blood, and the consideration of drug interactions and their undesirable or collateral effects.

This Master's Degree is a great tool available to the professional pharmacists that allows them to specialize in the area of pharmacology of the veterinary clinic, since there are more and more pets and exotic animals that require specific medication for certain pathologies. A high-quality program, offering the most advanced resources in online specialization, to guarantee the student an effective, real and practical learning that will boost their competencies to the highest level in this area of work.

The content of each module provides the student with comprehensive knowledge of the theoretical and practical aspects of Veterinary Pharmacology. The practices that are proposed make the Master's Degree unique by applying different simulated situations that will allow students to develop skills for their performance in the real clinical environment.

The program includes practical activities to facilitate students' acquisition and mastery of the theory learned, supporting and complementing the knowledge acquired in the theoretical teaching. The contents are presented to the professional in an attractive and dynamic way in multimedia packages that include videos, images and diagrams in order to reinforce knowledge.

Thanks to its innovative teaching methodology, it allows the student to follow its contents in a totally flexible and personalized way, with great availability on the part of the teachers for consultations, doubts or tutorials.

After passing the evaluations of the Master's Degree in Veterinary Pharmacology, the professional will have acquired the necessary professional competences to carry out a quality and up-to-date praxis.

This **Master's Degree in Veterinary Pharmacology** contains the most complete and up-

to-date scientific program on the market. The most important features include:

- ◆ Practical cases presented by experts in Veterinary Pharmacology
- ◆ 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
- ◆ Practical exercises where self-assessment can be used to improve learning
- ◆ Its special emphasis on innovative methodologies
- ◆ 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



*A comprehensive program in the use of veterinary drugs for the prevention and treatment of diseases affecting animal health"*

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*Learn in an efficient way, with a real qualification objective, with this Master's Degree, unique for its quality and price, in the online teaching market"*

The program's teaching staff includes professionals from sector who contribute their work experience to this training program, as well as renowned specialists from leading societies and prestigious universities.

Its multimedia content, developed with the latest scientific technology, will allow the professional a situated and contextual learning, that is, a simulated environment that will provide an immersive program programmed to learn in real situations.

This program is designed around Problem-Based Learning, whereby the professional must try to solve the different professional practice situations that arise throughout the program. For this purpose, the student will be assisted by an innovative interactive video system created by renowned and experienced experts.

*The competencies you will acquire after completing this Master's Degree will position you as an expert in Veterinary Pharmacology.*

*Improving your skills in a sector with a high demand for professionals will boost both your professional and personal career.*



# 02

# Objectives

The design of the program of this Master's Degree will allow the student to acquire the necessary competences to update in the profession after deepening in the key aspects of Veterinary Pharmacology. Its objective is to provide the students with the required competencies in relation to preclinical or clinical research of drugs used in veterinary medicine, and their application in the therapeutic use of drugs so that they can better incorporate into the professional field. The knowledge acquired in the development of the points of the syllabus will drive the professional from a global perspective, with full capacity to achieve the proposed goals.







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*Expert curriculum and quality content  
are the key to your learning success”*



## General Objectives

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- ◆ Examine the general concepts of pharmacology at the veterinary level
- ◆ Determine the mechanisms of action of drugs
- ◆ Analyze Pharmacokinetics and Pharmacodynamics
- ◆ Review the current legislation on veterinary pharmaceutical products
- ◆ Analyze aspects related to the prescription, dispensing and administration of veterinary pharmaceutical products
- ◆ Determine the importance of the responsible and rational use of medicines for global health
- ◆ Differentiate the Autonomic Nervous System and its organization
- ◆ Identify the groups of drugs that act on the autonomic nervous system
- ◆ Recognize the mechanisms of action and therapeutic uses of this group of drugs
- ◆ Examine the main pharmacological properties of the groups of drugs acting on the central nervous system
- ◆ Identify the different pharmacological targets involved in CNS transmission
- ◆ Recognize the mechanisms of action, therapeutic and toxic uses of this group of drugs
- ◆ Examine the pharmacological basis of cardiorespiratory system therapy and homeostasis
- ◆ Identify the main therapeutic groups and their indications
- ◆ Determine the mechanisms of action of different drug groups, properties and pharmacokinetics
- ◆ Develop the student's critical and analytical skills through the resolution of clinical cases
- ◆ Determine the pharmacological basis of digestive tract therapy
- ◆ Identify the main therapeutic groups and their indications in veterinary medicine
- ◆ Examine different drug groups' mechanisms of action, properties and pharmacokinetics
- ◆ Develop the student's critical and analytical skills through the resolution of clinical cases
- ◆ Examine pharmacology in relation to reproduction and metabolism
- ◆ Identify each pharmacological group with its uses and applications
- ◆ Prescribe drugs in a reasonable manner
- ◆ Examine and explain the main pharmacological properties of the anti-infective drug groups
- ◆ Identify the different pharmacological targets involved in anti-infective agents
- ◆ Recognize the main pharmacological characteristics (mechanism of action, pharmacokinetics, and therapeutic and toxic effects) of groups of anti-infective drugs
- ◆ Examine and explain the main pharmacological properties of the antineoplastic drug groups
- ◆ Identify the different pharmacological targets involved in antineoplastic agents
- ◆ Know the main toxic effects of antineoplastic drugs
- ◆ Prepare professionals in simple and natural treatments, and their integration in the curative activities within Conventional Veterinary Medicine
- ◆ Examine the theoretical bases of Natural Medicines; especially homeopathy, phytotherapy and the use of nutraceuticals
- ◆ Briefly frame the evolution of the disciplines within a historical context



## Specific Objectives

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### Module 1. General Pharmacology

- ◆ Develop all those processes that affect a drug molecule when administered to an animal species
- ◆ Establish the different biological barriers and their significance in therapeutic effectiveness
- ◆ Examine the factors that will influence drug absorption, distribution and elimination processes
- ◆ Analyze how to manipulate the renal excretion process and its importance in the treatment of intoxications
- ◆ Establish, based on the pharmacodynamics and pharmacokinetics of a drug, its possible drug-drug interactions
- ◆ Identify and characterize at the molecular level the different types of pharmacological receptors
- ◆ Determine which second messengers and biochemical pathways are coupled to each of the pharmacological receptor types
- ◆ Present the relationship between the molecular phenomenon and the pharmacological effect
- ◆ Analyze all the phenomena involved in drug-receptor interaction
- ◆ Examine the different types of pharmacological agonism and antagonism
- ◆ Correctly establish the differences between the different species that are important for the administration of drugs or their therapeutic efficacy
- ◆ Develop the concepts of side, adverse and toxic effects

## Module 2. Legal Framework of Medicine for Veterinary Use. Veterinary Pharmacovigilance

- ◆ Consult and apply current regulations in a practical way in veterinary medicine
- ◆ Quickly find the resources available on the AEMPS website and, in particular, the information available on the online Veterinary Medicines Information Center (CIMA Vet)
- ◆ Determine everything related to the veterinary prescription being able to make the appropriate prescription in each specific case
- ◆ Understand the roles and responsibilities of the various actors involved in the dispensing and supply of veterinary medicinal products
- ◆ Be able to make decisions regarding pharmacological treatments with an adequate benefit-risk ratio, or discontinue their use when this is not possible
- ◆ Determine our obligations in relation to the Spanish System of Pharmacovigilance of Veterinary Medicines (SEFV-VET) and the information it can provide us with
- ◆ Examine the Guidelines for responsible use in different animal species and how to apply them appropriately in veterinary practice
- ◆ Examine the responsibility we have in the exercise of our professional work, in the use of medicine, in relation to animal health, human health and the environment
- ◆ Assume the importance of our decisions in the use of antimicrobials, in the prevention and control of antimicrobial resistance and know and follow the PRAN guidelines

## Module 3. Pharmacology of the Autonomic Nervous System

- ◆ Establish the classification of drugs according to their structure, mechanism of action and pharmacological action acting on the Autonomic Nervous System
- ◆ Distinguish the chemical mediators and receptors that interact in the Autonomic Nervous System
- ◆ Determine the classification of drugs by their mechanism of action and pharmacological action acting on the Autonomic Nervous System





- ◆ Analyze the drugs that act at the level of cholinergic transmission in the Autonomic Nervous System by their structure, mechanism of action and route of administration
- ◆ Examine drugs acting at the level of adrenergic transmission in the autonomic nervous system by their structure, mechanism of action and route of administration
- ◆ Determine the general effects of neuromuscular blocking agents on the peripheral nervous system by their mechanism of action and pharmacological action
- ◆ Solve problems and interpret results of pharmacological experiments associated with the organ bath technique
- ◆ Acquire the ability to search for and manage information related to the Autonomic Nervous System

#### **Module 4. Pharmacology of the Central Nervous System**

- ◆ Establish the classification of drugs according to their structure, mechanism of action and pharmacological action acting on the Central Nervous System
- ◆ Always act with the objective of facilitating good health and quality of life for the animals, avoiding unnecessary suffering through the administration of different drugs
- ◆ Distinguish the chemical mediators and receptors that interact in pain
- ◆ Differentiate the classification of analgesic drugs by their mechanism of action and pharmacological action acting on the Central Nervous System
- ◆ Analyze the drugs that act at the level of anesthesia and sedation in the Central Nervous System by their structure, mechanism of action and route of administration
- ◆ Determine the general effects of stimulant drugs on the Central Nervous System and recognize their mechanism of action and pharmacological action
- ◆ Determine the general effects of depressant drugs on the Central Nervous System and recognize their mechanism of action and pharmacological action

### **Module 5. Pharmacology of the Cardiovascular, Renal and Respiratory System. Hemostasis**

- ◆ Describe the mechanisms of action of drugs used to treat heart failure, hypertension or arrhythmias
- ◆ Examine antianemic drugs and growth factors, as well as mechanisms of action, adverse reactions and pharmacokinetics
- ◆ Determine the main routes of administration of drugs used in the cardiorespiratory system and homeostasis
- ◆ Present the drugs used against cough, mucolytics and expectorants and their mechanisms of action, adverse reactions, pharmacokinetics and side effects
- ◆ Solve problems and clinical cases related to the cardiorespiratory system
- ◆ Associate the correct drug to the main symptoms and pathologies of the cardiorespiratory system
- ◆ Safe and effective use of pharmaceuticals

### **Module 6. Pharmacology of the Digestive System**

- ◆ Identify the most common routes of administration of each of the drugs and the forms of presentation of the same in veterinary medicine
- ◆ Examine drugs related to acid secretion: antisecretory, antacids and mucosal protectants, as well as their adverse effects, contraindications and pharmacokinetics
- ◆ Present drugs to improve gastrointestinal motility, their mechanisms of action, drug interactions and adverse reactions
- ◆ Describe the drugs used to treat vomiting
- ◆ Determine the pharmacology of the hepatobiliary and pancreatic systems, their mechanisms of action, interactions and pharmacokinetics
- ◆ Solve problems and clinical cases related to the digestive system
- ◆ Associate the correct drug to the main symptoms and pathologies of the digestive tract

### **Module 7. Pharmacology of the Endocrine and Reproductive System. Reproductive Disorders**

- ◆ Determine the pharmacological basis of reproductive system therapy
- ◆ Examine different drug groups' mechanisms of action, properties and pharmacokinetics
- ◆ Identify the main therapeutic groups and their indications in veterinary reproduction
- ◆ Treat the most prevalent obstetric cases
- ◆ Present reproductive biotechnologies and understand the scope of their application
- ◆ Solving individual and population reproductive problems
- ◆ Establish the different animal pathologies of the endocrine system and their treatment
- ◆ Identify the main therapeutic groups and their indications in endocrine system pathologies
- ◆ Develop the student's critical and analytical skills through the resolution of clinical cases

### **Module 8. Antiseptics and Chemotherapeutics I**

- ◆ Analyze the historical development of antiseptic and chemotherapeutic substances
- ◆ Point out the general principles of chemotherapy and the drugs that comprise it
- ◆ Define the concepts of antiseptic and antibiotic
- ◆ Explain the mechanisms of antibiotic resistance
- ◆ Classify antibiotics according to mechanism of action
- ◆ Describe each of the groups of antibiotics and know their mechanism of action
- ◆ Classifying antifungal and antiviral drugs
- ◆ Describe each of the groups of antifungal and antiviral drugs and their mechanism of action
- ◆ Analyze the importance of antiparasitics in veterinary medicine

**Module 9. Chemotherapy II: Antineoplastic Drugs**

- ◆ Analyzing cancer in small animals
- ◆ Point out the general principles in the use of antineoplastic drugs
- ◆ Know the care in the application of antineoplastic drugs
- ◆ Classify the main families of chemotherapeutics
- ◆ Determine the main drugs for palliative use in neoplasms
- ◆ Consider the use of each antineoplastic according to the pathology
- ◆ Analyze the main toxicity effects of antineoplastic drugs
- ◆ Describe each of the groups of antifungal and antiviral drugs and their mechanism of action
- ◆ Analyze the importance of antiparasitics in veterinary medicine

**Module 10. Natural Therapies: Homeopathy, Phytotherapy and Nutraceuticals**

- ◆ Analyze objective clinical signs or manifestations and subjective symptoms or perceptions in homeopathy
- ◆ Approach the anamnesis from these objective and subjective manifestations
- ◆ Present the Homeopathic Materia Medica and its therapeutic indications
- ◆ Determine the rationale behind the development of drugs
- ◆ Approaching the approach to pathologies from homeopathic repertorization
- ◆ Establish the active principles most commonly used in phytotherapy and their application
- ◆ Examine the different nutraceutical products and their application



*Realistic goals that will turn into immediate job advancements"*

# 03 Skills

The structure of this Master's Degree has been designed in such a way that the professional to whom it is addressed will be able to identify and solve problems related to veterinary pharmacology, thanks to a unique methodology and the support of the experts who have developed it. This Master's Degree offers the student a realistic learning in the context of Veterinary Pharmacology, which makes it an extremely useful tool for the professional pharmacist. Through clinical simulations at a practical level, they will be able to face real situations and provide a broader and more effective response to them.







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*A unique opportunity to learn from internationally renowned professors, with teaching, clinical and research experience”*

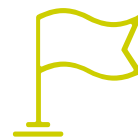


## General Skills

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- ◆ Understand that Pharmacology is the rational basis of all therapies
- ◆ Training to recognize and select different drugs by their generic names
- ◆ Be able to prescribe scientific pharmacotherapy for preventive, prophylactic, symptomatic and curative purposes
- ◆ Have a clear knowledge of the uses of drugs, pharmacokinetics, pharmacodynamics and adverse effects to be able to apply them in the clinic
- ◆ Be able to judge the risk involved in prescribing a drug to a patient and to select the drug based on criteria of effectiveness and safety





## Specific Skills

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- ◆ Choosing a drug at the veterinary level
- ◆ Know the mechanisms of action, available therapeutic groups, etc.
- ◆ Know what the differential pharmacokinetic characteristics are
- ◆ Determine the most frequent interactions
- ◆ Know the safety of drug use in each case
- ◆ Distinguish factors that alter the response
- ◆ Determine the route of administration, dosage and therapeutic regimen
- ◆ Establish the duration of treatment
- ◆ Controlling the Treatment
- ◆ Recognize the mechanism of action of drugs
- ◆ Know the relationship between chemical structure and biological action
- ◆ Localize the site of action of drugs in the biological system under study
- ◆ Know the mechanisms of absorption, distribution, metabolism and excretion of drugs
- ◆ Know the relationship between the dose of a drug and the biological effect produced
- ◆ Explain the pharmacological actions in different organs, tissues and organisms



04

# Course Management

The teaching team of this Master's Degree is made up of professionals specialized in the study of Pharmacology with clinical experience in small and large animals. They have extensive and recognized teaching and research experience, with officially recognized six-year research periods, participation in numerous research projects and dissemination of their research globally in high impact journals, books and conferences.



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*Safely acquire the most advanced skills of a professional veterinary pharmacology specialist and give your practice a boost to the highest level”*

## Management



### **Dr. Santander Ballestín, Sonia**

- ♦ Associate Professor of the Department of Pharmacology and Physiology. University of Zaragoza
- ♦ Degree in Biology and Biochemistry, specializing in the area of Pharmacology.
- ♦ Teaching Coordinator, Department of Pharmacology, University of Zaragoza, Spain.
- ♦ PhD with the European Degree from the University of Zaragoza.
- ♦ Master's Degree in Environment and Water Management. Andalusia Business School
- ♦ Evaluation professor in objective structured clinical evaluation of the medical degree
- ♦ Lecturer in the Postgraduate Certificate "Introduction to Pharmacology: Principles for the Rational Use of Drugs" Basic Program of the University of Experience of Zaragoza

## Professors

### Dr. González Sancho, Lourdes

- ◆ Health administration Pharmacist. Health Department
- ◆ Degree in Pharmacy from the University of Valencia
- ◆ Health administration Pharmacist. Department of Health and Consumer Affairs
- ◆ Pharmaceutical care in the pharmacy office
- ◆ Food E-Commerce. General Directorate of Public Health
- ◆ Labeling and Claims on Food Composition. General Directorate of Public Health
- ◆ Resistance to Antibiotics. General Directorate of Public Health
- ◆ Biocides Regulatory. Health Surveillance (HPAI)
- ◆ Recycling of plastics and contaminants in food and feed. General Directorate of Public Health
- ◆ Audit systems and internal audit. General Directorate of Public Health

### Dr. Abanto Peiró, María Dolores

- ◆ Health administration Pharmacist. Alcañiz
- ◆ Degree in Pharmacy
- ◆ Technical Agricultural Engineering. Literacy University of Valencia
- ◆ Agricultural Research Projects at the Valencian Institute of Agrarian Research
- ◆ Assistant Pharmacist in Pharmacy Office
- ◆ Medical Visitor
- ◆ State Pharmacist in the Government Delegation of Aragon
- ◆ Inspection and control of drugs in public and judicial security
- ◆ Foreign Health Inspection

### Dr. García Barrios, Alberto

- ◆ Professor at the University of Zaragoza
- ◆ Degree in Veterinary Medicine
- ◆ PhD in Veterinary Science
- ◆ Casetas Veterinary Clinic
- ◆ Utebo Veterinary Clinic
- ◆ Nanoscale Biomagnetics R&D Researcher
- ◆ Veterinary Clinic Utebo. Clinical Veterinarian
- ◆ Postgraduate Veterinary Oncology (Improve International). Homologation of the qualification to work with experimental animals

### Dr. Lomba Eraso, Laura

- ◆ Professor of Pharmacokinetics at San Jorge University in the Degree in Pharmacy.
- ◆ Degree in Chemistry from the the University of Zaragoza
- ◆ Ph.D. with European Mention in Pharmacy University of Zaragoza
- ◆ Graduate in Pharmacy University of Zaragoza
- ◆ Researcher in the field of Green Chemistry
- ◆ Professor of Biochemistry and Molecular Biology II at San Jorge University in the Degree in Pharmacy.
- ◆ Professor of Biochemistry and Molecular Biology, Universidad San Jorge, Degree in Pharmacy.
- ◆ Professor of Physicochemistry I at the Universidad San Jorge, degree in Pharmacy.
- ◆ Professor of Pharmacology Applied to Physiotherapy, Universidad San Jorge, Physiotherapy degree.
- ◆ Professor of Biopharmacy and Pharmacokinetics, Universidad San Jorge, Degree in Pharmacy.
- ◆ Master's Degree in Environmental Management in Companies
- ◆ Research stay in the Department of Medicinal Chemistry at the Institute of Cancer Therapeutics, Cradford, UK.

**Dr. Luesma Bartolomé, María José**

- ◆ Study group on prion diseases, vector-borne diseases and emerging zoonoses. University of Zaragoza
- ◆ Degree in Veterinary Medicine. University of Zaragoza
- ◆ Doctor of Veterinary Medicine. University of Zaragoza
- ◆ Study group of the University Research Institute. Research Institute
- ◆ Film and anatomy teacher. University degree: Complementary Academic Activities. University of Zaragoza
- ◆ Master's Degree in Quality Systems Audits (Project: "Implementation of a quality system in a testing laboratory"). Diputación General de Aragón
- ◆ Professor of Anatomy and Histology. University Degree: Graduate in Optics and Optometry. University of Zaragoza
- ◆ Professor of the Final Degree Project for University Degrees: Degree in Medicine. University of Zaragoza
- ◆ Professor of Morphology, Development and Biology. University Degree: Master's Degree in Initiation to Research in Medicine. University of Zaragoza
- ◆ Certificate B for the use of animals for experimental purposes.
- ◆ Recognition of a six-year research period by the University Quality and Prospective Agency of Aragón (Government of Aragón).







**Dr. Arribas Blázquez, Marina**

- ◆ Bill & Melinda Gates Foundation: Post-doctoral teaching and research labor contract
- ◆ Degree in Biology from the University of Salamanca.
- ◆ Doctorate in Neuroscience from the Complutense University of Madrid.
- ◆ Institute of Biomedical Research: Alberto Sols Labor researcher and teacher
- ◆ Complutense University of Madrid: Post-doctoral teaching and research labor contract
- ◆ Complutense University of Madrid: Teaching and research labor contract
- ◆ Severo Ochoa Molecular Biology Center: Predoctoral teaching and research labor contract
- ◆ Complutense University of Madrid: Predoctoral teaching and research labor contract
- ◆ Bachelor's Degree in Biology Specialty: Fundamental Biology and Biotechnology
- ◆ Category B qualification in Protection of animals used for experimental and other scientific purposes.
- ◆ Master in Neurosciences

# 05

# Structure and Content

In its maxim of offering an elite education for all, TECH counts on renowned professionals so that the student acquires a solid knowledge in the specialty of Veterinary Pharmacology. For this reason, this Master's Degree has a highly qualified team with extensive experience in the sector, which will offer the best possible resources for students in the development of their skills during the course. It provides all the necessary knowledge to be able to perform, in the best possible way, pharmacology in veterinary medicine. A complete and accessible preparatory course that will make a difference in your career progression.





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*A scientific program with which you will learn to develop all those processes that affect the molecule of a drug when it is administered to an animal species"*

## Module 1. General Pharmacology

- 1.1. Concept and Evolution of Pharmacology. Objectives of Veterinary Pharmacology
  - 1.1.1. Origin
  - 1.1.2. Evolution of Pharmacology as a Science
  - 1.1.3. Veterinary Pharmacology: Objectives
  - 1.1.4. General Concepts
    - 1.1.4.1. Pharmaceuticals
    - 1.1.4.2. Medication
    - 1.1.4.3. Pharmaceutical Forms
    - 1.1.4.4. Others
- 1.2. Pharmacokinetics I: Drug Transport Systems across Biological Membranes.
  - 1.2.1. General Principles
  - 1.2.2. General Transportation Mechanisms
    - 1.2.2.1. Transport Across Cell Membranes
    - 1.2.2.2. Transport Through Intercellular Clefts
- 1.3. Pharmacokinetics II: Routes of Drug Administration. Concept of Absorption
  - 1.3.1. General Principles
  - 1.3.2. Routes of Administering Medication
    - 1.3.2.1. Enteral Routes
      - 1.3.2.1.1. Oral
      - 1.3.2.1.2. Rectal
      - 1.3.2.1.3. Sublingual
      - 1.3.2.1.4. Others: Inhalation, Otic, Conjunctival, Dermal or Topical
    - 1.3.2.2. Parenteral Routes
      - 1.3.2.2.1. Intravenous
      - 1.3.2.2.2. Intramuscular
      - 1.3.2.2.3. Subcutaneous
      - 1.3.2.2.4. Intrathecal
      - 1.3.2.2.5. Epidural
  - 1.3.3. Absorption Mechanisms
    - 1.3.4. Concept of Bioavailability
    - 1.3.5. Factors that Modify Absorption
- 1.4. Pharmacokinetics III: Drug Distribution I
  - 1.4.1. Distribution Mechanisms
    - 1.4.1.1. Binding to Plasma Proteins
    - 1.4.1.2. Hematoencephalic Barrier
    - 1.4.1.3. Placental Barrier
  - 1.4.2. Factors that Modify the Distribution
  - 1.4.3. Distribution Volume
- 1.5. Pharmacokinetics IV: Drug Distribution II. Pharmacokinetic Compartments
  - 1.5.1. Pharmacokinetic Models
  - 1.5.2. Concepts of the Most Characteristic Parameters
    - 1.5.2.1. Apparent Volume of Distribution
    - 1.5.2.2. Aqueous Compartments
  - 1.5.3. Variability of the Response
- 1.6. Pharmacokinetics V: Drug Elimination: Metabolism
  - 1.6.1. Concept of Metabolism
  - 1.6.2. Phase I and II Metabolic Reactions
  - 1.6.3. Hepatic Microsomal System: Cytochromes. Polymorphisms
  - 1.6.4. Factors Influencing Biotransformation Processes
    - 1.6.4.1. Physiological Factors
    - 1.6.4.2. Pathological Factors
    - 1.6.4.3. Pharmacological Factors (Induction/Inhibition)
- 1.7. Pharmacokinetics VI: Drug Elimination: Excretion
  - 1.7.1. General Mechanisms
  - 1.7.2. Renal Excretion
  - 1.7.3. Biliary Excretion
  - 1.7.4. Other Excretion Routes
    - 1.7.4.1. Saliva
    - 1.7.4.2. Milk
    - 1.7.4.3. Sweat

- 1.7.5. Elimination Kinetics
  - 1.7.5.1. Elimination Constant and Half-Life
  - 1.7.5.2. Metabolic and Excretion Clearance
- 1.7.6. Factors that Modify the Excretion
- 1.8. Pharmacodynamics: Drug Action Mechanisms Molecular Aspects.
  - 1.8.1. General Concepts Receptor
  - 1.8.2. Types of Receptors
    - 1.8.2.1. Ion Channel Associated Receptors
    - 1.8.2.2. Enzyme Receptors
    - 1.8.2.3. Receptors Associated with Protein G
    - 1.8.2.4. Intracellular Receptors
  - 1.8.3. Drug- Receptor Interactions
- 1.9. Adverse Reactions to Medications. Toxicity
  - 1.9.1. Classification of Adverse Reactions According to their Origin
  - 1.9.2. Mechanisms of Production of Adverse Reactions
  - 1.9.3. General Aspects of Drug Toxicity
- 1.10. Pharmacological Intervention
  - 1.10.1. Concept of Pharmacological Interaction
  - 1.10.2. Modifications Induced by Pharmacological Interactions
    - 1.10.2.1. Synergy
    - 1.10.2.2. Agony
    - 1.10.2.3. Antagonism
  - 1.10.3. Pharmacokinetic and Pharmacodynamic Interactions
    - 1.10.3.1. Variability in Response Due to Pharmacokinetic Causes
    - 1.10.3.2. Variability in Response due to Pharmacodynamic Causes

## Module 2. Legal Framework of Medicine for Veterinary Use. Veterinary Pharmacovigilance

- 2.1. Prescription of Medicines for Animal Use
  - 2.1.1. Veterinary Prescription
  - 2.1.2. Ordinary Statute of Limitations
  - 2.1.3. Exceptional Requirements
  - 2.1.4. Prescription of Narcotic Drugs
  - 2.1.5. Prescription of Medicated Feed
- 2.2. Dispensing of Medicines for Animal Use
  - 2.2.1. Pharmacy Offices
  - 2.2.2. Livestock Entities or Groups
  - 2.2.3. Retail Commercial Establishments
  - 2.2.4. Emergency First Aid Kits
- 2.3. Supply of Medicinal Products for Animal Use to Veterinarians
  - 2.3.1. Professional Practice of Veterinary Medicine
  - 2.3.2. Availability of Veterinary Medicines
  - 2.3.3. Possession and Use of Medicinal Gases
- 2.4. Commercial Presentation and Information on Veterinary Medicinal Products.
  - 2.4.1. Packaging and Labeling
  - 2.4.2. Prospectus
  - 2.4.3. Information and Advertising
- 2.5. Veterinary Pharmacovigilance I
  - 2.5.1. Introduction to Veterinary Pharmacovigilance. Glossary of Terms
  - 2.5.2. Risks Derived from Marketed Medicines
- 2.6. Veterinary Pharmacovigilance II Animal Safety
  - 2.6.1. Safe Use of Veterinary Drugs in Animals
  - 2.6.2. Animal Welfare and Disease Prevention in Animals
  - 2.6.3. Guidelines for the Responsible Use of Large Animal Species: Animals for Slaughter
  - 2.6.4. Guidelines for Responsible Use of Companion Animal Species

- 2.7. Veterinary Pharmacovigilance III Safety of Persons
  - 2.7.1. Adverse Effects of Veterinary Drugs on Humans
  - 2.7.2. Good Practices in the Use and Administration of Veterinary Medicine
  - 2.7.3. Protective Equipment for the Administration of Veterinary Pharmaceuticals
- 2.8. Veterinary Pharmacovigilance IV Safety of Foods of Animal Origin
  - 2.8.1. Residues of Veterinary Medicine in Products of Animal Origin
  - 2.8.2. Importance of the Routes of Administration in Waiting Times
  - 2.8.3. Maximum Residue Limits (MRL)
- 2.9. Veterinary Pharmacovigilance V. Antibiotic Resistance and Safety for the Environment.
  - 2.9.1. Importance of Responsible Use of Veterinary Antimicrobials to Prevent Antibiotic Resistance
  - 2.9.2. Categorization of Antibiotics for Veterinary Use
  - 2.9.3. Importance of the Responsible Use of Medicines for the Environment

### Module 3. Pharmacology of the Autonomic Nervous System

- 3.1. Peripheral Nervous System
  - 3.1.1. Definition
  - 3.1.2. Classification
  - 3.1.3. Autonomic Nervous System
    - 3.1.3.1. Definition
    - 3.1.3.2. Classification



- 3.2. Cholinergic Neurotransmitter System
  - 3.2.1. Definition
  - 3.2.2. Nicotinic and Muscarinic Receptors
  - 3.2.3. Classification of Drugs
- 3.3. Pharmacology of Cholinergic Transmission I
  - 3.3.1. Transmission Blocking Drugs in Autonomous Ganglia
  - 3.3.2. Nicotinic Receptor Antagonists with Sympathokolitic Effects
  - 3.3.3. Nicotinic Receptor Antagonists with Parasympatholytic Effects (Hexamethonium, Mecamylamine)
- 3.4. Pharmacology of Cholinergic Transmission II
  - 3.4.1. Transmission-Blocking Drugs at Neuroeffector Junctions
  - 3.4.2. Muscarinic Receptor Antagonists
  - 3.4.3. Parasympatholytic Effects (Atropine, Scopolamine)
- 3.5. Pharmacology of Cholinergic Transmission
  - 3.5.1. Drugs that Mimic the Effects of Acetylcholine on Neuroeffector Junctions
  - 3.5.2. Muscarinic Receptor Agonists
  - 3.5.3. Parasympathomimetic Effects (Acetylcholine, Methacholine, Betanechol)
- 3.6. Adrenergic Neurotransmitter System
  - 3.6.1. Definition
  - 3.6.2. Adrenergic Receptors
  - 3.6.3. Classification of Drugs
- 3.7. Pharmacology of Adrenergic Transmission
  - 3.7.1. Drugs that Promote Noradrenaline at Neuroeffector Synapses
- 3.8. Pharmacology of Adrenergic Transmission
  - 3.8.1. Transmission-Blocking Drugs at Neuroeffector Junctions
- 3.9. Pharmacology of Adrenergic Transmission
  - 3.9.1. Drugs that Mimic the Effects of Noradrenaline at Neuroeffector Junctions
- 3.10. Pharmacology in the Motor Plate
  - 3.10.1. Ganglionic or Ganglioplegic Blocking Drugs
  - 3.10.2. Non-Depolarizing Neuromuscular Blocking Drugs
  - 3.10.3. Depolarizing Neuromuscular Blocking Drugs

## Module 4. Pharmacology of the Central Nervous System

- 4.1. Pain
  - 4.1.1. Definition
  - 4.1.2. Classification
  - 4.1.3. Pain Neurobiology
    - 4.1.3.1. Transduction
    - 4.1.3.2. Transmission
    - 4.1.3.3. Modulation
    - 4.1.3.4. Perception
  - 4.1.4. Animal Models for the Study of Neuropathic Pain
- 4.2. Nociceptive Pain
  - 4.2.1. Neuropathic Pain
  - 4.2.2. Pathophysiology of Neuropathic Pain
- 4.3. Analgesic Drugs. Nonsteroidal Anti-Inflammatory Drugs
  - 4.3.1. Definition
  - 4.3.2. Pharmacokinetics
  - 4.3.3. Action Mechanism
  - 4.3.4. Classification
  - 4.3.5. Pharmacological Effects
  - 4.3.6. Side Effects
- 4.4. Analgesic Drugs. Steroidal Anti-Inflammatory Drugs
  - 4.4.1. Definition
  - 4.4.2. Pharmacokinetics
  - 4.4.3. Action Mechanism. Classification
  - 4.4.4. Pharmacological Effects
  - 4.4.5. Side Effects
- 4.5. Analgesic Drugs. Opioids
  - 4.5.1. Definition
  - 4.5.2. Pharmacokinetics
  - 4.5.3. Action Mechanism Action Mechanism Opioid Receptors

- 4.5.4. Classification
- 4.5.5. Pharmacological Effects
  - 4.5.5.1. Side Effects
- 4.6. Pharmacology of Anesthesia and Sedation
  - 4.6.1. Definition
  - 4.6.2. Mechanism of Action
  - 4.6.3. Classification: General and Local Anesthetics
  - 4.6.4. Pharmacological Properties
- 4.7. Local Anesthetic. Inhalation Anesthetics
  - 4.7.1. Definition
  - 4.7.2. Action Mechanism
  - 4.7.3. Classification
  - 4.7.4. Pharmacological Properties
- 4.8. Non-Injectable Anesthetics
  - 4.8.1. Neuroleptoanesthesia and Euthanasia. Definition
  - 4.8.2. Action Mechanism
  - 4.8.3. Classification
  - 4.8.4. Pharmacological Properties
- 4.9. Central Nervous System Stimulant Drugs
  - 4.9.1. Definition
  - 4.9.2. Action Mechanism
  - 4.9.3. Classification
  - 4.9.4. Pharmacological Properties
  - 4.9.5. Side Effects
  - 4.9.6. Antidepressants
- 4.10. Central Nervous System Depressant Drugs. and
  - 4.10.1. Definition
  - 4.10.2. Action Mechanism
  - 4.10.3. Classification

- 4.10.4. Pharmacological Properties
- 4.10.5. Side Effects
- 4.10.6. Anticonvulsants

## Module 5. Pharmacology of the Cardiovascular, Renal and Respiratory System. Hemostasis

- 5.1. Pharmacology of the Cardiovascular System I
  - 5.1.1. Positive Inotropic and Inodilator Drugs
  - 5.1.2. Sympathomimetic Amines
  - 5.1.3. Glycosides
- 5.2. Pharmacology of the Cardiovascular System II
  - 5.2.1. Diuretic Drugs
- 5.3. Pharmacology of the Cardiovascular System III
  - 5.3.1. Drugs Acting on the Renin-Angiotensin System
  - 5.3.2. Beta-Adrenergic Antagonist Drugs
- 5.4. Pharmacology of the Cardiovascular System IV
  - 5.4.1. Vasodilator Drugs
  - 5.4.2. Calcium Channel Antagonists
- 5.5. Pharmacology of the Cardiovascular System V
  - 5.5.1. Antiarrhythmic Drugs
- 5.6. Pharmacology of the Cardiovascular System VI
  - 5.6.1. Antianginal Drugs
  - 5.6.2. Lipid-Lowering Drugs
- 5.7. Blood Pharmacology I
  - 5.7.1. Anti-Anemia Drugs
    - 5.7.1.1. Iron
    - 5.7.1.2. Folic Acid
    - 5.7.1.3. Vitamin B12
  - 5.7.2. Hematopoietic Growth Factors
    - 5.7.2.1. Erythropoietin
    - 5.7.2.2. Granulocyte Colony Stimulating Factors



- 5.8. Blood Pharmacology II
  - 5.8.1. Antithrombotic Drugs
  - 5.8.2. Anti-Aggregation Drugs
  - 5.8.3. Anticoagulants
  - 5.8.4. Fibrinolytic Drugs
- 5.9. Pharmacology of the Respiratory System I
  - 5.9.1. Antitussives
  - 5.9.2. Expectorants
  - 5.9.3. Mucolytics
- 5.10. Pharmacology of the Respiratory System II
  - 5.10.1. Bronchodilators (Methylxanthines, Sympathomimetics, Antimuscarinics)
  - 5.10.2. Anti-Inflammatory Drugs used in Asthma
  - 5.10.3. Anti-Inflammatory Drugs Used in Chronic Obstructive Pulmonary Disease (Corticosteroids, Mediator Release Inhibitors, Leukotriene Inhibitors)

## Module 6. Pharmacology of the Digestive System

- 6.1. Pharmacology of Acid Secretion I
  - 6.1.1. Physiology of Secretion and Main Alterations
  - 6.1.2. Antisecretory Agents
  - 6.1.3. Proton Pump Inhibitors
  - 6.1.4. Histamine H<sub>2</sub>-Receptor Antagonists
- 6.2. Pharmacology of Acid Secretion II. Antacids
  - 6.2.1. Magnesium Compounds
  - 6.2.2. Aluminum Compounds
  - 6.2.3. Calcium Carbonate
  - 6.2.4. Sodium Bicarbonate
- 6.3. Pharmacology of Acid Secretion III. Mucous Membrane Protectors.
  - 6.3.1. Sucralfate
  - 6.3.2. Bismuth Salts
  - 6.3.3. Prostaglandin Analogs
- 6.4. Pharmacology of Ruminants
  - 6.4.1. Biochemical Alterations of Drugs in the Rumen
  - 6.4.2. Effects of Drugs on Ruminal Microflora
  - 6.4.3. Drug Distribution in the Rumen-Reticulum
  - 6.4.4. Salivary Secretion of Drugs
  - 6.4.5. Agents Affecting Pre-stomach Functions
  - 6.4.6. Treatment of Meteorism, Tympanism, Ruminal Acidosis and Atonia.
- 6.5. Pharmacology of Intestinal Motility I
  - 6.5.1. Physiology of Motility and Main Alterations
  - 6.5.2. Prokinetic Drugs
- 6.6. Pharmacology of Intestinal Motility II
  - 6.6.1. Antidiarrheal Drugs
  - 6.6.2. Prebiotics, Probiotics and Flora
- 6.7. Pharmacology of Intestinal Motility III. Constipation
  - 6.7.1. Bolus-Forming Drugs
  - 6.7.2. Lubricants and Emollients
  - 6.7.3. Osmotic Laxatives
  - 6.7.4. Stimulant Laxatives
  - 6.7.5. Enemas
- 6.8. Pharmacology of Vomiting
  - 6.8.1. Antiemetic and Emetic Drugs
  - 6.8.2. D<sub>2</sub> Dopaminergic Antagonists
  - 6.8.3. Antihistamines
  - 6.8.4. Muscarinic Antagonists
  - 6.8.5. Serotonergic Antagonists

- 6.9. Pharmacology of the Hepatobiliary and Pancreatic System
  - 6.9.1. Choleric and Chologogue Drugs
- 6.10. Pharmacology of Inflammatory Bowel Disease
  - 6.10.1. Corticoids
  - 6.10.2. Immunosuppressants
  - 6.10.3. Antibiotics
  - 6.10.4. Aminosalicylates

## Module 7. Pharmacology of the Endocrine and Reproductive System. Reproductive Disorders

- 7.1. Endocrine System Pharmacology.
  - 7.1.1. Introduction
  - 7.1.2. Classification of Hormones of Pharmacological Interest
  - 7.1.3. Action Mechanisms
  - 7.1.4. General Information on Hormone Therapeutics
- 7.2. Hormones Involved in Metabolism and Electrolyte Balance
  - 7.2.1. Adrenal Pharmacology: Mineralocorticoids and Glucocorticoids
  - 7.2.2. Pharmacological Actions
  - 7.2.3. Therapeutic Uses
  - 7.2.4. Side Effects
- 7.3. Thyroid and Parathyroid Pharmacology
  - 7.3.1. Thyroid Hormones
  - 7.3.2. Antithyroid Drugs
  - 7.3.3. Calcemia Regulation
    - 7.3.3.1. Calcitonin
    - 7.3.3.2. Parathormone
- 7.4. Pharmacology of the Pancreas:
  - 7.4.1. Insulin
  - 7.4.2. Oral Hypoglycemic Agents
  - 7.4.3. Glucagon
- 7.5. Hormones Involved in Reproduction
  - 7.5.1. Introduction
  - 7.5.2. Gonadotropin-Releasing Hormone
  - 7.5.3. Pituitary and Non-pituitary Gonadotropins
- 7.6. Sex Hormones
  - 7.6.1. Androgens
  - 7.6.2. Estrogens
  - 7.6.3. Progestogens
  - 7.6.4. Actions in the Organism
  - 7.6.5. Clinical Uses
  - 7.6.6. Toxicity
- 7.7. Luteolytic Drugs
  - 7.7.1. Prostaglandins
  - 7.7.2. Oxytocic Drugs: Oxytocin
  - 7.7.3. Pharmacology of Lactation
- 7.8. Hormones of Diagnostic Utility in Veterinary Medicine
  - 7.8.1. Diagnostic Tests
    - 7.8.1.1. Hormones of Diagnostic Utility in Large Animals: Production Animals
    - 7.8.1.2. Testosterone
    - 7.8.1.3. Estrogens
    - 7.8.1.4. Progesterone
    - 7.8.1.5. Iodothyronines
  - 7.8.2. Hormones of Diagnostic Utility in Companion Animals
    - 7.8.2.1. Reproductive Hormones
    - 7.8.2.2. Metabolic Hormones

- 7.9. Pharmacology of the Reproductive System:
  - 7.9.1. Introduction
  - 7.9.2. Classification of Hormones of Pharmacological Interest
  - 7.9.3. Action Mechanisms
  - 7.9.4. Therapeutics in General
- 7.10. Pharmacology of Reproductive Disorders
  - 7.10.1. Main Reproductive Disorders
    - 7.10.1.1. Large Animals: Production Animals
    - 7.10.1.2. Companion Animals
  - 7.10.2. Estrous Cycle Control
  - 7.10.3. Melatonin

## Module 8. Antiseptics and Chemotherapeutics I

- 8.1. Introduction. Definition of Antiseptic and Chemotherapeutic. Antiseptics
  - 8.1.1. Introduction
  - 8.1.2. Antiseptic and Disinfectant Concept
  - 8.1.3. Factors Affecting the Potency of Antiseptics and Disinfectants
  - 8.1.4. Characteristics of an Ideal Antiseptic and Disinfectant
  - 8.1.5. Classification of Disinfectants and Antiseptics
  - 8.1.6. Main Antiseptics and Disinfectants for Clinical Use
    - 8.1.6.1. Alcohol
    - 8.1.6.2. Biguanides
    - 8.1.6.3. Halogenated Products
    - 8.1.6.4. Peroxygens
    - 8.1.6.5. Other Antiseptics
- 8.2. Introduction to Antimicrobial Therapy. Types of Antibiotics. Rational Use
  - 8.2.1. Introduction
  - 8.2.2. Historical Review of Antimicrobial Therapy
  - 8.2.3. Side Effects
  - 8.2.4. Principles of Antibiotherapy
  - 8.2.5. Resistance: Types and Mechanisms of Occurrence
  - 8.2.6. Waiting Times
  - 8.2.7. Requirements for an Antimicrobial
  - 8.2.8. Classification of Antimicrobials
    - 8.2.8.1. According to its Spectrum
    - 8.2.8.2. According to its Effect
    - 8.2.8.3. According to its Action Mechanism
    - 8.2.8.4. According to its Chemical Group
    - 8.2.8.5. Depending on the Microorganism Affected
  - 8.2.9. Criteria to be Followed in the Selection of a Drug
- 8.3. Antimicrobials that Act Against the Bacterial Wall. Antibiotics that Inhibit Protein Synthesis
  - 8.3.1. Antibiotics Acting Against the Bacterial Wall
    - 8.3.1.1. General Aspects
    - 8.3.1.2. Beta-Lactamics (b-lactamics)
      - 8.3.1.2.1. Penicillins
      - 8.3.1.2.2. Cephalosporins
      - 8.3.1.2.3. Vancomycin and Bacitracin
  - 8.3.2. Antibiotics that Inhibit Protein Synthesis
    - 8.3.2.1. Aminoglycosides
    - 8.3.2.2. Tetracyclines
    - 8.3.2.3. Chloramphenicol and Derivatives
    - 8.3.2.4. Macrolides and Lincosamides
  - 8.3.3.  $\beta$ -Lactamase Inhibitors

- 8.4. Antibiotics that Act on the Synthesis of Nucleic Acids. Antibiotics Acting on the Bacterial Membrane
  - 8.4.1. Fluroquinolones
  - 8.4.2. Nitrofurans
  - 8.4.3. Nitroimidazoles
  - 8.4.4. Sulfamides
  - 8.4.5. Polymyxins and Thyrotricsins
- 8.5. Antifungal
  - 8.5.1. General Description of the Mycotic Structure
  - 8.5.2. Classification of Antifungal Agents by Chemical Structure
  - 8.5.3. Systemic Antifungals
  - 8.5.4. Topical Antifungals
- 8.6. Antivirals
  - 8.6.1. Objective of Antiviral Chemotherapy
  - 8.6.2. Groups of Antivirals According to their: Origin, Chemistry, Pharmacological Action, Pharmacokinetics, Pharmacodynamics, Posology, Therapeutic Uses, Adverse Reactions, Contraindications, Interactions and Pharmaceutical Forms
    - 8.6.2.1. Inhibitors of RNA and DNA Synthesis
    - 8.6.2.2. Purine Analogs
    - 8.6.2.3. Pyrimidine Analogs
    - 8.6.2.4. Reverse Transcriptase Inhibitors
    - 8.6.2.5. Interferons.
- 8.7. Antiparasitics II
  - 8.7.1. Introduction to Antiparasitic Therapy
  - 8.7.2. Importance of Antiparasitic Drugs in Veterinary Medicine
  - 8.7.3. General Concepts: Antinematodic, Anticestodic, Antitrematodic, Antiprotozoal, Ectoparasiticide and Endectocide.

- 8.8. Antiparasitics for Internal or Endoparasitic Use.
  - 8.8.1. Antinematodes
  - 8.8.2. Antistatics
  - 8.8.3. Antitrematodic
  - 8.8.4. Antiprotozoals
- 8.9. Antiparasitics for External or Ectoparasitic Use
  - 8.9.1. Introduction to External Parasites
  - 8.9.2. Antiparasitics II
- 8.10. Antiparasitics for Internal and External Use or Endectocides
  - 8.10.1. Introduction
  - 8.10.2. Macrocyclic Lactones
  - 8.10.3. Main Combinations of Endectocide Use

## Module 9. Chemotherapy II: Antineoplastic Drugs

- 9.1. Introduction to Antineoplastic Therapy
  - 9.1.1. Cancer in Veterinary Medicine: Pathophysiology and Etiology of Cancer
  - 9.1.2. Antineoplastic Treatment Approach: Drug Posology
  - 9.1.3. Administration of Chemotherapy Drugs
    - 9.1.3.1. Care in the Application of Chemotherapeutic Agents
    - 9.1.3.2. Standards and Instructions for Chemotherapy Application: Preparation During Preparation/Administration of Cytotoxic Drugs
- 9.2. Palliative Antineoplastic Pharmacology. Introduction to Special Antineoplastic Pharmacology
  - 9.2.1. Introduction to Palliative Antineoplastic Pharmacology: Oncologic Pain Control/ Assessment. Pharmacological Principles for Palliative Pain Management. Nutritional Management of the Oncology Patient
  - 9.2.2. Non-Steroidal Analgesics
  - 9.2.3. Opioids
  - 9.2.4. Others: NMDA Antagonists, Bisphosphonates, Tricyclic Antidepressants, Anticonvulsants, Nutraceuticals, Cannabidiol
  - 9.2.5. Introduction to Special Antineoplastic Pharmacology. Main Antineoplastic Drug Families



- 9.3. Family I: Alkylating Agents
  - 9.3.1. Introduction
  - 9.3.2. Nitrogen Mustards: Cyclophosphamide, Chlorambucil and Melphalan
  - 9.3.3. Nitrosoureas: Lomustine/Procarbazine
  - 9.3.4. Others: Hydroxyurea
  - 9.3.5. Main Uses in Veterinary Medicine
- 9.4. Family II: Antimetabolites
  - 9.4.1. Introduction
  - 9.4.2. Folic Acid Analogs (Antifolates): Methotrexate
  - 9.4.3. Purine Analogues: Azathioprine
  - 9.4.4. Pyrimidine Analogues: Cytosine Arabinoside, Gentamicin, 5-Fluorouracil
  - 9.4.5. Main Uses in Veterinary Medicine
- 9.5. Family III: Antibiotics
  - 9.5.1. Introduction
  - 9.5.2. Anthracycline-Derived Antibiotics (Doxorubicin/Other Anthracyclines) and Non-Anthracycline-Derived Antibiotics (Actinomycin-d, Mitoxantrone, Bleomycin)
  - 9.5.3. Main Uses in Veterinary Medicine
- 9.6. Family IV: Antineoplastics of Plant Origin
  - 9.6.1. Introduction
  - 9.6.2. Alkaloids: History/Antitumor Activity. Vinca Alkaloids
  - 9.6.3. Epipododiphyllotoxin-Derived Ligands
  - 9.6.4. Camptothecin Alkaloid Analogs
  - 9.6.5. Main Uses in Veterinary Medicine
- 9.7. Family V: Tyrosine Kinase Inhibitors
  - 9.7.1. Introduction
  - 9.7.2. Protein Kinases: Non-Receptor Tyrosine Kinase Proteins (NRTK; Receptor Tyrosine Kinase RTK)
  - 9.7.3. Toceranib
  - 9.7.4. Masitinib
  - 9.7.5. Main Uses in Veterinary Medicine

- 9.8. Platinum Derivatives
  - 9.8.1. Introduction
  - 9.8.2. Carboplatin
  - 9.8.3. Cisplatin
  - 9.8.4. Main Uses in Veterinary Medicine
- 9.9. Miscellaneous. Monoclonal Antibodies. Nanotherapy. L-asparaginase.
  - 9.9.1. Introduction
  - 9.9.2. L-asparaginase
  - 9.9.3. Monoclonal Antibodies
  - 9.9.4. Tiglyanol Toglolate (Stelfonta)
  - 9.9.5. Immunotherapy
  - 9.9.6. Metronomic Therapy
- 9.10. Toxicity of Antineoplastic Drugs
  - 9.10.1. Introduction
  - 9.10.2. Hematological Toxicity
  - 9.10.3. Gastrointestinal Toxicity
  - 9.10.4. Cardiotoxicity
  - 9.10.5. Urinary Toxicity
  - 9.10.6. Specific Toxicities: Hepatic, Neurological, Cutaneous, Hypersensitivity, Breed/Species Associated.
  - 9.10.7. Pharmacological Interactions

## Module 10. Natural Therapies: Homeopathy, Phytotherapy and Nutraceuticals

- 10.1. Introduction
  - 10.1.1. Definition of Natural Therapies
  - 10.1.2. Classification
  - 10.1.3. Differences with Conventional Medicine
  - 10.1.4. Regulation
  - 10.1.5. Scientific Evidence
  - 10.1.6. Risk
- 10.2. Homeopathy I
  - 10.2.1. Brief Historical Review. The Hahnemann Concept
  - 10.2.2. Concept of Homeopathy: Key Ideas
  - 10.2.3. Basic Principles
- 10.3. Homeopathy II The Field of Homeopathy
  - 10.3.1. Constitutions
  - 10.3.2. Symptom Modalities
  - 10.3.3. Anamnesis
  - 10.3.4. Hering Blade
- 10.4. Homeopathy III Properties
  - 10.4.1. Preparation
    - 10.4.1.1. Substances Used in Their Manufacture
    - 10.4.1.2. Excipients
  - 10.4.2. Preparation of Mother Tincture

- 10.4.3. Dilutions
  - 10.4.3.1. Dilution Methods and Dilutions
  - 10.4.3.2. Dynamization or Succussion
  - 10.4.3.3. Classification of Dilutions
- 10.4.4. Pharmaceutical Forms
- 10.4.5. Routes of Administration
- 10.5. Homeopathy IV Related Symptoms
  - 10.5.1. General Aspects
  - 10.5.2. Medical Subject Matter. Hahnemann's Treatment
  - 10.5.3. Introduction to the Repertoire
- 10.6. Approach to Pathologies from the Homeopathic Repertorization I
  - 10.6.1. Digestive system
  - 10.6.2. Respiratory System
  - 10.6.3. Urinary System
  - 10.6.4. Male and Female Genital Apparatus
- 10.7. Approach to Pathologies from the Homeopathic Repertorization II
  - 10.7.1. Mammitis
  - 10.7.2. Tegumentary System
  - 10.7.3. Locomotor System
  - 10.7.4. Sensory Organs
- 10.8. Phytotherapy
  - 10.8.1. Brief Historical Review
  - 10.8.2. Veterinary Phytotherapy
  - 10.8.3. Active Ingredients of Medicinal Plants
  - 10.8.4. Preparations and Forms of Administration
  - 10.8.5. Prescribing and Dispensing Guide
- 10.9. Phytotherapy. Addressing Pathologies
  - 10.9.1. Digestive system
  - 10.9.2. Respiratory System
  - 10.9.3. Urinary System
  - 10.9.4. Male and Female Genital Apparatus
  - 10.9.5. Locomotor System
- 10.10. Nutraceuticals and Functional Foods
  - 10.10.1. Brief Historical Review
  - 10.10.2. Definition
  - 10.10.3. Classification and Application



*It advances towards excellence  
with the help of the best  
professionals and teaching  
resources of the moment"*

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, students will be confronted with multiple simulated clinical cases based on real patients, in which they will have to investigate, establish hypotheses and ultimately, resolve the situation. There is an abundance of scientific evidence on the effectiveness of the method. Pharmacists learn better, more quickly 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, attempting to recreate the actual conditions in a pharmacist'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. Pharmacists who follow this method not only grasp concepts, but also develop their mental capacity, by evaluating real situations and applying their knowledge.
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. Students like to feel that the effort they put into their studies is worthwhile. This then translates into a greater interest in learning and more 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.

Our 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, which represent a real revolution with respect to simply studying and analyzing cases.

*Pharmacists will learn through real cases and by solving 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 115,000 pharmacists have been trained with unprecedented success in all clinical specialties, regardless of the surgical load. This pedagogical methodology is developed in a highly demanding environment, with a university student body with a high socioeconomic 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 specialization, developing a critical mindset, defending arguments, and contrasting opinions: a direct equation to 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 created specifically for the course by specialist pharmacists who will be teaching the course, so that the didactic development is highly specific and accurate.

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.



### Video Techniques and Procedures

TECH introduces students to the latest techniques, to the latest educational advances, to the forefront of current pharmaceutical care procedures. All of this, first hand, and explained and detailed with precision to contribute to assimilation and a better understanding. And best of all, you can watch them as many times as you want.



### Interactive Summaries

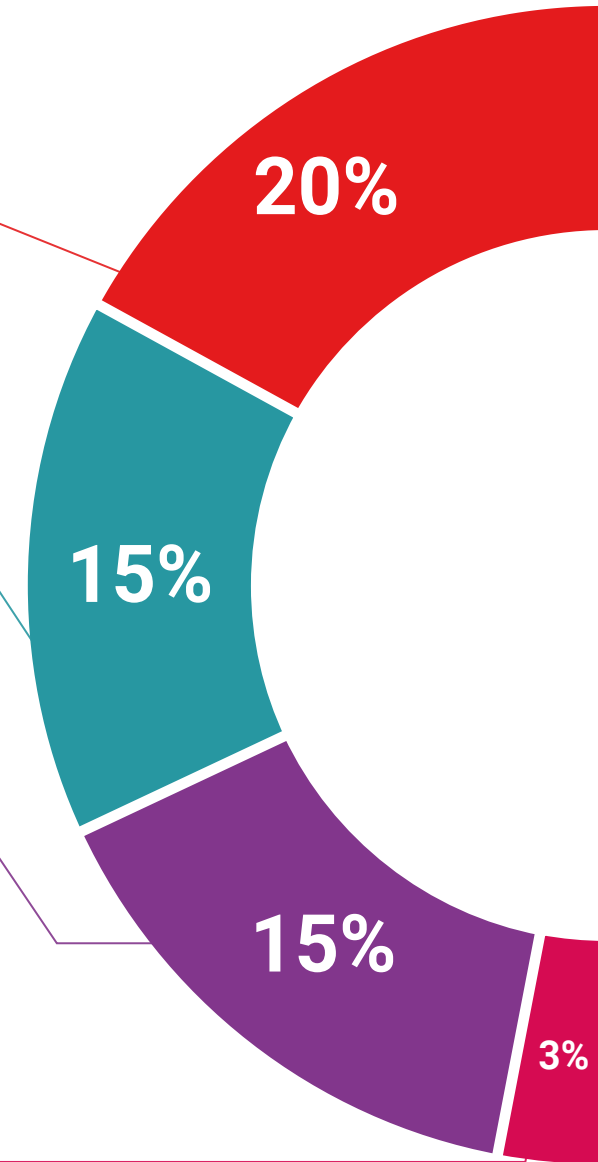
The TECH team presents the contents attractively and dynamically in multimedia lessons that include audio, videos, images, diagrams, and concept maps in order to reinforce knowledge.

This unique multimedia content presentation training system 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, we will present you with real case developments in which the expert will guide you through 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 on the usefulness of learning by observing experts. The system known as 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 Master's Degree in Veterinary Pharmacology guarantees students, in addition to the most rigorous and up-to-date education, access to a Master's Degree issued by TECH Global University.







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

This private qualification will allow you to obtain a **Master's Degree diploma in Veterinary Pharmacology** 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.

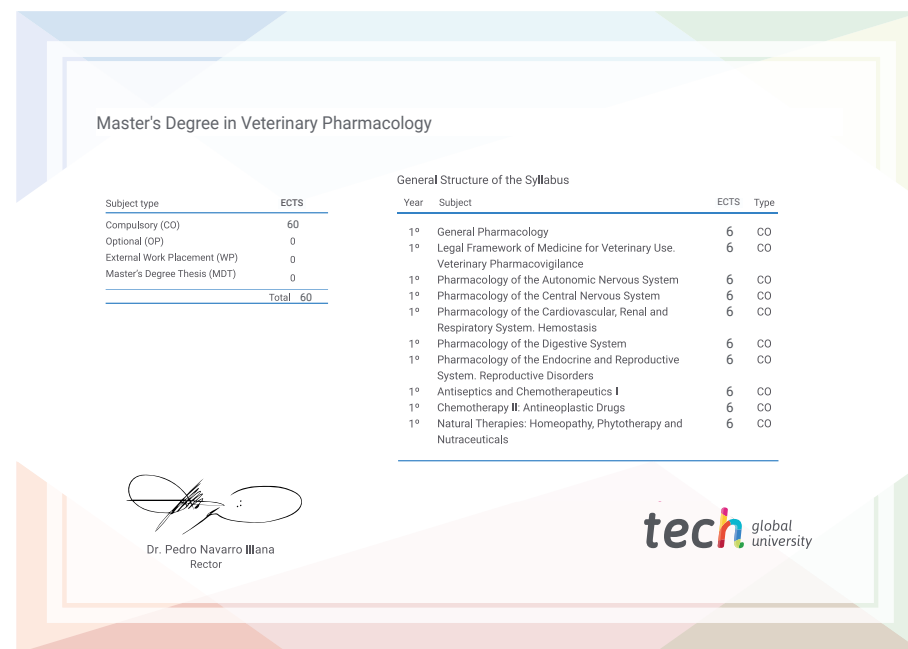
This **TECH Global University** private qualification is a European program of continuing education and professional updating that guarantees the acquisition of competencies in its area of knowledge, providing a high curricular value to the student who completes the program.

Title: **Master's Degree in Veterinary Pharmacology**

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.



## Master's Degree

### Veterinary Pharmacology

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

# Master's Degree Veterinary Pharmacology

