

# Postgraduate Certificate

## Veterinary Pharmacology of the Autonomic and Central Nervous System





## Postgraduate Certificate Veterinary Pharmacology of the Autonomic and Central Nervous System

- » Modality: online
- » Duration: 12 weeks
- » Certificate: TECH Technological University
- » Dedication: 16h/week
- » Schedule: at your own pace
- » Exams: online

Website: [www.techtitute.com/us/veterinary-medicine/postgraduate-certificate/veterinary-pharmacology-autonomic-central-nervous-system](http://www.techtitute.com/us/veterinary-medicine/postgraduate-certificate/veterinary-pharmacology-autonomic-central-nervous-system)

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# 01

# Introduction

This complete program develops, through an exhaustive syllabus, the main pharmacological properties of the groups of drugs capable of modifying body functions that interfere with their autonomic regulation. A syllabus that will bring you up to date on everything related to the treatment of neurological and psychiatric diseases in animals and the medication used in these cases. A high-quality study program, which offers the most advanced resources in online preparation, to guarantee the student an effective, real and practical learning that boosts their competencies to the highest level in this area of work.





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*An in-depth study of the main pharmacological properties of groups of drugs acting on the central nervous system used in veterinary intervention"*



Given the large number of functions and organs that are controlled by the autonomic nervous system and the relatively small number of different receptors that mediate cholinergic and adrenergic transmission, it is difficult to ensure that drugs that interfere with these neurotransmitter systems achieve the necessary selectivity (absence of side effects) to be able to make broad therapeutic use of them.

However, many of them are valuable tools in pharmacological research that have found some clinical utility by acting in three ways: by modifying the availability of the transmitter in the extracellular space, by acting on the presynaptic element (preganglionic or postganglionic nerve fibers) and by acting at the postsynaptic level (soma of the postganglionic neuron or effector cell).

It establishes the drugs used for the treatment of a wide variety of neurological and psychiatric diseases, analgesics, among other symptoms.

Due to their complexity, the mechanisms by which various drugs act on the Central Nervous System are not always well understood. These drugs with effects on the Central Nervous System act on specific receptors that regulate synaptic transmission.

This **Postgraduate Certificate in Veterinary Pharmacology of the Autonomic and Central Nervous System** contains the most complete and up-to-date scientific program on the market. The most important features include:

- ♦ Innovative and up-to-date diagnostic techniques in infectious diseases and their application in daily clinical practice, including the use of cytology as a diagnostic tool in these diseases
- ♦ The most frequent and not so frequent pathologies of infectious origin in dogs from a practical and completely up-to-date point of view
- ♦ Infectious Pathologies oriented to the feline species, dealing extensively with all those of this species
- ♦ "One Health" vision, in which Zoonoses and their implications for public health will be reviewed
- ♦ At present, there are no more exotic diseases, and they should be included by the clinician in the differential diagnosis when the epidemiology allows to suspect them
- ♦ Prevention and management of all infectious diseases, including clinical, home and community settings



*Get up to date on the effects of veterinary drugs on the Central Nervous System and their action on specific receptors that regulate synaptic transmission"*

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*A revolutionary study for its ability to reconcile the highest quality of learning with the most comprehensive online program”*

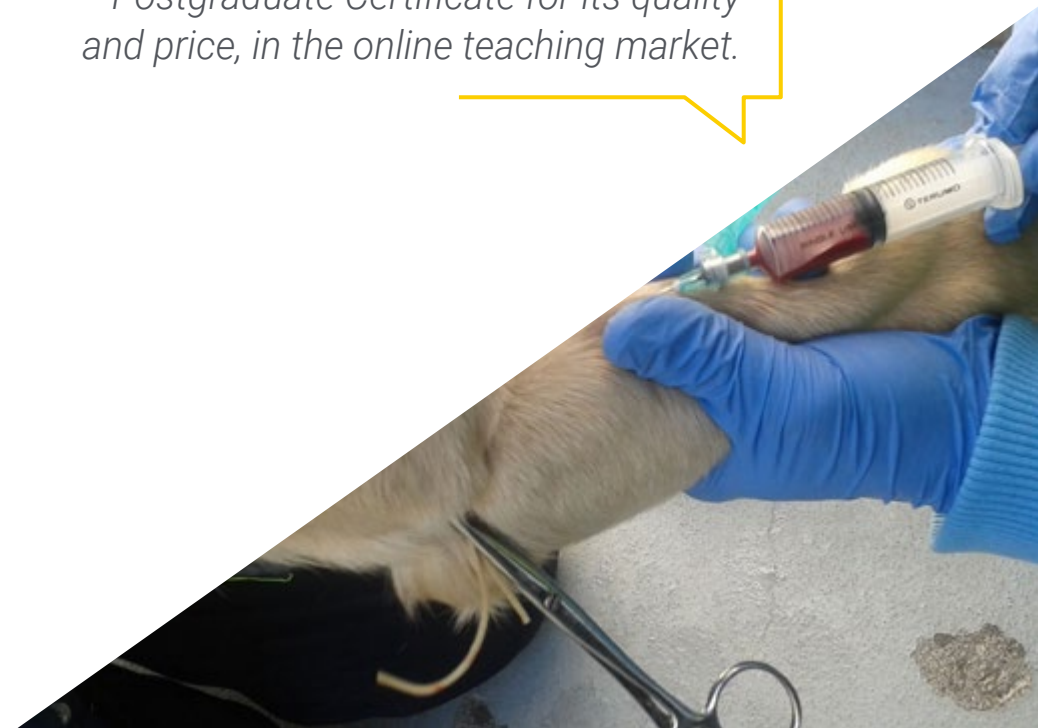
Its teaching staff includes professionals belonging to the field of Veterinary Medicine, who bring to this program the experience of their work, as well as renowned specialists from reference societies and prestigious universities.

Its multimedia content, developed with the latest educational technology, will allow the professional a situated and contextual learning, that is to say, a simulated environment that will provide an immersive learning 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 professional will be assisted by an innovative interactive video system created by renowned and experienced psychology experts.

*The most efficient way of applying drugs to ailments affecting the autonomic nervous system based on the latest scientific research.*

*Learn in an efficient way, with a real qualification objective, with this unique Postgraduate Certificate for its quality and price, in the online teaching market.*



# 02

# Objectives

The objective of the Postgraduate Certificate 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 be integrated into the professional field.





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*Learn to identify the groups of drugs that act on the autonomic nervous system, their mechanisms of action and their therapeutic uses”*



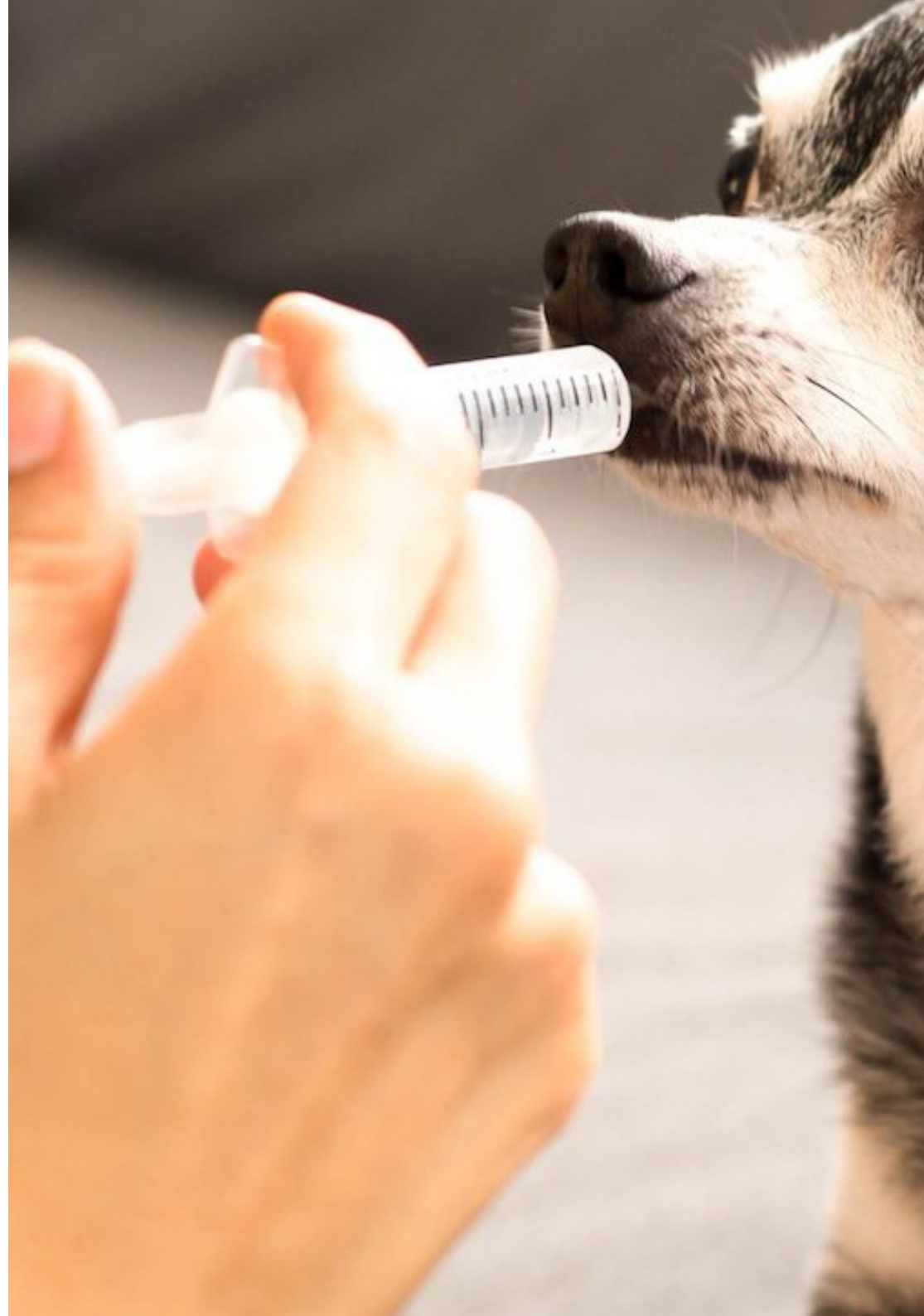
## General Objectives

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- 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

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*A path of learning and professional growth that will propel you towards greater competitiveness in the labor market”*







## Specific Objectives

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- ◆ 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 that act 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

03

# Course Management

The teaching staff of this Postgraduate Certificate is prepared by professionals specialized in the study of Pharmacology, both human and veterinary, 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 both nationally and internationally in high impact journals, books and conferences.







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

## Management



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

- ♦ Teaching Coordinator, Department of Pharmacology, University of Zaragoza, Spain
- ♦ Lecturer in the university course: "Introduction to Pharmacology: Principles for the Rational Use of Drugs" Basic Program of the University of Zaragoza
- ♦ Evaluation professor in: objective-structured clinical evaluation of the Degree in Medicine
- ♦ Degree in Biology and Biochemistry, specializing in the area of Pharmacology
- ♦ PhD with the European Degree from the University of Zaragoza
- ♦ Master's Degree in Environment and Water Management. Andalusia Business School
- ♦ Title of the doctoral program: Biochemistry and Molecular and Cellular Biology

## Professors

### Dr. Arribas Blázquez, Marina

- ♦ Degree in Biology. Specialty in Fundamental Biology and Biotechnology by the University of Salamanca
- ♦ Bill and Melinda Gates Foundation: teaching and postdoctoral research employment contract
- ♦ Institute of Biomedical Research: Alberto Sols Labor researcher and teacher
- ♦ Complutense University of Madrid: postdoctoral teaching and research labor contract
- ♦ Complutense University of Madrid: teaching and research employment contract
- ♦ Molecular Biology Center Severo Ochoa: teaching and predoctoral researcher labor contract
- ♦ Complutense University of Madrid: predoctoral teaching and research labor contract
- ♦ Category B qualification in Protection of animals used for experimental and other scientific purposes
- ♦ Master in Neurosciences
- ♦ Doctorate in Neuroscience from the Complutense University of Madrid
- ♦ Postgraduate Certificate in Culture Room Standards for the use of viral and other pathogenic biological agents at Instituto de Investigaciones Biomédicas de Madrid

### Dr. Luesma Bartolomé, María José

- ♦ Veterinarian. Study Group on Prion Diseases, Vectorial Diseases and Emerging Zoonoses at the University of Zaragoza
- ♦ University Research Institute Study Group
- ♦ Professor of Film and Anatomy. University Degree: Complementary Academic Activities
- ♦ Professor of Anatomy and Histology University degree: Graduate in Optics and Optometry. University of Zaragoza
- ♦ Professor of Final Degree Project University Degree, Bachelor's Degree in Medicine
- ♦ Professor of Morphology. Development Biology University degree: Professional Master's Degree in Initiation to Research in Medicine. University of Zaragoza
- ♦ Doctor of Veterinary Medicine. Official Doctorate Program in Veterinary Sciences. University of Zaragoza
- ♦ Degree in Veterinary Medicine. University of Zaragoza

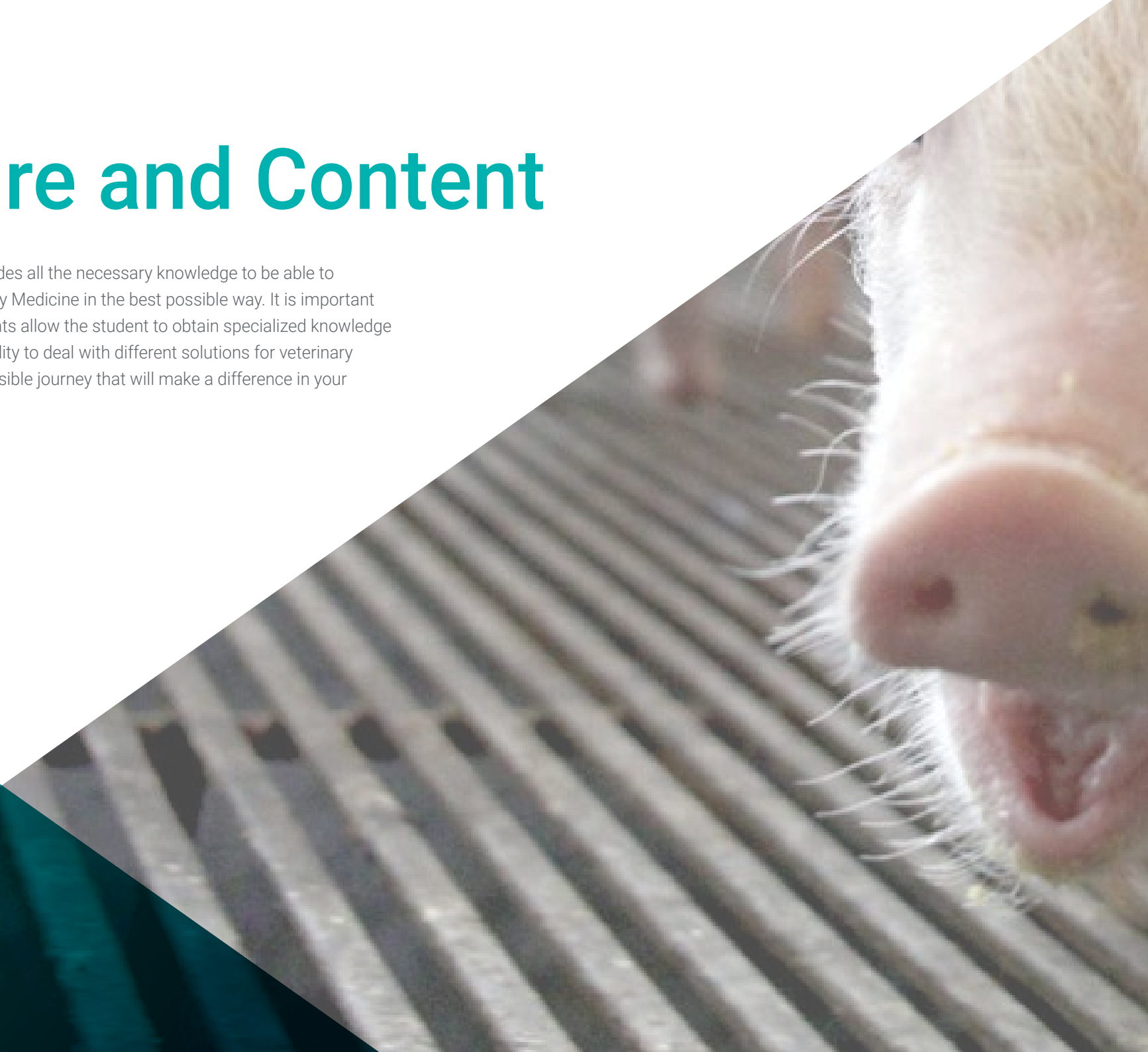
### Dr. García Barrios, Alberto

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

# 04

## Structure and Content

This Postgraduate Certificate provides all the necessary knowledge to be able to perform Pharmacology in Veterinary Medicine in the best possible way. It is important to take into account that the contents allow the student to obtain specialized knowledge of pharmacology, as well as the ability to deal with different solutions for veterinary pathologies. A complete and accessible journey that will make a difference in your career progression.





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*A complete program that will lead you to the exhaustive knowledge necessary to intervene as a specialist in the theoretical and practical aspects of Veterinary Pharmacology of the autonomic and central nervous system”*

## Module 1. Pharmacology of the Autonomic Nervous System

- 1.1. Peripheral Nervous System
  - 1.1.1. Definition
  - 1.1.2. Classification
  - 1.1.3. Autonomic Nervous System
    - 1.1.3.1. Definition
    - 1.1.3.2. Classification
- 1.2. Cholinergic Neurotransmitter System
  - 1.2.1. Definition
  - 1.2.2. Nicotinic and Muscarinic Receptors
  - 1.2.3. Classification of Drugs
- 1.3. Pharmacology of Cholinergic Transmission I
  - 1.3.1. Transmission Blocking Drugs in Autonomous Ganglia
  - 1.3.2. Nicotinic Receptor Antagonists with Sympathokolytic Effects
  - 1.3.3. Nicotinic Receptor Antagonists with Parasympatholytic Effects (Hexamethonium, Mecamylamine)
- 1.4. Pharmacology of Cholinergic Transmission II
  - 1.4.1. Transmission-Blocking Drugs at Neuroeffector Junctions
  - 1.4.2. Muscarinic Receptor Antagonists
  - 1.4.3. Parasympatholytic Effects (Atropine, Scopolamine)
- 1.5. Pharmacology of Cholinergic Transmission
  - 1.5.1. Drugs that Mimic the Effects of Acetylcholine on Neuroeffector Junctions
  - 1.5.2. Muscarinic Receptor Agonists
  - 1.5.3. Parasympathomimetic Effects (Acetylcholine, Methacholine, Betanechol)
- 1.6. Adrenergic Neurotransmitter System
  - 1.6.1. Definition
  - 1.6.2. Adrenergic Receptors
  - 1.6.3. Classification of Drugs
- 1.7. Pharmacology of Adrenergic Transmission
  - 1.7.1. Drugs that Promote Noradrenaline at Neuroeffector Synapses
- 1.8. Pharmacology of Adrenergic Transmission
  - 1.8.1. Transmission-Blocking Drugs at Neuroeffector Junctions



- 1.9. Pharmacology of Adrenergic Transmission
  - 1.9.1 Drugs that Mimic the Effects of Noradrenaline at Neuroeffector Junctions
- 1.10. Pharmacology in the Motor Plate
  - 1.10.1 Ganglionic or Ganglioplegic Blocking Drugs
  - 1.10.2 Non-Depolarizing Neuromuscular Blocking Drugs
  - 1.10.3 Depolarizing Neuromuscular Blocking Drugs

## Module 2. Pharmacology of the Central Nervous System

- 2.1. Pain
  - 2.1.1 Definition
  - 2.1.2 Classification
  - 2.1.3. Pain Neurobiology
    - 2.1.3.1. Transduction
    - 2.1.3.2. Transmission
    - 2.1.3.3. Modulation
    - 2.1.3.4. Perception
  - 2.1.4 Animal Models for the Study of Neuropathic Pain
- 2.2. Nociceptive Pain
  - 2.2.1 Neuropathic Pain
  - 2.2.2 Pathophysiology of Neuropathic Pain
- 2.3. Analgesic Drugs. Nonsteroidal Anti-Inflammatory Drugs
  - 2.3.1 Definition
  - 2.3.2 Pharmacokinetics
  - 2.3.3. Mechanism of Action
  - 2.3.4 Classification
  - 2.3.5 Pharmacological Effects
  - 2.3.6 Side Effects
- 2.4. Analgesic Drugs. Steroidal Anti-Inflammatory Drugs
  - 2.4.1 Definition
  - 2.4.2 Pharmacokinetics
  - 2.4.3. Mechanism of Action. Classification
  - 2.4.4 Pharmacological Effects
  - 2.4.5 Side Effects
- 2.5. Analgesic Drugs. Opioids
  - 2.5.1 Definition
  - 2.5.2 Pharmacokinetics
  - 2.5.3. Mechanism of Action. Opioid Receptors
  - 2.5.4 Classification
  - 2.5.5 Pharmacological Effects
    - 2.5.5.1. Side Effects
- 2.6. Pharmacology of Anesthesia and Sedation
  - 2.6.1 Definition
  - 2.6.2 Mechanism of Action
  - 2.6.3. Classification: General and Local Anesthetics
  - 2.6.4 Pharmacological Properties
- 2.7. Local Anesthetic. Inhalation Anesthetics
  - 2.7.1 Definition
  - 2.7.2 Mechanism of Action
  - 2.7.3. Classification
  - 2.7.4 Pharmacological Properties
- 2.8. Non-Injectable Anesthetics
  - 2.8.1 Neuroleptoanesthesia and Euthanasia. Definition
  - 2.8.3. Mechanism of Action
  - 2.8.3. Classification
  - 2.8.4 Pharmacological Properties
- 2.9. Central Nervous System Stimulant Drugs
  - 2.9.1 Definition
  - 2.9.2 Mechanism of Action
  - 2.9.3. Classification
  - 2.9.4 Pharmacological Properties
  - 2.9.5 Side Effects
  - 2.9.6 Antidepressants
- 2.10. Central Nervous System Depressant Drugs
  - 2.10.1 Definition
  - 2.10.2 Mechanism of Action
  - 2.10.3. Classification
  - 2.10.4 Pharmacological Properties
  - 2.10.5 Side Effects
  - 2.10.6 Anticonvulsants

05

# 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.







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*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.



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*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. 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 program.



## Relearning Methodology

At TECH, we enhance the Harvard 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 adapted in 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

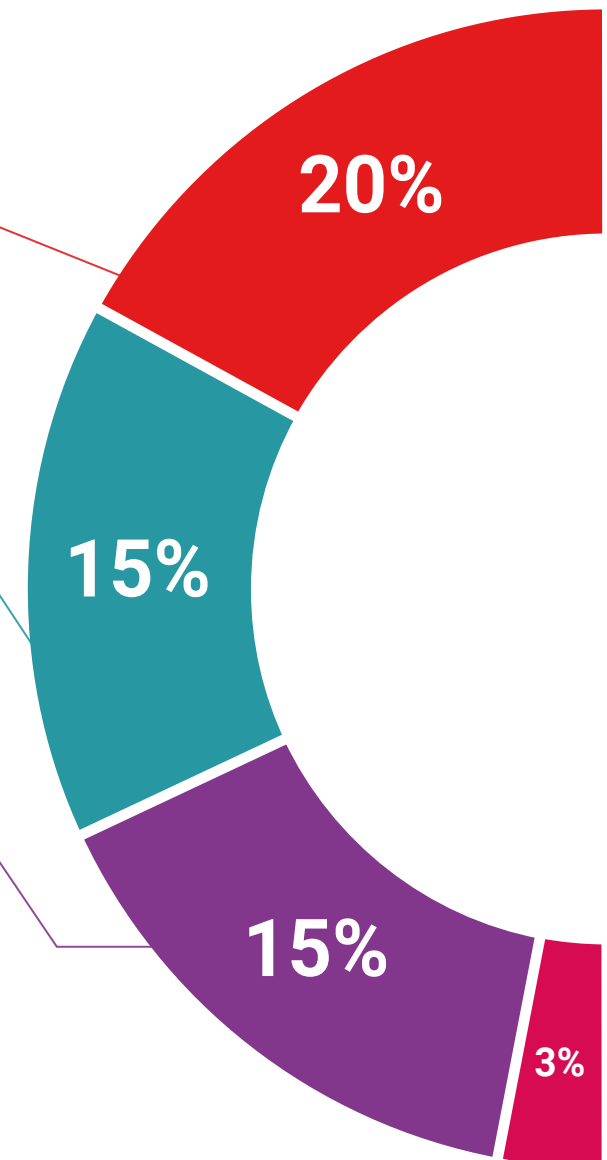
The TECH team presents the contents attractively and dynamically in multimedia lessons that include audio, videos, images, diagrams, and concept maps in order to reinforce knowledge.

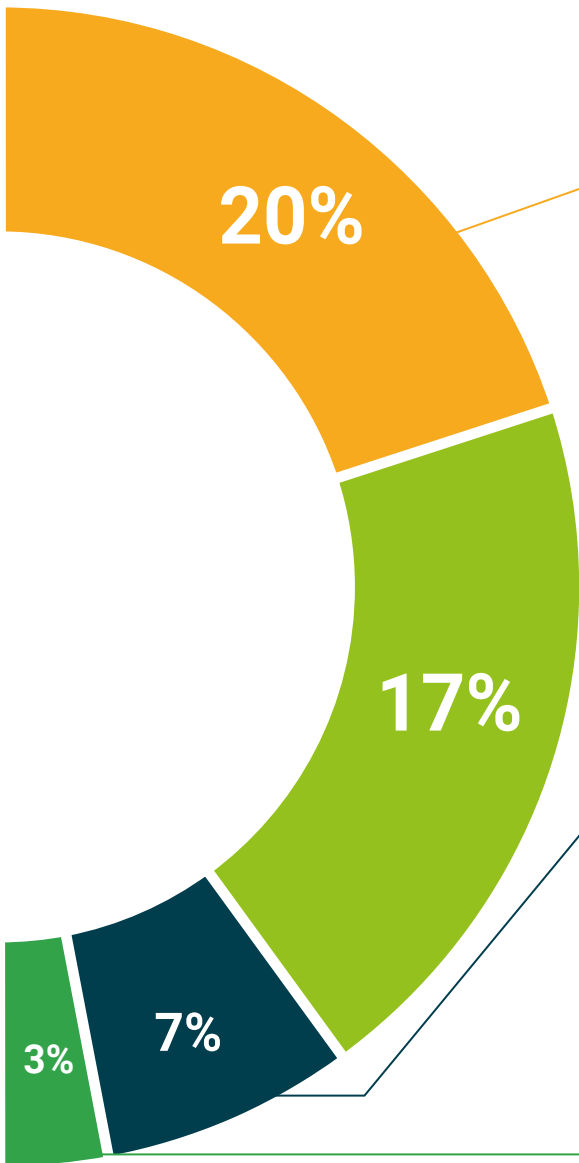
This exclusive educational system for presenting multimedia content was awarded by Microsoft as a "European Success Story".



#### 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.





06

# Certificate

The Postgraduate Certificate in Veterinary Pharmacology of the Autonomic and Central Nervous System guarantees students, in addition to the most rigorous and up-to-date education, access to a Postgraduate Certificate issued by TECH Technological University.





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

This **Postgraduate Certificate in Veterinary Pharmacology of the Autonomic and Central Nervous System** contains the most complete and up-to-date educational program on the market.

After the student has passed the assessments, they will receive their corresponding **Postgraduate Certificate** issued by **TECH Technological University** via tracked delivery\*.

The diploma issued by **TECH Technological University** will reflect the qualification obtained through the Postgraduate Certificate, and meets the requirements commonly demanded by labor exchanges, competitive examinations and professional career evaluation committees.

Title: **Postgraduate Certificate in Veterinary Pharmacology of the Autonomic and Central Nervous System**

Official N° of hours: **300 h.**



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



## Postgraduate Certificate Veterinary Pharmacology of the Autonomic and Central Nervous System

- » Modality: online
- » Duration: 12 weeks
- » Certificate: TECH Technological University
- » Dedication: 16h/week
- » Schedule: at your own pace
- » Exams: online

**Postgraduate Certificate**  
Veterinary Pharmacology  
of the Autonomic and Central  
Nervous System

