

# 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.techtute.com/us/pharmacy/postgraduate-certificate/veterinary-pharmacology-autonomic-central-nervous-system](http://www.techtute.com/us/pharmacy/postgraduate-certificate/veterinary-pharmacology-autonomic-central-nervous-system)

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# 01

# Introduction

This intensive program is a great tool available to the professional pharmacist that allows him/her to specialize in Veterinary Pharmacology of the Autonomic and Central Nervous System, as more and more domestic and exotic animals require specific medication for certain pathologies. A high quality program, which offers the most advanced resources in online specialization, to guarantee the student an effective, real and practical learning that boosts their competencies to the highest level in this area of work. Thanks to its innovative learning methodology, the student can follow its contents in a totally flexible and personalized way, with great availability on the part of the teachers for consultations, doubts or tutorials.





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

This complete specialization 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. An apprenticeship 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 program that 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.

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 educational program on the market. The most important features include:

- ♦ Practical cases presented by experts in Veterinary Pharmacology
- ♦ The graphic, schematic, and eminently 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 training in the use of veterinary drugs for the prevention and treatment of diseases affecting animal health"*

“

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

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.

The multimedia content, developed with the latest educational technology, will provide the professional with situated and contextual learning, i.e., a simulated environment that will provide immersive training programmed to train 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 during the academic year. For this purpose, the student will be assisted by an innovative interactive video system created by renowned and experienced experts.

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

*The skills you will acquire after completing this Postgraduate Certificate will position you as an expert in veterinary pharmacology.*



# 02

# Objectives

The design of this Postgraduate Certificate program will allow students to acquire the necessary skills to update their knowledge in the profession after studying in depth the key aspects of Veterinary Pharmacology. Its objective is to provide the student 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 he/she 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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*The most efficient way of applying drugs to ailments affecting the Autonomic Nervous System supported by the latest scientific research"*



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





## 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 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

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.





“

*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
- Lecturer in the Postgraduate Certificate "Introduction to Pharmacology: Principles for the Rational Use of Drugs" Basic Program of the University of Experience of Zaragoza
- Evaluation professor in objective structured clinical evaluation of the medical degree

## Professors

### 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

### Ms. 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

### Ms. 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: Professional 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 Aragon (Government of Aragon)

# 04

## Structure and Content

The structure of this Postgraduate Certificate 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 program offers the student a realistic learning opportunity in the context of Veterinary Pharmacology, which makes it an extremely useful tool for the professional pharmacist. Through clinical simulations at a practical level, you 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”*

## Module 1. Pharmacology of the Autonomous 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 Sympatholytic Effects
  - 1.3.3. Nicotinic Receptor Antagonists with Parasympatholytic Effects (hexamethonium, mecamlamine)
- 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



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

**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. Injectable Anesthetics
  - 2.8.1. Neuroleptoanesthesia and Euthanasia. Definition
  - 2.8.2. 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.





*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.

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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. 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.



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 in 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.

future  
health confidence people  
education information tutors  
guarantee accreditation teaching  
institutions technology learning  
community commitment  
personalized service innovation  
knowledge present  
development language  
virtual classroom



**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  
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