

# 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 Global University
- » Accreditation: 12 ECTS
- » 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 Sympathokolic 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, betanecol)
- 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

# Study Methodology

TECH is the world's first university to combine the **case study** methodology with **Relearning**, a 100% online learning system based on guided repetition.

This disruptive pedagogical strategy has been conceived to offer professionals the opportunity to update their knowledge and develop their skills in an intensive and rigorous way. A learning model that places students at the center of the educational process giving them the leading role, adapting to their needs and leaving aside more conventional methodologies.





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*TECH will prepare you to face new challenges in uncertain environments and achieve success in your career”*

## The student: the priority of all TECH programs

In TECH's study methodology, the student is the main protagonist.

The teaching tools of each program have been selected taking into account the demands of time, availability and academic rigor that, today, not only students demand but also the most competitive positions in the market.

With TECH's asynchronous educational model, it is students who choose the time they dedicate to study, how they decide to establish their routines, and all this from the comfort of the electronic device of their choice. The student will not have to participate in live classes, which in many cases they will not be able to attend. The learning activities will be done when it is convenient for them. They can always decide when and from where they want to study.

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*At TECH you will NOT have live classes  
(which you might not be able to attend)”*





### The most comprehensive study plans at the international level

TECH is distinguished by offering the most complete academic itineraries on the university scene. This comprehensiveness is achieved through the creation of syllabi that not only cover the essential knowledge, but also the most recent innovations in each area.

By being constantly up to date, these programs allow students to keep up with market changes and acquire the skills most valued by employers. In this way, those who complete their studies at TECH receive a comprehensive education that provides them with a notable competitive advantage to further their careers.

And what's more, they will be able to do so from any device, pc, tablet or smartphone.

“*TECH's model is asynchronous, so it allows you to study with your pc, tablet or your smartphone wherever you want, whenever you want and for as long as you want*”

## Case Studies and Case Method

The case method has been the learning system most used by the world's best business schools. Developed in 1912 so that law students would not only learn the law based on theoretical content, its function was also to present them with real complex situations. In this way, they could make informed decisions and value judgments about how to resolve them. In 1924, Harvard adopted it as a standard teaching method.

With this teaching model, it is students themselves who build their professional competence through strategies such as Learning by Doing or Design Thinking, used by other renowned institutions such as Yale or Stanford.

This action-oriented method will be applied throughout the entire academic itinerary that the student undertakes with TECH. Students will be confronted with multiple real-life situations and will have to integrate knowledge, research, discuss and defend their ideas and decisions. All this with the premise of answering the question of how they would act when facing specific events of complexity in their daily work.



## Relearning Methodology

At TECH, case studies are enhanced with the best 100% online teaching method: Relearning.

This method breaks with traditional teaching techniques to put the student at the center of the equation, providing the best content in different formats. In this way, it manages to review and reiterate the key concepts of each subject and learn to apply them in a real context.

In the same line, and according to multiple scientific researches, reiteration is the best way to learn. For this reason, TECH offers between 8 and 16 repetitions of each key concept within the same lesson, presented in a different way, with the objective of ensuring that the knowledge is completely consolidated during the study process.

*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.*



## A 100% online Virtual Campus with the best teaching resources

In order to apply its methodology effectively, TECH focuses on providing graduates with teaching materials in different formats: texts, interactive videos, illustrations and knowledge maps, among others. All of them are designed by qualified teachers who focus their work on combining real cases with the resolution of complex situations through simulation, the study of contexts applied to each professional career and learning based on repetition, through audios, presentations, animations, images, etc.

The latest scientific evidence in the field of Neuroscience points to the importance of taking into account the place and context where the content is accessed before starting a new learning process. Being able to adjust these variables in a personalized way helps people to remember and store knowledge in the hippocampus to retain it in the long term. This is a model called Neurocognitive context-dependent e-learning that is consciously applied in this university qualification.

In order to facilitate tutor-student contact as much as possible, you will have a wide range of communication possibilities, both in real time and delayed (internal messaging, telephone answering service, email contact with the technical secretary, chat and videoconferences).

Likewise, this very complete Virtual Campus will allow TECH students to organize their study schedules according to their personal availability or work obligations. In this way, they will have global control of the academic content and teaching tools, based on their fast-paced professional update.



*The online study mode of this program will allow you to organize your time and learning pace, adapting it to your schedule"*

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

1. Students who follow this method not only achieve the assimilation of concepts, but also a development of their mental capacity, through exercises that assess real situations and the application of 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.



### The university methodology top-rated by its students

The results of this innovative teaching model can be seen in the overall satisfaction levels of TECH graduates.

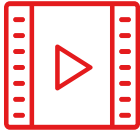
The students' assessment of the teaching quality, the quality of the materials, the structure of the program and its objectives is excellent. Not surprisingly, the institution became the top-rated university by its students according to the global score index, obtaining a 4.9 out of 5.

*Access the study contents from any device with an Internet connection (computer, tablet, smartphone) thanks to the fact that TECH is at the forefront of technology and teaching.*

*You will be able to learn with the advantages that come with having access to simulated learning environments and the learning by observation approach, that is, Learning from an expert.*



As such, the best educational materials, thoroughly prepared, will be available in this program:



#### 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.

This content is then adapted in an audiovisual format that will create our way of working online, with the latest techniques that allow us to offer you high quality in all of the material that we provide you with.



#### Practicing Skills and Abilities

You will carry out activities to develop specific competencies and skills in each thematic field. Exercises and activities to acquire and develop the skills and abilities that a specialist needs to develop within the framework of the globalization we live in.



#### Interactive Summaries

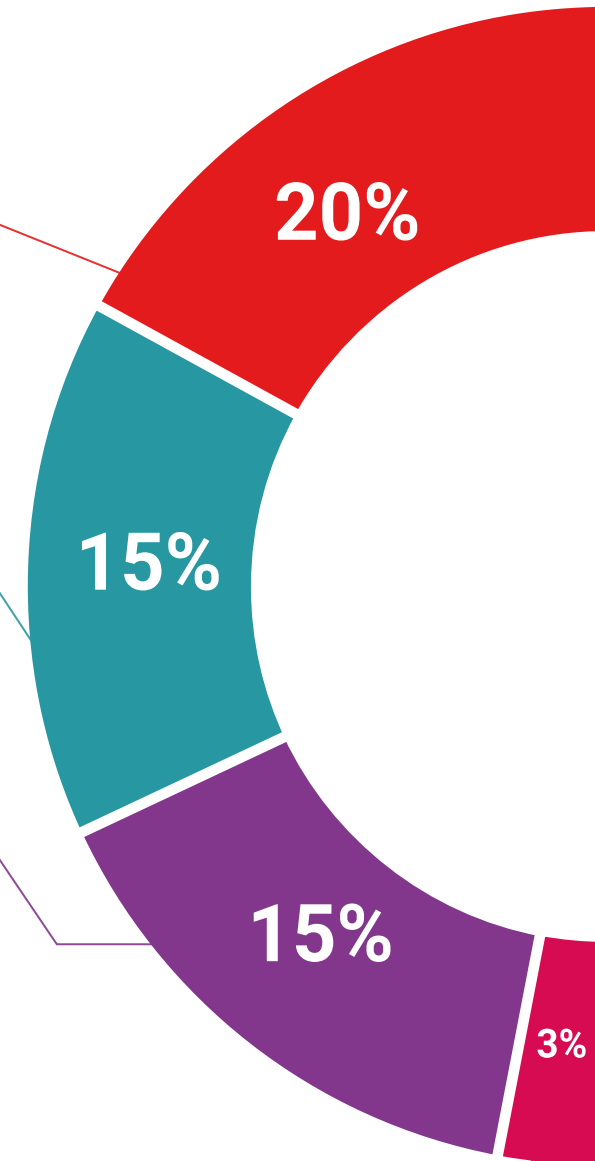
We present the contents attractively and dynamically in multimedia lessons that include audio, videos, images, diagrams, and concept maps in order to reinforce knowledge.

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

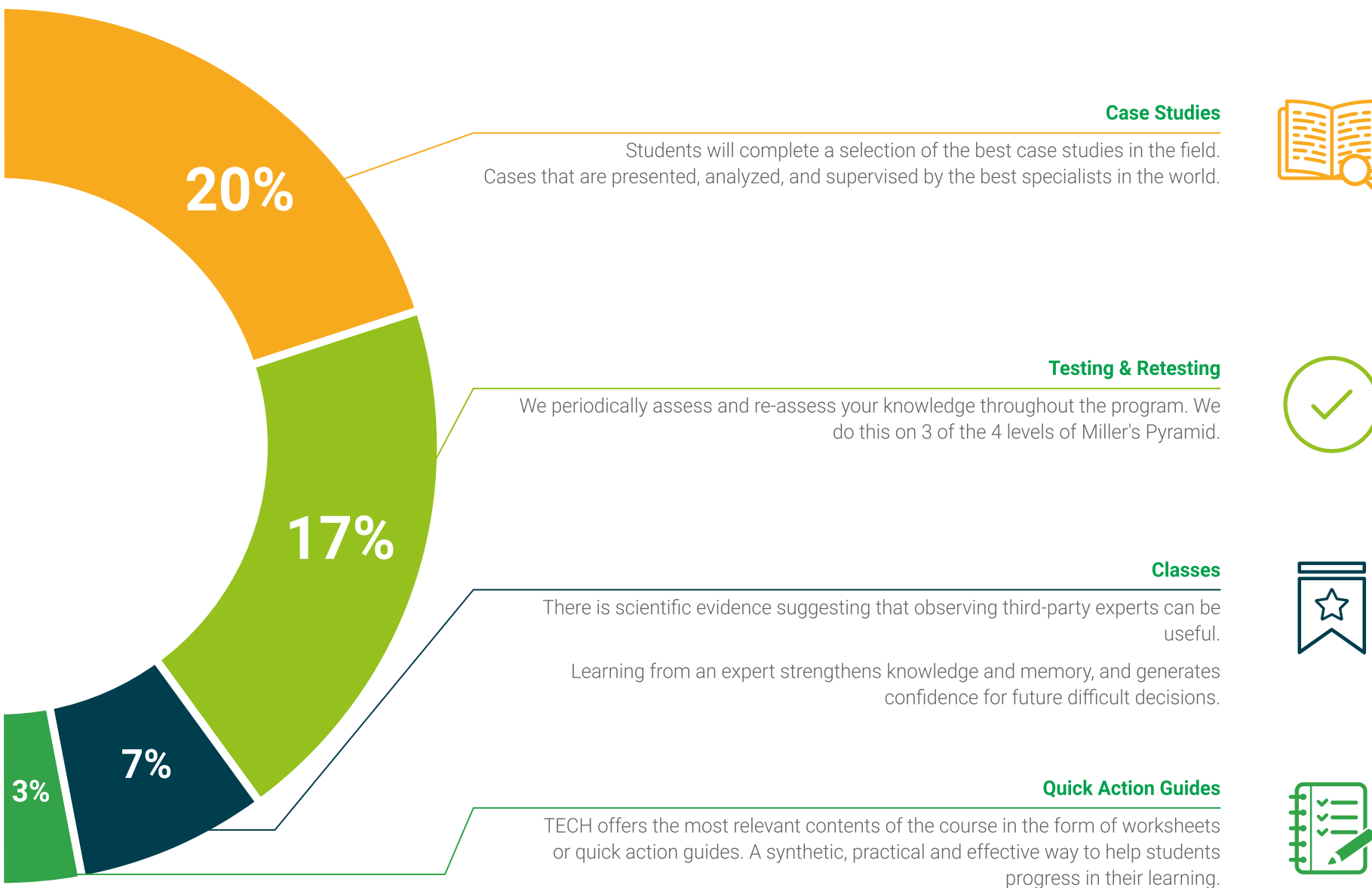


#### Additional Reading

Recent articles, consensus documents, international guides... In our virtual library you will have access to everything you need to complete your education.







# 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 Global University.



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

This private qualification will allow you to obtain a **Postgraduate Certificate in Veterinary Pharmacology of the Autonomic and Central Nervous System** 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: **Postgraduate Certificate in Veterinary Pharmacology of the Autonomic and Central Nervous System**

Modality: **online**

Duration: **12 weeks**

Accreditation: **12 ECTS**







## Postgraduate Certificate

Veterinary Pharmacology  
of the Autonomic and  
Central Nervous System

- » Modality: online
- » Duration: 12 weeks
- » Certificate: TECH Global University
- » Accreditation: 12 ECTS
- » Schedule: at your own pace
- » Exams: online

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