Professional Master's Degree

Multidrug-Resistant Bacteria

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Professional Master's Degree
Multidrug-Resistant Bacteria

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

Website: www.techtitute.com/us/pharmacy/professional-master-degree/master-multidrug-resistant-bacteria

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01

Introduction

According to data from the World Health Organization (WHO), infections caused by Multidrug-Resistant Bacteria result in higher mortality rates and increase healthcare costs. In response to this crisis, continuous specialization in updated antibiotic use protocols becomes crucial for pharmacists, who play a key role in prudent antimicrobial stewardship and preventing the spread of resistance. In this situation, TECH presents a comprehensive program, which will include the most advanced protocols for the proper use of antibiotics, and will address one of the main concerns in modern hospitals: Gram-negative microorganisms. Therefore, it stands out for an exclusive and intensive methodology totally online, using the innovative Relearning method.

With this 100% online program, you will gain an in-depth understanding of the mechanisms of bacterial resistance, as well as the most effective strategies for the management and prevention of multidrug-resistant infections"

Multidrug-Resistant Bacteria are responsible for a significant increase in cases of difficult-to-treat infections, prolonging hospitalization times and increasing healthcare costs. Against this backdrop, it is imperative that pharmacists are equipped with the most up-to-date knowledge on management and prevention strategies, including the rational use of antimicrobials
and the adoption of effective infection control measures.

This is how this study is born, which will address the mechanisms of bacterial resistance and its impact on Public Health, developing a comprehensive understanding of the most effective diagnostic and therapeutic strategies. It will also focus on critical clinical situations where these infections may be more prevalent and severe, so that
pharmacists are updated on advanced treatment and resistance management protocols.

Likewise, the characteristics, evolution and specific control strategies for this bacterial group of high clinical relevance will be examined in depth. In this sense, the knowledge will be complemented with the detailed analysis of antibiotic resistance in Streptococcus, Enterococcus and Staphylococcus, providing a comprehensive approach on the main Gram Positive Bacteria.

Finally, emerging topics such as Proteomics in Clinical Microbiology, the presence of Multidrug-Resistant Bacteria in the food chain and antimicrobial resistance in animal health will be addressed, reflecting the importance of a holistic view in the fight against these microbiological threats. It will also
delve into emerging strategies and the development of new antimicrobial molecules, as well as on the integration of Artificial Intelligence
in Clinical Microbiology and infectious diseases.

These exhaustive contents will offer graduates a completely online methodology, being able to adapt the study time according to their schedules and personal and work commitments. Additionally, the revolutionary Relearning system will be incorporated, which facilitates the intensive assimilation of key concepts through repetition. Therefore, students will be able to study at their own pace and acquire a complete mastery of the latest scientific evidence on Multidrug-Resistant Bacteria.

This **Professional Master's Degree in Multidrug-Resistant Bacteria** contains the most complete and up-to-date scientific program on the market. Its most notable features are:

- The development of practical cases presented by experts in Microbiology, Medicine and Parasitology
- The graphic, schematic and eminently practical contents with which it is conceived gather scientific and practical information on those disciplines that are indispensable 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

Bet on TECH! You will learn about the latest advances in molecular diagnostics and antimicrobial treatment, becoming familiar with innovative techniques such as Proteomics and the use of Artificial Intelligence in Clinical Microbiology"

You will delve into the potential of Artificial Intelligence in Clinical Microbiology and infectious diseases, mastering predictive and diagnostic tools to improve the management of multidrug-resistant infections"

You will address the management of patients with Multidrug-Resistant Bacterial infections in Intensive Care Units (ICU), using effective strategies for the care and prevention of these infections.

You will examine antibiotic resistance in Streptococcus, Enterococcus and Staphylococcus, analyzing therapeutic strategies and their implications for clinical practice. With all TECH's quality guarantees!

The program's teaching staff includes professionals from the sector who contribute their work experience to this specializing 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 education 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 during the course. For this purpose, students will be assisted by an innovative interactive video system created by renowned and experienced experts.

02

Objectives

Through this program, professionals will be updated on the mechanisms of bacterial resistance, as well as on the application of advanced treatment strategies. Another fundamental objective will be to prepare pharmacists in the optimal management of infections caused by Multidrug-Resistant Bacteria, promoting evidence-based practices and the rational use of antimicrobials. In addition, research and leadership skills will be developed, preparing graduates to actively contribute to the management and prevention of antimicrobial resistance in clinical and community settings.

The main objective of this program in Multidrug-Resistant Bacteria will be to provide you with comprehensive and specialized qualification in the field of Clinical Microbiology focused on antimicrobial resistance."

General Objectives

- Understand how bacterial resistance evolves as new antibiotics are introduced into clinical practice
- Understand the colonization and infection of patients in Intensive Care Units (ICUs), the different types and risk factors associated with infection
- Evaluate the impact of Nosocomial Infections in the critically ill patient, including the importance of risk factors and their impact on length of stay in the ICU
- Analyze the effectiveness of infection prevention strategies, including the use of quality indicators, evaluation tools and continuous improvement tools
- Understand the pathogenesis of Gram-negative Infections, including the factors related to these bacteria and patients themselves
- Examine the main infections by Gram Positive Bacteria, including their natural habitat, Nosocomial Infections and community-acquired infections
- Determine the clinical significance, resistance mechanisms and treatment options for different Gram-positive Bacteria
- Substantiate the importance of Proteomics and Genomics in the Microbiology laboratory including recent advances and technical and bioinformatics challenges
- Acquire knowledge on the dissemination of resistant bacteria in food production
- Study the presence of multidrug-resistant bacteria in the environment and wildlife, as well as to understand their potential impact on public health
- Acquire expertise on innovative antimicrobial molecules, including antimicrobial peptides and bacteriocins, bacteriophage enzymes and nanoparticles
- Develop expertise in the discovery methods for new antimicrobial molecules
- Gain specialized knowledge on Artificial Intelligence (AI) in Microbiology, including current expectations, emerging areas and its cross-cutting nature
- Understand the role that AI will play in Clinical Microbiology, including the technical lines and challenges for its implementation and deployment in laboratories

You will deepen your understanding of Multidrug-Resistant Bacteria, including their epidemiology, resistance mechanisms and associated clinical implications, through a comprehensive library of multimedia resources"

Specific Objectives

Module 1. Multidrug-Resistant Bacteria in Human Pathology

- Evaluate the causes of antibiotic resistance, from the lack of new antibiotics, to socioeconomic factors and health policies
- Examine the current status of antibiotic resistance in the world, including global statistics and trends in different regions

Module 2. Management of Patients with Multidrug-Resistant Bacterial Infections in Intensive Care Units (ICU)

- Acquire specialized knowledge on the diagnosis and treatment of common infections in ICUs
- Develop skills for the prevention of Multiresistant Bacterial Infections in the ICU

Module 3. Multidrug-Resistant Gram Negative Bacteria

- Select the appropriate empirical antibiotic treatment for suspected infections with mMultidrug-resistant Gram-negative Microorganisms
- Determine the importance of PROA (Program for Optimization of Antimicrobial Agents) teams in infections by Multidrug-resistant Gram-negative Microorganisms

Module 4. Antibiotic Resistance in Streptococcus, Enterococcus and Staphylococcus

- Explore the implications of antibiotic resistance of the major Gram Positive Bacteria on Public Health and clinical practice
- Discuss strategies to mitigate antibiotic resistance in Gram Positive Bacteria

Module 5. Proteomics in Clinical Microbiology

- Delve into qualitative and quantitative techniques for protein separation and identification
- Apply bioinformatics tools for Proteomics and Genomics

Module 6. Multi-drug Resistant Bacteria in the Food Chain

- Analyze the role of the food chain in the spread of bacterial resistance to antibiotics through food of animal and plant origin, as well as through water

Module 7. Antimicrobial Resistance in Animal Health

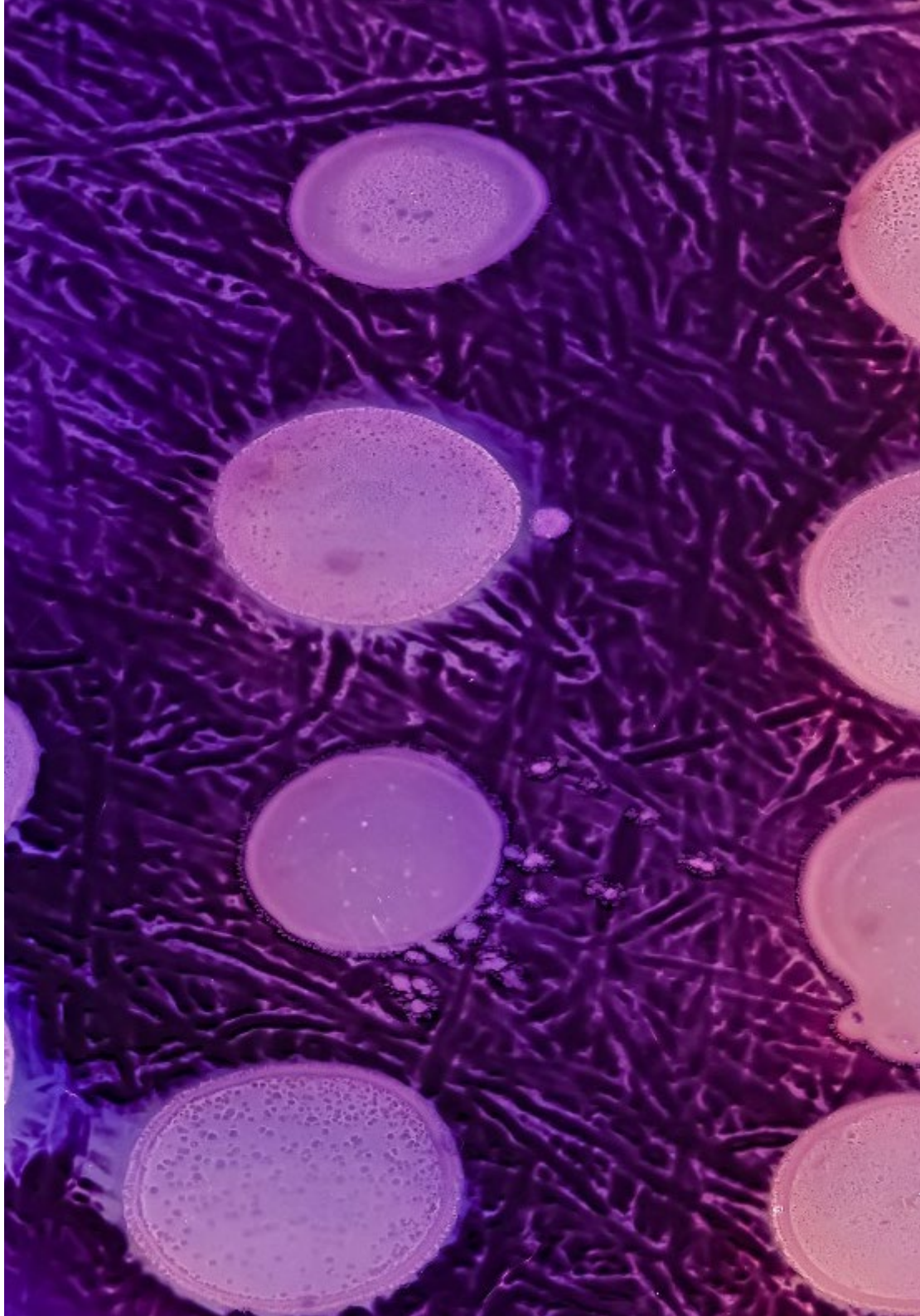
- Analyze the causes and mechanisms of bacterial resistance in the veterinary field, including the dissemination of antibiotic resistance genes
- Identify the species of multi-resistant bacteria of major veterinary importance, and understand their impact on animal health
- Establish preventive and control measures against bacterial resistance in animals, including systems and processes for the appropriate use of antibiotics, and alternatives to antibiotics in livestock and aquaculture
- Determine the objectives of the One Health strategy and its application in the study and control of multidrug-resistant bacteria

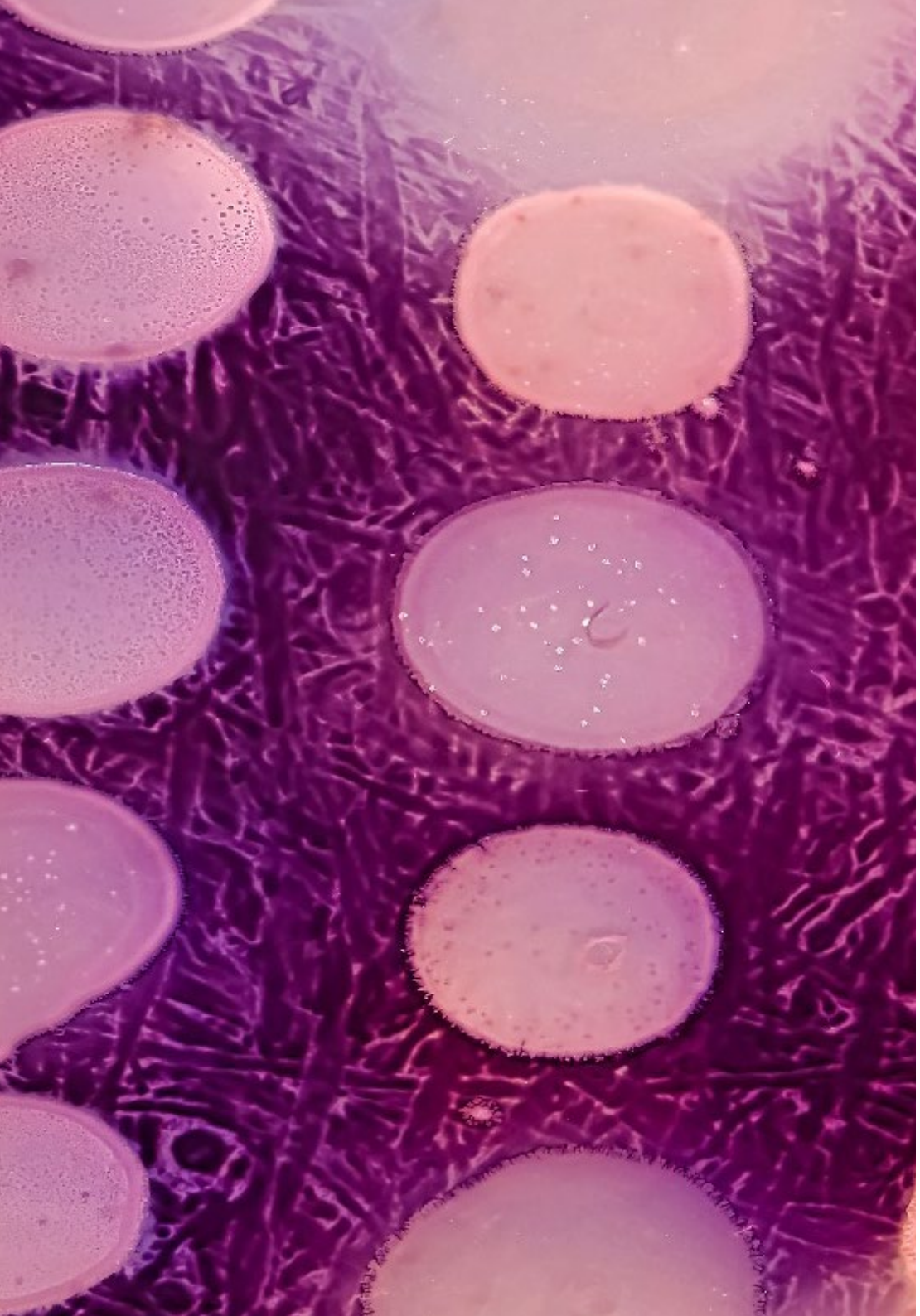
Module 8. Emerging Strategies for Multidrug-Resistant Bacteria

- Examine in depth the mechanism of different molecular techniques for use against multiresistant bacteria, including CRISPR-Cas9 gene editing, its molecular mechanism of action and its potential applications

Module 9. New Antimicrobial Molecules

- Analyze the mechanisms of action, antimicrobial spectrum, therapeutic uses and adverse effects of new antimicrobial molecules
- Differentiate new antimicrobial molecules among the antibiotic families: penicillins, cephalosporins, carbapenemics, glycopeptides, macrolides, tetracyclines, aminoglycosides, quinolones and others





Module 10. Artificial Intelligence in Clinical Microbiology and Infectious Diseases

- Analyze the fundamentals of AI in Microbiology, including its history and evolution, technologies that can be used in Microbiology and research objectives
- Include AI algorithms and models for protein structure prediction, identification and understanding of resistance mechanisms, and analysis of genomic Big Data
- Apply AI in machine learning techniques for bacterial identification and its practical implementation in clinical and Microbiology research laboratories
- Explore synergy strategies with AI between Microbiology and Public Health, including infectious outbreak management, epidemiological surveillance, and personalized treatments

03

Skills

Through this university program, professionals will acquire skills to analyze and understand the mechanisms of resistance of various bacteria, as well as to apply innovative strategies in the diagnosis and treatment of multidrug-resistant infections. In addition, they will design and manage effective infection control programs in clinical and community settings, promoting the rational use of antimicrobials and adopting evidence-based approaches to improve clinical outcomes and reduce the spread of resistant strains.

The program in Multidrug-Resistant Bacteria empowers pharmacists with advanced and specialized competencies to address the challenges of antimicrobial resistance"

General Skills

- Develop an updated view of the mechanisms of antibiotic resistance, both acquired and intrinsic
- Analyze the impact of antibiotic resistance on human pathology, including increased mortality and morbidity, the impact on public health and the associated economic cost
- Develop specialized knowledge on Gram Negative Microorganism Infections
- Analyze resistance and multi-resistance in other Bacteria of increasing relevance, including Coagulase Negative Staphylococcus and Clostridioides Difficile
- Examine the types of genetic sequencing and their applications in Clinical Microbiology
- Understand antimicrobial resistance in different bacteria, including Salmonella spp, Campylobacter spp, Escherichia coli, Staphylococcus, enterobacteria and other food-borne pathogens
- Substantiate the importance of antibiotics in the veterinary setting, including the prescription, acquisition and misuse of antibiotics
- Develop strategies based on the manipulation of the microbiota, including the engineering of probiotic bacteria, their production of antimicrobial molecules, bacterial antagonism, immune system modulation, clinical applications, and limitations
- Determine the need, challenges and opportunities for the development of innovative antimicrobial molecules
- Determine AI techniques and other complementary technologies, including technologies such as Machine Learning, Deep Learning, data science, and Big Data

Specific Skills

- Determine the main multidrug-resistant human pathogens and the priorities for health care systems in combating them
- Master the appropriate use of antibiotics in ICUs, including antibiotic prophylaxis, antibiotic therapy strategies for the treatment of Gram Negative and Gram Positive bacteria, and antibiotic therapy strategies for the treatment of co-infection
- Acquire skills for the clinical evaluation of patients with multidrug-resistant Gram Negative Microorganisms infections
- Acquire skills in the use of in vitro and in vivo systems to study resistance in Gram Positive Bacteria
- Acquire skills in qualitative and quantitative techniques for protein separation and identification, especially using Mass Spectrometry (MS)
- Explore strategies to prevent and control the spread of microbial resistance in the food chain, including preventative and control measures in production
- Develop strategic plans to reduce the risk of selection and dissemination of antibiotic resistance in livestock and aquaculture
- Establish strategies based on bacterial vaccines and the use of bacteriophages and Phage therapy
- Apply the knowledge acquired to understand how new antimicrobial molecules can be used in clinical practice and in the fight against multidrug-resistant bacteria
- Use Artificial Intelligence for genome decoding of multidrug-resistant bacteria

04

Course Management

The faculty are recognized experts with an outstanding track record in clinical microbiology and antimicrobial resistance. These professionals not only possess in-depth theoretical and practical knowledge in the field of multidrug-resistant bacteria, but are also committed to research and clinical application of new therapeutic strategies. Their expertise ranges from epidemiology and resistance mechanisms to the development of advanced diagnostic methods and the implementation of infection control policies.

TECH faculty will guide you in acquiring critical skills to address emerging challenges related to antimicrobial resistance in diverse healthcare settings"

Management

Dr. Ramos Vivas, José

- Director of the Banco Santander-Universidad Europea del Atlántico Chair in Innovation
- Researcher at the Center for Innovation and Technology of Cantabria (CITICAN)
- Academic of Microbiology and Parasitology at the European University of the Atlantic
- Founder and former director of the Cellular Microbiology Laboratory of the Valdecilla Research Institute (IDIVAL)
- PhD in Biology from the University of León
- Doctor in Sciences from the University of Las Palmas de Gran Canaria
- Degree in Biology from the University of Santiago de Compostela
- Master's Degree in Molecular Biology and Biomedicine from the University of Cantabria
- Member of: CIBERINFEC (MICINN-ISCIII), Member of the Spanish Society of Microbiology and Member of the Spanish Network of Research in Infectious Pathology

Professors

Dr. Alegría González, Ángel

- Researcher and Academician in Food Microbiology and Molecular Genetics of the University of León
- Researcher in 9 projects funded by public competitive calls
- Principal Investigator as beneficiary of an Intra-European Marie Curie Fellowship (IEF-FP7) in a project associated to the University of Groningen (The Netherlands)
- PhD in Food Biotechnology from the University of Oviedo - CSIC
- Degree in Biology from the University of Oviedo
- Master's Degree in Food Biotechnology from the University of Oviedo

Dr. Domenech Lucas, Mirian

- Researcher at the Spanish Reference Laboratory for Pneumococci, National Centre of Microbiology
- Researcher in International Groups led from College London, UK and Radboud University in the Netherlands
- Academician of the Department of Genetics, Physiology and Microbiology of UCM
- PhD in Biology from the Complutense University of Madrid
- Degree in Biology, specializing in Biotechnology from UCM
- Diploma of Advanced Studies, UCM

Dr. Armiñanzas Castillo, Carlos

- FEA at the University Hospital Marqués de Valdecilla, Cantabria
- Researcher at the Valdecilla Research Institute (IDIVAL), Cantabria
- Doctor in Medicine by the University of Cantabria
- Master's Degree in Human Immunodeficiency Virus Infection by the Rey Juan Carlos University
- Master's Degree in Graphic Medicine from the International University of Andalusia Degree in Medicine from the University of Cantabria
- Member of: Centre for Biomedical Research in the Infectious Diseases Network CIBERINFEC (MICINN-ISCIII) and Society of Infectious Diseases and Clinical Microbiology (SEIMC)

Dr. Ruiz de Alegría Puig, Carlos

- FEA at the University Hospital Marqués de Valdecilla, Cantabria
- Rotation in the Area of Molecular Biology and Fungi at the Hospital of Basurto, Bilbao
- Specialist in Microbiology and Immunology by the Marqués de Valdecilla University Hospital
- PhD in Molecular Biology and Biomedicine by the University of Cantabria
- Degree in Medicine and Surgery from the University of the Basque Country
- Member of: Spanish Society of Microbiology (SEM) and Center for Biomedical Research in Infectious Diseases Network CIBERINFEC (MICINN-ISCIII)

Dr. Breñosa Martínez, José Manuel

- Project Manager at the Cantabria Centre for Industrial Research and Technology (CITICAN)
- Academic of Artificial Intelligence at the European University of the Atlantic (UNEAT), Cantabria
- Programmer and Simulation Developer at Ingemotions, Cantabria
- Researcher at the Centre for Automation and Robotics (CAR: UPM-CSIC), Madrid
- PhD in Automatics and Robotics at the Polytechnic University of Madrid
- Master's Degree in Automatics and Robotics at the Polytechnic University of Madrid
- Degree in Industrial Engineering at the Polytechnic University of Madrid

Dr. Acosta Arbelo, Félix

- Researcher at the University Institute IU-ECOAQUA of the ULPGC
- Academician in the Area of Animal Health, Infectious Diseases in the Faculty of Veterinary Medicine, ULPGC
- European Specialist in Aquatic Animal Health by the European Committee
- Veterinarian Specialization
- Specialist in Microbiology and Immunology, Marqués de Valdecilla University Hospital, Cantabria
- Doctor in Veterinary Medicine, University of Las Palmas de Gran Canaria (ULPGC)
- Degree in Veterinary Medicine, University of Las Palmas de Gran Canaria (ULPGC)

Dr. Pacheco Herrero, María del Mar

- Project Manager at the European University of the Atlantic, Cantabria
- Principal Researcher at the Pontifical Catholic University Madre y Maestra (PUCMM), Dominican Republic
- Founder and Director of the Neuroscience Research Laboratory at PUCMM, Dominican Republic
- Scientific Director of the Dominican Republic Node of the Latin American Brain Bank for the Study of Neurodevelopmental Diseases, University of California, USA
- Researcher at the Ministry of Higher Education, Science and Technology, Dominican Republic
- Researcher at the German Academic Exchange Service (Deutscher Akademischer Austauschdienst) (DAAD), Germany
- International Advisor at the National Dementia BioBank of the National Autonomous University of Mexico
- Postdoctoral Research Stays at the University of Antioquia (Colombia) and the University of Lincoln (UK)
- PhD in Neurosciences from the University of Cadiz
- Master's Degree in Biomedicine from the University of Cadiz
- Master's Degree in Monitoring of Clinical Trials and Pharmaceutical Development INESEM Business School
- Degree in Biochemistry from the University of Cordoba
- Member of: National Career of Researchers in Science, Technology and Innovation, Dominican Republic and Mexican Council of Neurosciences

Dr. Suberviola Cañas, Borja

- Assistant Physician of the Intensive Care Medicine Service at the Marqués de Valdecilla University Hospital
- Principal Investigator and Collaborating Researcher in 6 projects with competitive funding
- Doctor en Medicina por la Universidad de Cantabria
- Specialty in Intensive Care Medicine and Resuscitation at the Marqués de Valdecilla University Hospital in Santander
- Degree in Medicine from the University of the Basque Country
- Master's Degree in Infectious Diseases in the Critically Ill Patient from the University of Valencia
- Member and Vice-coordinator of the Working Group on Infectious Diseases and Sepsis (GTEIS) of the Spanish Society of Intensive Care Medicine, Critical Care and Coronary Units (SEMICYUC)
- Member of the Group of Infectious Diseases in the Critical Patient of the Spanish Society of Infectious Diseases and Clinical Microbiology (SEIMC)

Dr. Ocaña Fuentes, Aurelio

- Director of Research at the Bureau Veritas University Center, Camilo José Cela University
- Research Fellow at the Neurobehavioral Institute, Miami
- Researcher in the Area of Food Technology, Nutrition and Dietetics, Department of Applied Physical Chemistry, Autonomous University of Madrid
- Researcher in the Area of Human Physiology, Epidemiology and Public Health, Department of Health Sciences, Rey Juan Carlos University
- Researcher of the Training Plan for Research Personnel of the University of Alcalá
- D. in Health Sciences from the Rey Juan Carlos University
- Master's Degree in Research, Epidemiology and Public Health
- Diploma in Advanced Studies from Rey Juan Carlos University
- Degree in Chemical Sciences, specializing in Biochemistry, from the Complutense University of Madrid

Take the opportunity to learn about the latest advances in this field in order to apply it to your daily practice"

05

Structure and Content

This program will cover from the basics of Multidrug-Resistant Bacteria in human pathology to advanced strategies for the management of affected patients. Therefore, professionals will explore specialized topics such as Multidrug-Resistant Gram-Negative bacteria, specific resistance in Streptococcus, Enterococcus and Staphylococcus, as well as the implications of Proteomics in Clinical Microbiology. In addition, critical aspects such as antimicrobial resistance in the food chain and animal health will be covered, along with new antimicrobial molecules and the application of Artificial Intelligence in infectious diseases.

Don't miss this unique opportunity! The content has been designed to provide pharmacists with an in-depth and up-to-date understanding of the key issues related to antimicrobial resistance"

Module 1. Multidrug-Resistant Bacteria in Human Pathology

1.1. Mechanisms of Acquired Resistance to Antibiotics
- 1.1.1. Acquisition of Resistance Genes
- 1.1.2. Mutations
- 1.1.3. Acquisition of Plasmids

1.2. Mechanisms of Intrinsic Resistance to Antibiotics
- 1.2.1. Blockage of Antibiotic Entry
- 1.2.2. Modification of the Antibiotic Target
- 1.2.3. Inactivation of the Antibiotic
- 1.2.4. Antibiotic Expulsion

1.3. Chronology and Evolution of Antibiotic Resistance
- 1.3.1. Discovery of Antibiotic Resistance
- 1.3.2. Plasmids
- 1.3.3. Evolution of Resistance
- 1.3.4. Current Trends in the Evolution of Antibiotic Resistance

1.4. Antibiotic Resistance in Human Pathology
- 1.4.1. Increased Mortality and Morbidity
- 1.4.2. Impact of Resistance on Public Health
- 1.4.3. Economic Cost Associated with Antibiotic Resistance

1.5. Multidrug-Resistant Human Pathogens
- 1.5.1. Acinetobacter Baumannii
- 1.5.2. Pseudomonas Aeruginosa
- 1.5.3. Enterobacteriaceae
- 1.5.4. Enterococcus Faecium
- 1.5.5. Staphylococcus Aureus
- 1.5.6. Helicobacter Pylori
- 1.5.7. Campylobacter Spp
- 1.5.8. Salmonellae
- 1.5.9. Neisseria Gonorrhoeae
- 1.5.10. Streptococcus Pneumoniae
- 1.5.11. Hemophilus Influenzae
- 1.5.12. Shigella Spp

1.6. Bacteria Highly Dangerous to Human Health: Update of the WHO List
- 1.6.1. Critical Priority Pathogens
- 1.6.2. High Priority Pathogens
- 1.6.3. Pathogens with Medium Priority

1.7. Analysis of the Causes of Antibiotic Resistance
- 1.7.1. Lack of New Antibiotics
- 1.7.2. Socioeconomic Factors and Health Policies
- 1.7.3. Poor Hygiene and Sanitation
- 1.7.4. Health Policies and Antibiotic Resistance
- 1.7.5. International Travel and Global Trade
- 1.7.6. Dispersal of High-Risk Clones
- 1.7.7. Emerging Pathogens with Resistance to Multiple Antibiotics

1.8. Antibiotic Use and Abuse in the Community
- 1.8.1. Prescription
- 1.8.2. Acquisition
- 1.8.3. Misuse of Antibiotics

1.9. Current Status of Antibiotic Resistance in the World
- 1.9.1. Global Statistics
- 1.9.2. Central and South America
- 1.9.3. Africa
- 1.9.4. Europe
- 1.9.5. North America
- 1.9.6. Asia and Oceania

1.10. Perspectives on Antibiotic Resistance
- 1.10.1. Strategies to Mitigate the Problem of Multi-Drug Resistance
- 1.10.2. International Actions
- 1.10.3. Actions at the Global Level

Module 2. Management of Patients with Multidrug-Resistant Bacterial Infections in Intensive Care Units (ICU)

2.1. Colonization and Infection of Patients in ICUs
- 2.1.1. Types of ICUs
- 2.1.2. Epidemiology
- 2.1.3. Risk Factors Associated with Infection in ICUs

2.2. Impact of Nosocomial Infections in the Critically Ill Patient
- 2.2.1. Importance of Nosocomial Infections in ICUs
- 2.2.2. Risk Factors for Nosocomial Infections
  - 2.2.2.1. Patient Factors
  - 2.2.2.2. Factors of the ICU Environment
  - 2.2.2.3. Factors Related to the Healthcare Personnel
- 2.2.3. Impact of Nosocomial Infections in Immunocompromised Patients
- 2.2.4. Impact on Length of Stay in the ICU

2.3. Pneumonia Associated with Mechanical Ventilation
- 2.3.1. Etiology
- 2.3.2. Diagnosis
- 2.3.3. Treatment

2.4. Urinary Tract Infections Associated with Catheters
- 2.4.1. Etiology
- 2.4.2. Diagnosis
- 2.4.3. Treatment

2.5. Primary Bacteremias and Catheter-Related Bacteremias
- 2.5.1. Etiology
- 2.5.2. Diagnosis
- 2.5.3. Treatment

2.6. Pseudomembranous Colitis
- 2.6.1. Etiology
- 2.6.2. Diagnosis
- 2.6.3. Treatment

2.7. Infections by Opportunistic Pathogens
- 2.7.1. Etiology
- 2.7.2. Diagnosis
- 2.7.3. Treatment

2.8. Appropriate Use of Antibiotics
- 2.8.1. Programs for the Optimization of Antibiotic use (PROA) in the ICU
- 2.8.2. Antibiotic Therapy Strategies for the Treatment of Gram-Negative Patients
- 2.8.3. Antibiotic Therapy Strategies for the Treatment of Gram-Positive Patients
- 2.8.4. Antibiotic Therapy Strategies for the Treatment of Co-Infections

2.9. Strategies for the Prevention of BMR Infections in the ICU
- 2.9.1. Hygiene Measures
- 2.9.2. Infection Control Measures
- 2.9.3. Protocols and Clinical Practice Guidelines
- 2.9.4. Education and Training of ICU Personnel
- 2.9.5. Participation of Patients and their Families

2.10. Infection Prevention Strategies in the ICU
- 2.10.1. Infection Prevention Strategies in the ICU According to the Focus
  - 2.10.1.1. Pneumonia
  - 2.10.1.2. Bacteremia
  - 2.10.1.3. Urinary Infection
- 2.10.2. Evaluation and Quality Indicators in the Prevention of Infections
- 2.10.3. Evaluation and Continuous Improvement Tools
- 2.10.4. Successful Examples of Infection Prevention in ICUs

Module 3. Multidrug-Resistant Gram Negative Bacteria

3.1. Infections Due to Gram-Negative Microorganisms
- 3.1.1. Epidemiology of Gram-Negative Microorganisms
- 3.1.2. Community and Nosocomial Infections by Gram-Negative Microorganisms
- 3.1.3. Relevance of Infections by Multidrug-Resistant Gram-Negative Microorganisms

3.2. Pathogenesis of Infections by Gram-Negative Microorganisms
- 3.2.1. Factors Related to Gram-Negative Microorganisms
- 3.2.2. Patient Factors in Gram-Negative Infections
- 3.2.3. Other Factors in Gram-Negative Infections

3.3. Clinical Evaluation of Patients with Multidrug-Resistant Gram-Negative Infections
- 3.3.1. Medical History
- 3.3.2. Clinical Evaluation of Patients
- 3.3.3. Other Data of Interest

3.4. Complementary Tests in Infections by Multidrug-Resistant Gram-Negative Microorganisms
  3.4.1. Blood Tests
  3.4.2. Imaging Tests
  3.4.3. Microbiological Techniques
3.5. Estimation of Severity in Patients with Infections by Multidrug-Resistant Gram-Negative Microorganisms
  3.5.1. Gram-Negative Multidrug-Resistant Microorganisms
  3.5.2. Traditional Approach to Severity Estimation
  3.5.3. Practical Conclusions
3.6. Risk of Acquiring Infections by Multidrug-Resistant Gram-Negative Microorganisms
  3.6.1. Clinical Factors in the Acquisition of Infections by Multidrug-Resistant Gram-Negative Microorganisms
  3.6.2. Other Factors in the Acquisition of Infections by Multidrug-Resistant Gram-Negative Microorganisms
  3.6.3. Tools to Calculate the Risk of Presence of Multidrug-Resistant Gram-Negative Microorganisms
3.7. Empirical Treatment in the Suspicion of Infections by Multidrug-Resistant Gram-Negative Microorganisms
  3.7.1. Microorganisms Involved According to Localization
  3.7.2. Comprehensive Assessment of Patients with Suspected Infections by Multidrug-Resistant Gram-Negative Microorganisms
  3.7.3. Selection of Empirical Antibiotic Treatment
3.8. Targeted Therapy in Infections by Multidrug-Resistant Gram-Negative Microorganisms
  3.8.1. Adjustment of Antibiotic Therapy According to Microbiological Results
  3.8.2. Follow-up of Multidrug-Resistant Gram-Negative Microorganism Infection
  3.8.3. Most Relevant Side Effects of Antibiotherapy
3.9. Duration of Antibiotherapy in Infections by Multidrug-Resistant Gram-Negative Microorganisms
  3.9.1. Estimation of the Duration of Antibiotic Treatment in Infections by Multidrug-Resistant Gram-Negative Microorganisms
  3.9.2. Relevance of Focus Control in Infections by Multidrug-Resistant Gram-Negative Microorganisms
  3.9.3. Special Considerations Related to Antibiotic Therapy in These Infections
3.10. PROA Teams in Infections Caused by Multidrug-Resistant Gram-Negative Microorganisms
  3.10.1. PROA Teams: History
  3.10.2. Impact of PROA Teams on the Correct Use of Antibiotic Treatments
  3.10.3. Challenge of PROA Teams in the Treatment of Infections Caused by Multiresistant Gram-Negative Microorganisms

Module 4. Antibiotic Resistance in Streptococcus, Enterococcus and Staphylococcus

4.1. Infections Due to Gram-Positive Bacteria
  4.1.1. Natural Habitat of Gram-Positive Pathogens
  4.1.2. Nosocomial Infections due to Gram-Positive Bacteria
  4.1.3. Community-Acquired Infections by Gram-Positive Bacteria
4.2. In Vitro and in Vivo Systems for the Study of Resistance in Gram-Positive Bacteria
  4.2.1. Biofilms
  4.2.2. Cellular Models
  4.2.3. Animal Models
4.3. Streptococcus Pneumoniae
  4.3.1. Clinical Significance
  4.3.2. Resistance Mechanisms
  4.3.3. Biofilms
  4.3.4. Treatment Options
4.4. Streptococcus Pyogenes
  4.4.1. Clinical Significance
  4.4.2. Resistance Mechanisms
  4.4.3. Biofilms
  4.4.4. Treatment Options
4.5. Streptococcus Agalactiae
  4.5.1. Clinical Significance
  4.5.2. Resistance Mechanisms
  4.5.3. Biofilms
  4.5.4. Treatment Options

4.6. Enterococcus Faecalis
- 4.6.1. Clinical Significance
- 4.6.2. Resistance Mechanisms
- 4.6.3. Biofilms
- 4.6.4. Treatment Options

4.7. Enterococcus Faecium
- 4.7.1. Clinical Significance
- 4.7.2. Resistance Mechanisms
- 4.7.3. Biofilms
- 4.7.4. Treatment Options

4.8. Staphylococcus Aureus
- 4.8.1. Clinical Significance
- 4.8.2. Resistance Mechanisms
- 4.8.3. Biofilms
- 4.8.4. Treatment Options

4.9. Mycobacterium Tuberculosis
- 4.9.1. Clinical Significance
- 4.9.2. Resistance Mechanisms
- 4.9.3. Treatment Options

4.10. Resistance in Other Gram-Positive Bacteria
- 4.10.1. Coagulase-Negative Staphylococcus
- 4.10.2. Clostridioides Difficile
- 4.10.3. Emerging Gram Positive Pathogens

Module 5. Proteomics in Clinical Microbiology

5.1. Proteomics in the Microbiology Laboratory
- 5.1.1. Evolution and Development of Proteomics
- 5.1.2. Importance in Microbiological Diagnosis
- 5.1.3. Proteomics of Multi-Resistant Bacteria

5.2. Qualitative Protein Separation Techniques
- 5.2.1. Two-Dimensional Electrophoresis (2DE)
- 5.2.2. DIGE Technology
- 5.2.3. Applications in Microbiology

5.3. Quantitative Protein Separation Techniques
- 5.3.1. Isotopic Labelling
- 5.3.2. High Performance Liquid Chromatography (HPLC)
- 5.3.3. Mass Spectrometry (MS)
  - 5.3.3.1. MALDI-TOF Technologies in the Clinical Microbiology Laboratory
    - 5.3.3.1.1. VITEK®MS System
    - 5.3.3.1.2. MALDI Biotyper® System

5.4. MALDI-TOF Applications in Clinical Microbiology
- 5.4.1. Identification of Microorganisms
- 5.4.2. Characterization of Antibiotic Resistance
- 5.4.3. Bacterial Typing

5.5. Bioinformatics Tools for Proteomics
- 5.5.1. Proteomic Databases
- 5.5.2. Protein Sequence Analysis Tools
- 5.5.3. Visualization of Proteomic Data

5.6. Genomics in the Microbiology Laboratory
- 5.6.1. Evolution and Development of Genomics
- 5.6.2. Importance in Microbiological Diagnosis
- 5.6.3. Genomics of Multi-Resistant Bacteria

5.7. Types of Sequencing
- 5.7.1. Sequencing of Genes with Taxonomic Value
- 5.7.2. Sequencing of Genes of Taxonomic Value
- 5.7.3. Bulk Sequencing

5.8. Applications of Massive Sequencing in Clinical Microbiology
- 5.8.1. Whole Bacterial Genome Sequencing
- 5.8.2. Comparative Genomics
- 5.8.3. Epidemiological Surveillance
- 5.8.4. Microbial Diversity and Evolution Studies

5.9. Bioinformatics Tools for Genomics
- 5.9.1. Genomic Databases
- 5.9.2. Sequence Analysis Tools
- 5.9.3. Visualization of Genomic Data

5.10. Future of Genomics and Proteomics in the Clinical Laboratory
- 5.10.1. Recent and Future Developments in Genomics and Proteomics
- 5.10.2. Development of New Therapeutic Strategies
- 5.10.3. Technical and Bioinformatics Challenges
- 5.10.4. Ethical and Regulatory Implications

Module 6. Multi-drug Resistant Bacteria in the Food Chain

6.1. Multidrug-Resistant Bacteria in the Food Chain
- 6.1.1. The Role of the Food Chain in the Spread of Antimicrobial Resistance
- 6.1.2. Antimicrobial Resistances in Food (ESBL, MRSA, and Colistin)
- 6.1.3. The Food Chain within the One Health Approach

6.2. Dissemination of Antimicrobial Resistance through Food
- 6.2.1. Food of Animal Origin
- 6.2.2. Food of Plant Origin
- 6.2.3. Dissemination of Resistant Bacteria through Water

6.3. Spread of Resistant Bacteria in Food Production
- 6.3.1. Spread of Resistant Bacteria in Food Production Environments
- 6.3.2. Spread of Resistant Bacteria through Food Handlers
- 6.3.3. Cross-Resistance between Biocides and Antibiotics

6.4. Antimicrobial Resistance in Salmonella Spp
- 6.4.1. AmpC-, ESBL- and Carbapenemase-Producing Salmonella Spp
- 6.4.2. Resistant Salmonella Spp in Humans
- 6.4.3. Antibiotic Resistant Salmonella Spp in Farm and Meat Animals
- 6.4.4. Multidrug-Resistant Salmonella Spp in Humans

6.5. Antimicrobial Resistance in Campylobacter Spp
- 6.5.1. Antimicrobial Resistance in Campylobacter Spp
- 6.5.2. Antimicrobial Resistant Campylobacter Spp in Foods
- 6.5.3. Multi-Drug Resistant Campylobacter Spp

6.6. Antimicrobial Resistances in Escherichia Coli
- 6.6.1. AmpC, ESBL and Carbapenemase Producing E. Coli
- 6.6.2. Antimicrobial Resistant E. Coli in Farm Animals
- 6.6.3. Antimicrobial Resistant E. Coli in Foodstuffs
- 6.6.4. Multidrug-Resistant E. Coli

6.7. Antimicrobial Resistance in Staphylococci
- 6.7.1. Methicillin-Resistant S. Aureus (MRSA)
- 6.7.2. MRSA in Food and Farm Animals
- 6.7.3. Methicillin-Resistant Staphylococcuys Epidermidis (MRSE)
- 6.7.4. Multidrug-Resistant Staphylococcus Spp

6.8. Antimicrobial Resistance in Enterobacteria
- 6.8.1. Shigella Spp
- 6.8.2. Enterobacter Spp
- 6.8.3. Other Environmental Enterobacteriaceae

6.9. Antimicrobial Resistance in Other Food-Borne Pathogens
- 6.9.1. Listeria Monocytogenes
- 6.9.2. Enterococcus Spp
- 6.9.3. Pseudomonas Spp
- 6.9.4. Aeromonas Spp and Plesiomonas Spp

6.10. Strategies to Prevent and Control the Spread of Microbial Resistance in the Food Chain
- 6.10.1. Preventive and Control Measures in Primary Production
- 6.10.2. Preventive and Control Measures in Slaughterhouses
- 6.10.3. Preventive and Control Measures in Food Industries

Module 7. Antimicrobial Resistance in Animal Health

7.1. Antibiotics in the Veterinary Field
- 7.1.1. Prescription
- 7.1.2. Acquisition
- 7.1.3. Misuse of Antibiotics

7.2. Multidrug-Resistant Bacteria in the Veterinary Field
- 7.2.1. Causes of Bacterial Resistance in the Veterinary Field
- 7.2.2. Dissemination of Antibiotic Resistance Genes (ARGs), Especially through Horizontal Transmission Mediated by Plasmids
- 7.2.3. Mobile Colistin Resistance Gene (mcr)

7.3. Multidrug-Resistant Bacterial Species of Veterinary Importance
- 7.3.1. Pet Pathogens
- 7.3.2. Cattle Pathogens
- 7.3.3. Pig Pathogens
- 7.3.4. Poultry Pathogens
- 7.3.5. Goat and Sheep Pathogens
- 7.3.6. Fish and Aquatic Animal Pathogens

7.4. Impact of Multi-Resistant Bacteria in Animal Health
- 7.4.1. Animal Suffering and Losses
- 7.4.2. Impact on Household Livelihoods
- 7.4.3. Generation of "Superbugs"

7.5. Multidrug-Resistant Bacteria in the Environment and Wildlife
- 7.5.1. Antibiotic Resistant Bacteria in the Environment
- 7.5.2. Antibiotic Resistant Bacteria in Wildlife
- 7.5.3. Antimicrobial Resistant Bacteria in Marine and Inland Waters

7.6. Impact of Resistances Detected in Animals and in the Environment on Public Health
- 7.6.1. Shared Antibiotics in Veterinary Medicine and Human Medicine
- 7.6.2. Transmission of Resistance from Animals to Humans
- 7.6.3. Transmission of Resistance from the Environment to Humans

7.7. Prevention and Control
- 7.7.1. Preventive Measures Against Bacterial Resistance in Animals
- 7.7.2. Systems and Processes for the Effective Use of Antibiotics
- 7.7.3. Role of Veterinarians and Pet Owners in the Prevention of Bacterial Resistance
- 7.7.4. Treatments and Alternatives to Antibiotics in Animals
- 7.7.5. Tools for Limiting the Emergence of Antimicrobial Resistance and its and Spread in the Environment

7.8. Strategic Plans to Reduce the Risk of Selection and Spread of Antimicrobial Resistance
- 7.8.1. Monitoring and Surveillance of the Use of Critical Antibiotics
- 7.8.2. Training and Research
- 7.8.3. Communication and Prevention

7.9. One Health Strategy
- 7.9.1. Definition and Objectives of the One Health Strategy
- 7.9.2. Application of the One Health Strategy in the Control of Multidrug-Resistant Bacteria
- 7.9.3. Success Stories Using the One Health Strategy

7.10. Climate Change and Antibiotic Resistance
- 7.10.1. Increase in Infectious Diseases
- 7.10.2. Extreme Climatic Conditions
- 7.10.3. Displacement of Populations

Module 8. Emerging Strategies for Multidrug-Resistant Bacteria

8.1. CRISPR-Cas9 Gene Editing
- 8.1.1. Molecular Mechanism of Action
- 8.1.2. Applications
  - 8.1.2.1. CRISPR-Cas9 as a Therapeutic Tool
  - 8.1.2.2. Engineering of Probiotic Bacteria
  - 8.1.2.3. Rapid Detection of Resistance
  - 8.1.2.4. Elimination of Resistance Plasmids
  - 8.1.2.5. Development of New Antibiotics
  - 8.1.2.6. Safety and Stability
- 8.1.3. Limitations and Challenges

8.2. Temporary Collateral Sensitization (SCT)
- 8.2.1. Molecular Mechanism
- 8.2.2. Advantages and Applications of SCT
- 8.2.3. Limitations and Challenges

8.3. Gene Silencing
- 8.3.1. Molecular Mechanism
- 8.3.2. RNA Interference
- 8.3.3. Antisense Oligonucleotides
- 8.3.4. Benefits and Applications of Gene Silencing
- 8.3.5. Limitations

8.4. High-Throughput Sequencing
- 8.4.1. Stages of High-Throughput Sequencing
- 8.4.2. Bioinformatics Tools for Combating Multidrug-Resistant Bacteria
- 8.4.3. Challenges

8.5. Nanoparticles
- 8.5.1. Mechanisms of Action against Bacteria
- 8.5.2. Clinical Applications
- 8.5.3. Limitations and Challenges

8.6. Engineering of Probiotic Bacteria
- 8.6.1. Production of Antimicrobial Molecules
- 8.6.2. Bacterial Antagonism
- 8.6.3. Modulation of the Immune System
- 8.6.4. Clinical Applications
  - 8.6.4.1. Prevention of Nosocomial Infections
  - 8.6.4.2. Reducing the Incidence of Respiratory Infections
  - 8.6.4.3. Adjunctive Therapy in the Treatment of Urinary Tract Infections
  - 8.6.4.4. Prevention of Resistant Skin Infections
- 8.6.5. Limitations and Challenges

8.7. Antibacterial Vaccines
- 8.7.1. Types of Vaccines against Diseases Caused by Bacteria
- 8.7.2. Vaccines in Development against Major Multidrug-Resistant Bacteria
- 8.7.3. Challenges and Considerations

8.8. Bacteriophages
- 8.8.1. Mechanism of Action
- 8.8.2. Lytic Cycle of Bacteriophages
- 8.8.3. Lysogenic Cycle of Bacteriophages

8.9. Phage Therapy
- 8.9.1. Isolation and Transport of Bacteriophages
- 8.9.2. Purification and Handling of Bacteriophages in the Laboratory
- 8.9.3. Phenotypic and Genetic Characterisation of Bacteriophages
- 8.9.4. Preclinical and Clinical Trials
- 8.9.5. Compassionate Use of Phages and Success Stories

8.10. Antibiotic Combination Therapy
- 8.10.1. Mechanisms of Action
- 8.10.2. Efficacy and Risks
- 8.10.3. Challenges and Constraints
- 8.10.4. Combined Antibiotic and Phage Therapy

Module 9. New Antimicrobial Molecules

9.1. New Antimicrobial Molecules
- 9.1.1. The Need for New Antimicrobial Molecules
- 9.1.2. Impact of New Molecules on Antimicrobial Resistance
- 9.1.3. Challenges and Opportunities in the Development of New Antimicrobial Molecules

9.2. Methods of Discovery of New Antimicrobial Molecules
- 9.2.1. Traditional Discovery Approaches
- 9.2.2. Advances in Screening Technology
- 9.2.3. Rational Drug Design Strategies
- 9.2.4. Biotechnology and Functional Genomics
- 9.2.5. Other Innovative Approaches

9.3. New Penicillins: New Drugs, their Future Role in Anti-Infective Therapeutics
- 9.3.1. Classification
- 9.3.2. Mechanism of Action
- 9.3.3. Antimicrobial Spectrum
- 9.3.4. Therapeutic Uses
- 9.3.5. Adverse Effects
- 9.3.6. Presentation and Dosage

9.4. Cephalosporins
- 9.4.1. Classification
- 9.4.2. Mechanism of Action
- 9.4.3. Antimicrobial Spectrum
- 9.4.4. Therapeutic Uses
- 9.4.5. Adverse Effects
- 9.4.6. Presentation and Dosage

9.5. Carbapenemics and Monobactams
- 9.5.1. Classification
- 9.5.2. Mechanism of Action
- 9.5.3. Antimicrobial Spectrum
- 9.5.4. Therapeutic Uses
- 9.5.5. Adverse Effects
- 9.5.6. Presentation and Dosage

9.6. Cyclic Glycopeptides and Lipopeptides
- 9.6.1. Classification
- 9.6.2. Mechanism of Action
- 9.6.3. Antimicrobial Spectrum
- 9.6.4. Therapeutic Uses
- 9.6.5. Adverse Effects
- 9.6.6. Presentation and Dosage

9.7. Macrolides, Ketolides and Tetracyclines
- 9.7.1. Classification
- 9.7.2. Mechanism of Action
- 9.7.3. Antimicrobial Spectrum
- 9.7.4. Therapeutic Uses
- 9.7.5. Adverse Effects
- 9.7.6. Presentation and Dosage

9.8. Aminoglycosides and Quinolones
- 9.8.1. Classification
- 9.8.2. Mechanism of Action
- 9.8.3. Antimicrobial Spectrum
- 9.8.4. Therapeutic Uses
- 9.8.5. Adverse Effects
- 9.8.6. Presentation and Dosage

9.9. Lincosamides, Streptogramins and Oxazolidinones
- 9.9.1. Classification
- 9.9.2. Mechanism of Action
- 9.9.3. Antimicrobial Spectrum
- 9.9.4. Therapeutic Uses
- 9.9.5. Adverse Effects
- 9.9.6. Presentation and Dosage

9.10. Rifamycins and other Developmental Antimicrobial Molecules
- 9.10.1. Rifamycins: Classification
  - 9.10.1.2. Mechanism of Action
  - 9.10.1.3. Antimicrobial Spectrum
  - 9.10.1.4. Therapeutic Uses
  - 9.10.1.5. Adverse Effects
  - 9.10.1.6. Presentation and Dosage
- 9.10.2. Antibiotics of Natural Origin
- 9.10.3. Synthetic Antimicrobial Agents
- 9.10.4. Antimicrobial Peptides
- 9.10.5. Antimicrobial Nanoparticles

Module 10. Artificial Intelligence in Clinical Microbiology and Infectious Diseases

10.1. Artificial Intelligence (AI) in Clinical Microbiology and Infectious Diseases
- 10.1.1. Current Expectation of AI in Clinical Microbiology
- 10.1.2. Emerging Areas Interrelated to AI
- 10.1.3. Transversality of AI

10.2. Artificial Intelligence (AI) Techniques and other Complementary Technologies applied to Clinical Microbiology and Infectious Diseases
- 10.2.1. AI Logic and Models
- 10.2.2. Technologies for AI
  - 10.2.2.1. Machine Learning
  - 10.2.2.2. Deep Learning
  - 10.2.2.3. Data Science and Big Data

10.3. Artificial Intelligence (AI) in Microbiology
- 10.3.1. AI in Microbiology: History and Evolution
- 10.3.2. AI Technologies that can be Used in Microbiology
- 10.3.3. Research Objectives of AI in Microbiology
  - 10.3.3.1. Understanding Bacterial Diversity
  - 10.3.3.2. Exploring Bacterial Physiology
  - 10.3.3.3. Investigation of Bacterial Pathogenicity
  - 10.3.3.4. Epidemiological Surveillance
  - 10.3.3.5. Development of Antimicrobial Therapies
  - 10.3.3.6. Microbiology in Industry and Biotechnology

10.4. Classification and Identification of Bacteria using Artificial Intelligence (AI)
- 10.4.1. Machine Learning Techniques for Bacterial Identification
- 10.4.2. Taxonomy of Multi-Resistant Bacteria using AI
- 10.4.3. Practical Implementation of AI in Clinical and Research Laboratories in Microbiology

10.5. Bacterial Protein Decoding
- 10.5.1. AI Algorithms and Models for Protein Structure Prediction
- 10.5.2. Applications in the Identification and Understanding of Resistance Mechanisms
- 10.5.3. Practical Application AlphaFold and Rosetta

10.6. Decoding the Genome of Multi-Resistant Bacteria
- 10.6.1. Identification of Resistance Genes
- 10.6.2. Genomic Big Data Analysis: AI-Assisted Sequencing of Bacterial Genomes
- 10.6.3. Practical Application Identification of Resistance Genes

10.7. Artificial Intelligence (AI) Strategies in Microbiology and Public Health
- 10.7.1. Infectious Outbreak Management
- 10.7.2. Epidemiological Surveillance
- 10.7.3. AI for Personalized Treatments

10.8. Artificial Intelligence (AI) to Combat Antibiotic Resistance in Bacteria
- 10.8.1. Optimizing Antibiotic Use
- 10.8.2. Predictive Models for the Evolution of Antimicrobial Resistance
- 10.8.3. Targeted Therapy Based on Development of New Antibiotics by IA

10.9. Future of Artificial Intelligence in Microbiology
- 10.9.1. Synergies between Microbiology and IA
- 10.9.2. Lines of AI Implementation in Microbiology
- 10.9.3. Long-Term Vision of the Impact of AI in the Fight against Multi-Drug Resistant Bacteria

10.10. Technical and Ethical Challenges in the Implementation of Artificial Intelligence (AI) in Microbiology
- 10.10.1. Legal Considerations
- 10.10.2. Ethical and Liability Considerations
- 10.10.3. Barriers to AI Implementation
  - 10.10.3.1. Technical Barriers
  - 10.10.3.2. Social Barriers
  - 10.10.3.3. Economic Barriers
  - 10.10.3.4. Cybersecurity

The comprehensive approach of this program will equip you to address the complexity of multidrug-resistant infections, as well as lead effective prevention and treatment initiatives"

06

Methodology

This academic program offers students a different way of learning. Our methodology uses a cyclical learning approach: **Relearning.**

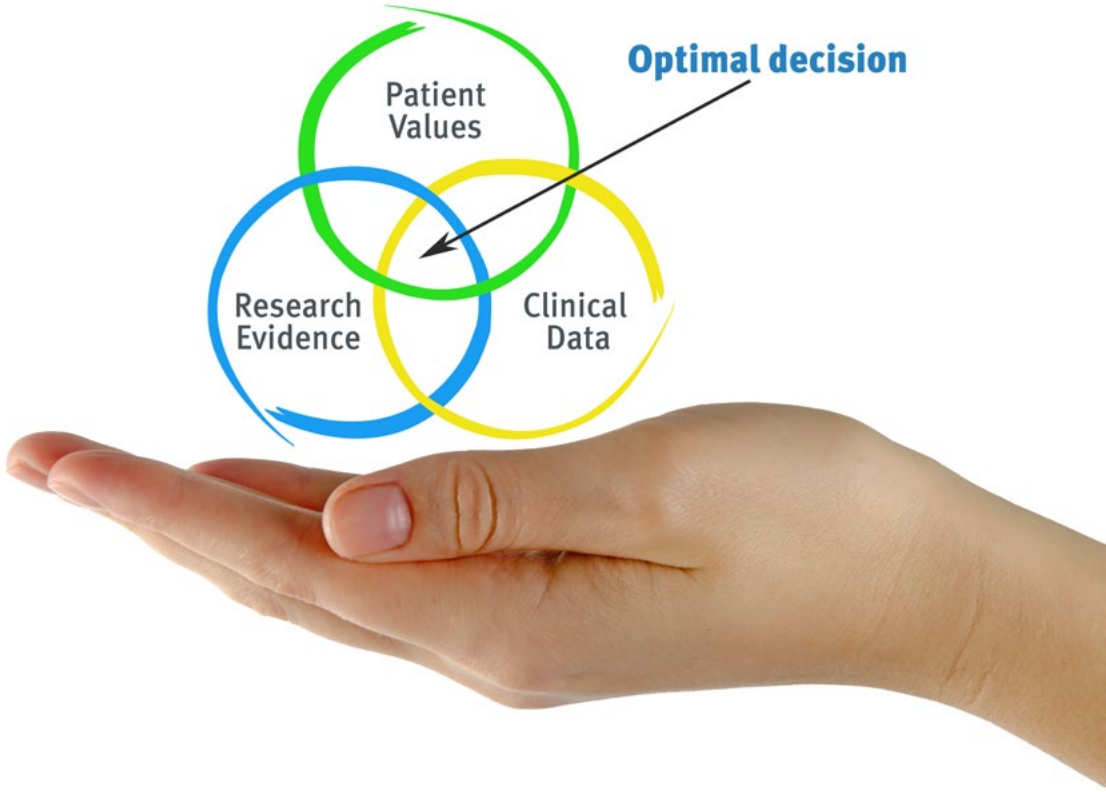
This teaching system is used, for example, in the most prestigious medical schools in the world, and major publications such as the **New England Journal of Medicine** have considered it to be one of the most effective.

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. Gérvas, 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:

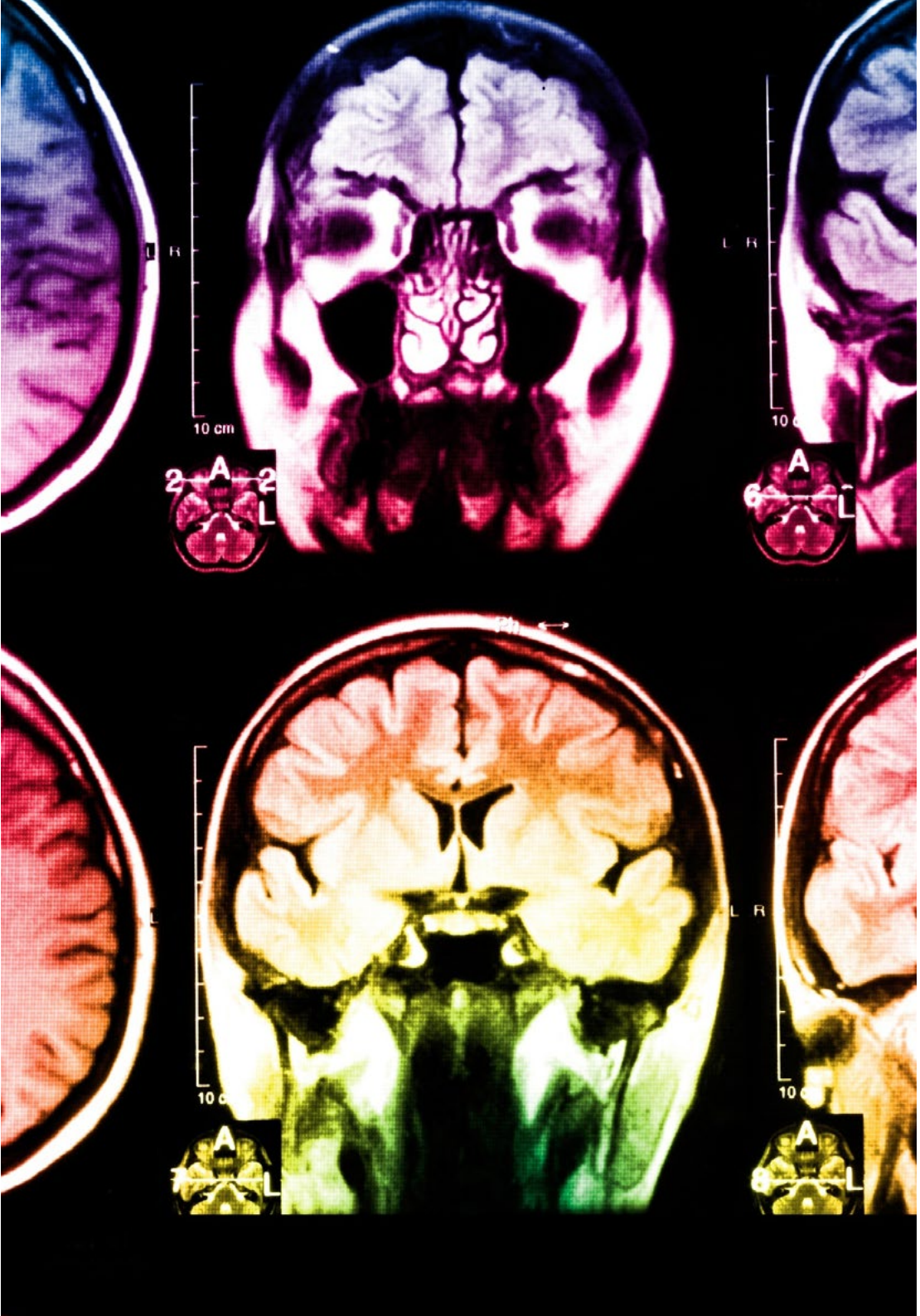
1. Pharmacists who follow this method not only grasp concepts, but also develop their mental capacity, by evaluating real situations and applying their knowledge.
2. Learning is solidly translated into practical skills that allow the student to better integrate into the real world.
3. Ideas and concepts 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.

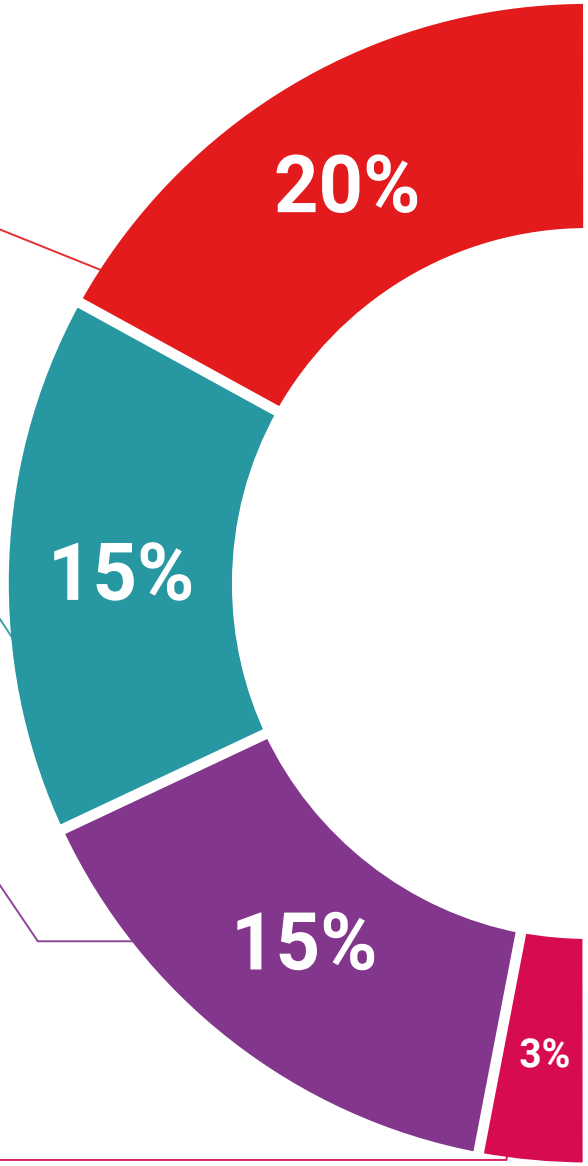
Interactive Summaries

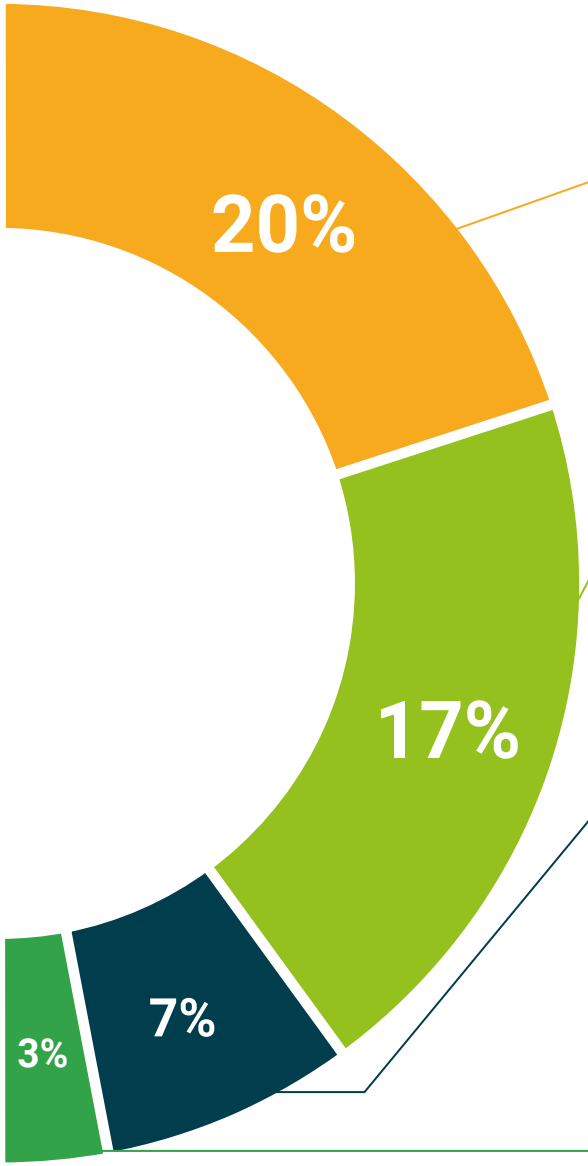
The TECH team presents the contents attractively and dynamically in multimedia lessons that include audio, videos, images, diagrams, and concept maps in order to reinforce knowledge.

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 Professional Master's Degree in Multidrug-Resistant Bacteria guarantees students, in addition to the most rigorous and up-to-date education, access to a Professional Master's Degree issued by TECH Global University.

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 **Professional Master's Degree in Multidrug-Resistant Bacteria** 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: **Professional Master's Degree in Multidrug-Resistant Bacteria**

Modality: **online**

Duration: **12 months**

Accreditation: **60 ECTS**


tech global university

Mr./Ms. _____, with identification document _____
has successfully passed and obtained the title of:

Professional Master's Degree in Multidrug-Resistant Bacteria

This is a private qualification of 1,800 hours of duration equivalent to 60 ECTS, with a start date of dd/mm/yyyy and an end date of dd/mm/yyyy.

TECH Global University is a university officially recognized by the Government of Andorra on the 31st of January of 2024, which belongs to the European Higher Education Area (EHEA).

In Andorra la Vella, on the 28th of February of 2024

Dr. Pedro Navarro Illana
Dean

This qualification must always be accompanied by the university degree issued by the competent authority to practice professionally in each country. Unique TECH Code: AFWORD23S techtitute.com/certificates


Professional Master's Degree in Multidrug-Resistant Bacteria

General Structure of the Syllabus

Subject type	ECTS
Compulsory (CO)	60
Optional (OP)	0
External Work Placement (WP)	0
Master's Degree Thesis (MDT)	0
	Total 60

General Structure of the Syllabus

Year	Subject	ECTS	Type
1º	Multidrug-Resistant Bacteria in Human Pathology	6	CO
1º	Management of Patients with Multidrug-Resistant Bacterial Infections in Intensive Care Units (ICU)	6	CO
1º	Multidrug-Resistant Gram Negative Bacteria	6	CO
1º	Antibiotic Resistance in Streptococcus, Enterococcus and Staphylococcus	6	CO
1º	Proteomics in Clinical Microbiology	6	CO
1º	Multi-drug Resistant Bacteria in the Food Chain	6	CO
1º	Antimicrobial Resistance in Animal Health	6	CO
1º	Emerging Strategies for Multidrug-Resistant Bacteria	6	CO
1º	New Antimicrobial Molecules	6	CO
1º	Artificial Intelligence in Clinical Microbiology and Infectious Diseases	6	CO

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Dean

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*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.

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Professional Master's Degree

Multidrug-Resistant Bacteria

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

Professional Master's Degree

Multidrug-Resistant Bacteria

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