VNIVERSITAT DE VALÈNCIA

# Course Guide
# 34495 Microbiological principles of antimicrobial treatment

## COURSE DATA

### DATA SUBJECT

**Code:** 34495
**Name:** Microbiological principles of antimicrobial treatment
**Cycle:** Undergraduate Studies
**ECTS Credits:** 4.5
**Academic year:** 2026-27

### STUDY (S)

| Degree | Center | Acad. year | Period |
|---|---|---|---|
| 1204 - Degree in Medicine | Facultat de Medicina i Odontologia | 3 | First quarter |

### SUBJECT-MATTER

| Degree | Subject-matter | Character |
|---|---|---|
| 1204 - Degree in Medicine | Optional subjects | ELECTIVES |

### COORDINATION

CAMARENA MIÑANA JUAN JOSE

## SUMMARY

In this subject, students will learn scientific knowledge doctors should acquire, such as:

**1)** The characteristics of antimicrobials (antibacterials, antivirals, antifungals and antiparasitics protozoa and helminths) depending on the target of action and their main indications in several infectious processes that microorganisms produce in humans.

**2)** Methods to be used and how to interpret studies regarding antimicrobial susceptibility, as well as studies of the main resistance mechanisms, and

**3)** The epidemiological and clinical impact due to the management of antimicrobials, both at in the community and hospital environments.

## PREVIOUS KNOWLEDGE

### RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

There are no specified enrollment restrictions with other subjects of the curriculum.

### OTHER REQUIREMENTS

As it is optional microbiological aspects be considered in therapeutic approaches microbial infections, it is recommended that students who wish to attend it have passed the compulsory subject in the 2nd year "Medical Microbiology and Parasitology" 34464.

Moreover, given the content of this material is recommended attending this elective in 3rd, 4th or 5th degree course in Medicine.

## COMPETENCES / LEARNING OUTCOMES

### 1204 - Degree in Medicine

Acknowledge diversity and multiculturality.

Capacity for communicating with professional circles from other domains.

Consideration of ethics as a fundamental value in the professional practise.

Criticism and self-criticism skills.

Proper organisation and planning of the workload and timing in professional activities.

Students must be able to apply their knowledge to their work or vocation in a professional manner and have acquired the competences required for the preparation and defence of arguments and for problem solving in their field of study.

Students must have the ability to gather and interpret relevant data (usually in their field of study) to make judgements that take relevant social, scientific or ethical issues into consideration.

Team-working skills and engaging with other people in the same line of work or different.

Understand and recognise source agents and risk factors which determine health status and the development of diseases.

Working capacity to function in an international context.

## DESCRIPTION OF CONTENTS

## 1. COGNITIVE CONTENT.

Lesson 1. - Antimicrobials, classification and their targets. Introduction to the general mechanisms of action inantibacterials, antivirals, antifungal and antiparasitics.

Lesson 2. -Antibacterials I) Classification and general mechanisms of action. Mechanism of action and microbial bases of resistance in synthesis inhibitors of the bacterial cell membrane. Special studies on beta-lactam antibiotics and glycopeptides.

Lesson 3. - Antibacterials II) Mechanism of action and microbial bases of resistance in analogue metabolic antibacterials and in functional inhibitors of the cytoplasmic membrane. Special studies on polymixines and lipopeptides.

Lesson 4. Antibacterials III) Mechanism of action and microbial bases of resistance in inhibitors of nucleic acids. Special study onfluoroquinolones, rifamycins, nitroimidazole drugs and nitrofurans.

Lesson 5. - Antibacterials IV) Mechanism of action and microbial bases of resistance in inhibitors of protein synthesis. Special study on aminoglycosides, MLS, tetracyclines and oxazolidinones.

Lesson 6. -Antibacterials V) Drugs with an action against Mycobacterium tuberculosis. Current situation of resistances to tuberculostatics and methods of study. Clinical and epidemiological implications. Antimycobacterials in leprosy. Active antimycobacterials against mycobacteriosis. Methods of study and their validation.

## 2. COGNITIVE CONTENT (continuation).

Lesson 7. - Antivirals I) Classification and general mechanisms of action. Resistance mechanisms of inhibitors of adsorption and viral fusion. Resistance mechanisms in penetration inhibitors and viral uncoating inhibitors.

Lesson 8. -Antivirals II) Resistance mechanisms in inhibitors of the synthesis and function of the mRNA and inhibitors of viral protein synthesis. Resistance mechanisms in inhibitors of nucleic acids replication. Mechanisms of action and resistance in blending inhibitors and viral maturation inhibitors.

Lesson 9. - Antifungals: classifications and general mechanisms of action. Resistance mechanisms in inhibitors of nucleic acids. Cell wall inhibitors and membrane inhibitors. New targets and new antifungals.

Lesson 10. -Antiparasitics: antiprotozoals and anthelminthics. Classification, mechanisms of action and resistances.

Lesson 11. -Antibiotic chemoprophylaxis and its applications in medicine.Effects of antimicrobials in the immune system.

3. a. -Seminaries.

Seminary 1. -Sequential management in the antibacterial antibiotic treatment. Adequate empiric treatment, guided treatment. The role of the microbiologist in the establishment of necessary steps.

Seminary 2. -Antimicrobials in the hospital and the community. Antibiotic policy, prevention strategies and control over the development of resistances.
3. b. -Practical sessions in the laboratory.

Session 1. -Methods of study on antibacterial susceptibility. Diffusion methods disc-plaque. And determination of susceptibility and resistance. Diffusion methods Epsilon test.

Session 2. -Dilution methods in liquid and solid medium, and determination of the minimum inhibitory

## 3. PROCEDURAL CONTENT (Seminaries and practise in the laboratory).

3. a. -Seminaries.

Seminary 1. -Sequential management in the antibacterial antibiotic treatment. Adequate empiric treatment, guided treatment. The role of the microbiologist in the establishment of necessary steps.

Seminary 2. -Antimicrobials in the hospital and the community. Antibiotic policy, prevention strategies and control over the development of resistances.
3. b. -Practical sessions in the laboratory.concentration (MIC) and the minimum bactericidal concentration (MBC).

Session 3. -Analysis and value of an interpreted reading regarding the susceptibility testing of gram-positive and gram-negative bacteria. Applications for the detection of resistance phenotypes and their practical value.

Session 4. - Methods of study regarding antifungal susceptibility. Reference methods and business methods.

Session 5. - Genotypic methods for the detection of antimicrobial resistance. Interpretation and value of the molecular detection of genetic mutations coding resistance.

## WORKLOAD

### PRESENCIAL ACTIVITIES

| Activity | Hours |
|---|---|
| Theory | 19,00 |
| Seminar | 20,00 |
| Laboratory | 6,00 |
| **Total hours** | **45,00** |

### NON PRESENCIAL ACTIVITIES

| Activity | Hours |
|---|---|
| Attendance at other activities | 0,00 |
| Individual or group project | 4,00 |
| Independent study and work | 25,50 |
| Preparation of lessons | 28,00 |
| Preparation for assessment activities | 10,00 |
| Resolution of case studies | 0,00 |
| **Total hours** | **67,50** |

## TEACHING METHODOLOGY

Regarding theoretical credits, professors will present the most important methods, procedures and content through master classes, in order to help students develop several skills and meet the objectives. Students'

participation in the class should be encouraged and they will have access to the didactic material professors may have used through the electronic platform *Aula Virtual*.

Regarding practical credits (training in the laboratory and seminaries), students – in small groups – will analyse and discuss important activities related to evaluation procedures of susceptibility to different antimicrobials, which will be explained by the professor in charge. Didactic material and bibliography will be provided for students to prepare.

The gender perspective, the respect for diversity, and the sustainable development goals (SDGs) will be incorporated into teaching, whenever possible.

## EVALUATION

In this subject, knowledge acquired from both cognitive and procedural content is valued when evaluating the students' learning process. This is done through theoretical and practical exams respectively.

It is necessary that students pass both the theoretical and practical parts (seminars and practise in the laboratory) in order to pass the subject.

Assessment of cognitive content will be done via theoretical exam which is 50% (5 points) of the maximum final score possible, and the one corresponding to procedural content (seminars and practise) will be the other 50%. Students have to pass both tests (2.5 in the theoretical exam and 2.5 in the practical one, at least) in order to obtain the following grades: Pass: 5 points or higher; Notable (grade B): 7 points or higher; Excellent: 9 points or higher; *cum laude*: amongst the top excellent students.

A.- Theoretical exams will comprise essay questions (4 questions worth 0.5 points maximum per question) and multiple choice ones (30 questions worth 0.1 points per right answer), with 3 points being the maximum.

For every 3 wrong multiple choice answers, 1 of the correct ones will be deducted. Blank answers do not penalise. Apart from knowledge assessment in official calls, continuous evaluation can be set once different blocks of content (theoretical units) are finished. They can be eliminatory if the score is 6 or higher.

B.- The evaluation of cognitive contents (seminars and practise in the laboratory) will represent 50% of the score and it will be done though continuous evaluation in each one of the sessions (3 points is the maximum is the practise and 2 points is the maximum possible in seminars), and/or a final test with multiple choice questions (in which skills and acquired abilities during practical sessions and seminars are assessed). There will be 25 questions regarding cognitive knowledge, worth 0.2 points each. For every 3 multiple choice questions being incorrectly answered, 1 from the correct ones will be deducted. Answers left blank do not penalise.

## REFERENCES


- Mandel GL, Bennett JE y Dolin R. Enfermedades Infecciosas. Principios y Práctica (2006) 6ª ed. Elsevier España SL. Vol I ISBN: 84-8174-954-0
- García Sánchez JE, López R y Prieto J eds. (1999) Sociedad Española de Quimioterapia. Antimicrobianos en Medicina. Prous Science. ISBN 84-8124-167-9
- Versalovic J. et al. Manual of Clinical Microbiology (2011). 10 th Edition. ASM Press Washington DC. ISBN 987-1-55581-463-2
- Mensa et al. Guía Terapéutica Antimicrobiana 2013. Editorial Antares ¿ Ediciones Escofet Zamora SL. ISBN 978-84-88825-09-4
- Murray PR, Rosenthal KS, Kobayashi GS y Pfaller MA. Microbiología médica. (2009). 6ª ed. Elsevier España SL. ISBN: 978-0-323-05470-6
- RECURSOS e-Salut:

  - ClinicalKey Student Medicina, Odontologia y Enfermería [https://uv-es.libguides.com/RecursosSalut]

  - Acces Medicina [https://uv-es.libguides.com/Access_Medicina]

  - Médica Panamericana [https://uv-es.libguides.com/Medica_Panamericana]