

**COURSE DATA****Data Subject**

<b>Code</b>	34495
<b>Name</b>	Microbiological principles of antimicrobial treatment
<b>Cycle</b>	Grade
<b>ECTS Credits</b>	4.5
<b>Academic year</b>	2022 - 2023

**Study (s)**

<b>Degree</b>	<b>Center</b>	<b>Acad. year</b>	<b>Period</b>
1204 - Degree in Medicine	Faculty of Medicine and Odontology	3	First term

**Subject-matter**

<b>Degree</b>	<b>Subject-matter</b>	<b>Character</b>
1204 - Degree in Medicine	18 - Optional subjects	Optional

**Coordination**

<b>Name</b>	<b>Department</b>
CAMARENA MIÑANA, JUAN JOSE	275 - Microbiology and Ecology

**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.

## OUTCOMES

### 1204 - Degree in Medicine

- 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.
- Understand and recognise source agents and risk factors which determine health status and the development of diseases.
- Proper organisation and planning of the workload and timing in professional activities.
- Team-working skills and engaging with other people in the same line of work or different.
- Criticism and self-criticism skills.
- Capacity for communicating with professional circles from other domains.
- Acknowledge diversity and multiculturality.
- Consideration of ethics as a fundamental value in the professional practise.
- Working capacity to function in an international context.

## LEARNING OUTCOMES

**1.-**Understanding of the basic characteristics of antimicrobials (antibacterials, antivirals, antifungals and antiparasitics protozoa and helminths) and their main indications in several infectious processes in the human patient.



- 2.-Knowledge of the study proceedings for antimicrobial susceptibility and their interpretation.
- 3.-Knowledge of the main resistance mechanisms to antimicrobials by microorganisms that infect the patient.
- 4.-Understanding of the epidemiological and clinical impact that management of antimicrobials has, both at a community and hospital level.

## DESCRIPTION OF CONTENTS

### 1. COGNITIVE CONTENT.

Lesson 1. - Antimicrobials, classification and their targets. Introduction to the general mechanisms of action in antibacterials, 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 polymyxins and lipopeptides.

Lesson 4. Antibacterials III) Mechanism of action and microbial bases of resistance in inhibitors of nucleic acids. Special study on fluoroquinolones, 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 blocking 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 anthelmintics. Classification, mechanisms of action and resistances.

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

### **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.**

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 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**

ACTIVITY	Hours	% To be attended
Seminars	20,00	100
Theory classes	19,00	100
Laboratory practices	6,00	100
Development of group work	4,00	0
Study and independent work	20,00	0
Readings supplementary material	5,50	0
Preparation of evaluation activities	10,00	0
Preparing lectures	20,00	0
Preparation of practical classes and problem	8,00	0
<b>TOTAL</b>	<b>112,50</b>	

**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 seminars), 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.

**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 in 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.

In order to access to an advance on the call of this subject, it is a requirement that the student has coursed all his/her practices.

Attendance to practical sessions is mandatory. Unjustified non-attendance to more than 20% of the sessions will make it impossible to pass the course.

Students are reminded of the importance of carrying out evaluation surveys on all the teaching staff of the degree subjects.

## REFERENCES

### Basic

- 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

### Additional

- 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: ClínicaKey Student. Elsevier (Scopus, ScienceDirect).  
[uv-es.libguides.com/RecursosSalut/BibliotecaSalut](http://uv-es.libguides.com/RecursosSalut/BibliotecaSalut)

