

**Medical Microbiology and Parasitology**

Code: 102933  
ECTS Credits: 8

Degree	Type	Year	Semester
2502442 Medicine	OB	3	0

The proposed teaching and assessment methodology that appear in the guide may be subject to changes as a result of the restrictions to face-to-face class attendance imposed by the health authorities.

### Contact

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### Use of Languages

Principal working language: catalan (cat)  
Some groups entirely in English: No  
Some groups entirely in Catalan: No  
Some groups entirely in Spanish: No

### Teachers

Rosa Maria Bartolomé Comas  
Juana María Lourdes Matas Andreu  
Beatriz Mirelis Otero  
Carme Muñoz Batet  
Nuria Rabella García  
Fernando Sánchez Reus  
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María Gloria Soria Guerrero  
Gema Fernandez Rivas  
Isabel Sanfeliu Sala  
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Ana Cristina Siverio Pares  
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Mateu Espasa Soley  
Cristina Vilaplana Massaguer

Eduardo Padilla León

Cristina Prat Aymerich

Elena Sulleiro Igual

## **Prerequisites**

General knowledge of cellular and molecular biology, anatomy, physiology and microscopic structure of human organs and systems.

## **Objectives and Contextualisation**

Medical Microbiology and Parasitology is placed in the Third Course in Medicine Degree, together with other subjects, which place the student in the world of functional and structural human diseases.

The fact that a set of diseases are caused by microorganisms, presupposes a specific area of interrelation between two living beings, whose relationship, in certain circumstances, result in pathological processes that translate into infectious disease.

The subject is inserted in a year (third) in which General Pathology (pathophysiology), Pathological Anatomy and Pharmacology are developed. An intense correlation is developed with these areas of knowledge, both with the conceptual and the organizational sphere.

Infectious diseases respond to the action of a living causative agent, a specific and differential aspect with the rest of pathology and that entails several particularities such as the mentioned biological interaction between living beings and the transmission of microorganisms between people and therefore of the disease.

At the same time, these diseases are subject to treatment by means of antimicrobial medications, and immune prophylaxis through vaccines.

To identify the causative microorganism of the disease, cardinal aspect to establish the treatment and the prophylaxis, the location of the infections (focal and general) must be specified to take the appropriate samples to refer them to the laboratory of microbiology, where the studies are done to determine the etiological diagnosis. This aspect is important so that the treatment is directed and effective.

So, in Microbiology, we can differentiate knowledge objects and applied objectives: 1) microorganisms as causative agents of disease, 2) injury caused by the microorganisms defined by their pathogenicity and virulence 3) the host responses 4) the diagnostic processes and 5) the treatment and prophylaxis.

The processes of microbial injury and host response are inseparable and conform what we can define as the pathophysiology of infection.

In this context the training objectives include:

1- List the microorganisms that cause human illness (pathogenic microorganisms) and differentiate them from the commensal microorganisms.

2- Describe the biological characteristics of microorganisms, emphasizing the following aspects: morphology, physiology and life cycles.

3- Name and describe the reservoirs of microorganisms and ways of transmission.

4- Describe the virulence factors and the mechanisms that explain the pathogenic capacity.

5- Describe the nonspecific and specific defense mechanisms of the host. Describe the interrelations between the pathogen and the host (ie the pathophysiology of the infection). Describe the concept of opportunism.

- 6- Describe the normal microbiome. Enumerate its physiological functions and its relation to opportunism.
- 7- Determine the clinical samples of the focus of infection that must be collected and establish the measures and procedures to collect them and to transfer them to the laboratory for their study.
- 8- Identify the tests that must be requested to the laboratory to make the etiological diagnosis of the process.
- 9- To know the antimicrobials and their indications.
- 10- Describe the sensitivity tests that must be used in the different microorganisms to direct the antimicrobial treatment.
- 11- Establish the rules of immediate prophylaxis (isolation and immune prophylaxis) and long-term (vaccination).
- 12- Based on the preceding information all microorganisms of human pathology are described to analyse and revise their characteristics: 1) structure and physiology 2) general epidemiology, reservoir and transmission mechanism 3) pathogenesis 4) clinical 5) etiologic diagnosis and 6) prophylaxis and treatment.

## Competences

- Communicate clearly, orally and in writing, with other professionals and the media.
- Demonstrate understanding of the causal agents and the risk factors that determine states of health and the progression of illnesses.
- Demonstrate, in professional activity, a perspective that is critical, creative and research-oriented.
- Establish a diagnostic approach and a well thought-out strategy for action, taking account of the results of the anamnesis and the physical examination, and the results of the appropriate complementary tests carried out subsequently.
- Indicate the basic diagnosis techniques and procedures and analyse and interpret the results so as to better pinpoint the nature of the problems.
- Maintain and sharpen one's professional competence, in particular by independently learning new material and techniques and by focusing on quality.
- Use information and communication technologies in professional practice.

## Learning Outcomes

1. Communicate clearly, orally and in writing, with other professionals and the media.
2. Demonstrate, in professional activity, a perspective that is critical, creative and research-oriented.
3. Describe the host-parasite interrelationship: mechanisms of pathogenicity and defence.
4. Describe the main infectious syndromes caused by the various microorganisms.
5. Describe the methods of microbiological diagnosis of infectious diseases comprehensively and holistically, from a theoretical and a practical perspective.
6. Establish a diagnostic approach and a specific strategy for action for each of the microorganisms responsible for infectious diseases.
7. Explain the basic concepts of microbial genetics and its relationship to pathogenicity and resistance to antimicrobial agents.
8. Explain the concept and the biological types of microorganisms.
9. Identify the actions to prevent and protect against infectious diseases.
10. Identify the causal agents and the risk and diagnostic factors of infectious diseases.
11. Identify the importance of symbiosis as a way of living. Commensalism and parasitism as forms of symbiosis.
12. Identify the indications of microbiological tests.
13. Identify the main mechanisms of resistance to antimicrobial agents.
14. Identify the performance of the different diagnostic techniques and interpret their results.
15. Identify the principles behind microbiology and parasitology.
16. Identify, individually, the biological, epidemiological (reservoir and transmission), pathogenic, clinical, diagnostic and therapeutic features of the different microorganisms responsible for infectious diseases.

17. Indicate the basic techniques and procedures for diagnosing the major syndromes of infectious pathology.
18. Indicate the clinical samples necessary for the microbiological diagnosis of syndromes, and how they are to be collected and transported to the laboratory.
19. Maintain and sharpen one's professional competence, in particular by independently learning new material and techniques and by focusing on quality.
20. Use information and communication technologies in professional practice.

## Content

Introduction to medical microbiology. Agents causing infectious diseases. Epidemiology. Main infectious syndromes. Microbial genetics. Mechanisms of pathogenicity. Defense mechanisms. Diagnosis of infectious diseases. Normal flora Treatment of infectious diseases. Mechanisms of resistance. Techniques for the study of the sensitivity to antimicrobials.

- Bacterial structure. Antibacterial drugs. Staphylococci. Streptococci. *Neisseria meningitidis* and *Neisseria gonorrhoeae*. Colonizing and pathogenic *Enterobacteriaceae*. Gram-negative non-fermenting bacilli. Vibrios. Parvobacteria. Legionella. Mycobacteria. Anaerobic bacteria. Treponematoses. *Mycoplasma Chlamydia. Rickettsia*.
- General characteristics of fungi. Antifungal agents. Yeasts. Molds. Dermatophytoses. Dimorphic fungi.
- General characteristics of viruses. Antiviral drugs. Enterovirus. Picornavirus and viruses that cause enteritis. Respiratory viruses Herpesvirus: herpes simplex virus, varicella, cytomegalovirus and Epstein Barr virus. Papillomavirus and Polyamavirus. Viruses causing exanthema diseases. Hepatitis virus. Viruses of human immunodeficiency. Arbovirus and emerging viruses.
- General characteristics of parasites. Anti-parasitic drugs. Protozoa of open cavities. Systemic protozoa. Helminths. Arthropods of interest in medicine.

Distributive blocks

A. Introduction to Microbiology

B. Bacteriology

C. Mycology

D. Virology

E. Parasitology

Schedule lectures (49 sessions of 60 ')

1. Introduction to Microbiology. Medical microbiology: vision as a whole
2. Pathogens causing infectious diseases. Autochthonous flora
3. Infectious diseases
4. Microbial genetics
5. Mechanisms of microbial pathogenicity
6. Host defense mechanisms
7. Epidemiology and prevention of infectious diseases
8. Classical diagnosis of infectious diseases

9. Molecular and serological diagnosis of infectious diseases
10. Structure and bacterial metabolism
11. Antibacterial drugs
12. Staphylococci
13. Streptococci
14. *Neisseria*
15. Pathogenic *Enterobacteriaceae*
16. Commensal enterobacteria and gram-negative non-fermenting bacilli
17. *Campylobacter*, *Helicobacter* and *Vibrio*
18. Parvobacteria and *Legionella*
19. Mycobacteria. *Mycobacterium tuberculosis* complex
20. Opportunistic environmental mycobacteria
21. Anaerobic bacteria
22. Spirochetes
23. *Chlamydia*
24. *Mycoplasma* and *Rickettsia*
25. Structure and metabolism of fungi
26. Antifungal agents
27. Yeasts
28. Dermatophytoses
29. Dimorphic fungi
30. Molds
31. Structure and propagation of viruses
32. Antiviral agents
33. Enterovirus. Picornavirus. Virus causing enteritis
34. Respiratory Virus: Flu. Syncytic respiratory virus. Other respiratory viruses
35. Herpes simplex virus. Chicken pox
36. Citomegalovirus. Virus Epstein- Barr. Other herpesvirus
37. Papillomavirus and Polyamavirus
38. Viruses causing exanthemic diseases
39. Hepatitis viruses (1)

40. Hepatitis viruses (2)
41. Viruses of human immunodeficiency
42. Arbovirus. Emerging viruses
43. General characteristics of protozoa and helminths
44. General characteristics of parasitic diseases. Arthropods of medical interest
45. Protozoa of open cavities
46. Systemic protozoa. Leishmania and Tripanosoma
47. Systemic protozoa. Toxoplasma and Plasmodium
48. Platelminths: Trematodes. Beasts
49. Intestinal and tissues nematodes

Laboratory practices (10 sessions of 90 ')

1. Conventional diagnosis of infectious diseases. Direct examination: Gram staining and Ziehl-Neelsen.
2. Techniques and means of cultivation. Identification
3. Study of the sensitivity to antimicrobials. Antibigram
4. Diagnosis of special bacteria: Mycobacteria and anaerobic bacteria
5. Quick diagnosis. Antigen detection
6. Molecular diagnosis of infectious diseases
7. Fungi
8. Viruses
9. Parasites
10. Serological diagnosis of infectious diseases

Specialized seminars (15 sessions of 60 ')

a) Fundamentals of practical education

1. Concept of infectious disease, focus of infection and clinical sample
2. Direct examination. Cultivation and Identification
3. Sensitivity to antimicrobials
4. Quick diagnosis. Antigen detection Techniques of molecular biology
5. Indirect etiologic diagnosis.

b) Clinical syndromes

1. Urinary infection
2. Sexually transmitted infection
3. Enteritis

4. Infection of the central nervous system
5. Respiratory infection
6. Infection of skin and soft parts
7. Osteo-articular infections
8. Hepatitis
9. Nosocomial infection
10. AIDS

Oral presentation (5 sessions of 120 ')

Presentation of work by students

## **Methodology**

This Guide describes the framework, contents, methodology and general norms of the subject, in accordance with the current curriculum. The final organization of the subject with regard to the number and size of groups, distribution in the calendar and dates of examinations, specific criteria of evaluation and review of exams, will be specified in each one of the Hospital Teaching Units (UUDHH), who will explain it through their web pages and the first day of class of each subject, through the teachers responsible for the subject at the UUDHH.

For the 2019-2020 academic year, the professors designated by the Departments as responsible for the subject at the Faculty level and the UUDHH are:

Responsible department(s): Department of Genetics and Microbiology. Area of Microbiology Head of Faculty: Tomás Pumarola

UUDHH Responsible

UD Vall d'Hebron: Tomás Pumarola

UD Germans Trias i Pujol: Lurdes Matas

UD Sant Pau: Carme Muñoz

UD Parc Taulí: Isabel Sanfeliu

### **Methodology**

The teaching methodology will consist of theoretical classes, laboratory work, specialized seminars and clinical cases presentation.

Theoretical classes will be taught in the form of master classes and constitute a basic knowledge base on which all the rest of the learning activity is supported.

The seminars will be held in groups of 20 students. In these seminars, the basic principles of the etiologic diagnosis of infectious diseases will be reviewed and discussed with students. These seminars are the theoretical basis for the correct realization of the laboratory work.

The laboratory work will be carried out in groups of 5-6 students. In these practices the students will develop different techniques to familiarize themselves with the methods of work of the Microbiology laboratory used for the etiologic diagnosis of infectious diseases.

Classroom practices are based on the development of acinical case on the part of the students, previous orientation on the part of the teachers about the content of the subject proposed, the way to develop it, as well

as the objectives that have to be done. Achieve, through support tutorials. Afterwards the students will orally present in class the result of their work.

## Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Classroom practical work (PAUL)	10	0.4	1, 6, 16, 19, 20
Clinical cases seminars (SCC)	10	0.4	1, 6, 13, 16, 19
Laboratory practical work (PLAB)	5	0.2	6, 14, 13, 12, 16, 18, 17
Specialized seminars (SEM)	15	0.6	3, 4, 5, 6, 8, 7, 10, 15, 11, 9, 16
Theory (TE)	49	1.96	3, 4, 5, 6, 8, 7, 15, 13, 11, 9, 16, 17
Type: Autonomous			
Autonomous activities: exercise writing, personal study, reading reports, reports of interest	101	4.04	2, 6, 13, 16, 19, 20

## Assessment

The subject will be evaluated by means of two partial exams. Each one of them will have a weight of 50% in the final grade and correspond, approximately, to 50% of the syllabus. Both exams will be written assessments and will consist of a part of the theory evaluation that will have a weight of 70% of the mark and a second part of the evaluation of the practices that will have a weight of 30% of the mark. The theory exam will consist of a part of multiple choice items and a part of restricted questions and / or correspondence items. The practical exam will consist of restricted questions and / or resolution of problems and / or oral presentation of works. To release the subject of the partial examinations, a mark of 6 or more is required. There will be a synthesis evaluation where the student will examine the parts not released in the partial exams. This synthesis exam will have the same structure and relative weight of the different parts as the partial examinations and will make an average, if applicable, with the note obtained in the released part. To pass the subject, you will need to obtain a global grade equal to or greater than 5 out of 10.

Attendance to classroom practices, laboratory work, clinical case seminars and specialized seminars is mandatory and an essential condition to be able to be evaluated.

The review of the tests is considered a fundamental part of the learning. Holding their exam, the students will listen to what the teachers expected from the various assessment activities. The day and time of the review of the exam will be announced along with the marks both in the virtual Campus and at the notice board.

Students who do not perform both theoretical and practical evaluation tests will be considered as not evaluated and will be recorded in the minutes, exhausting the rights to the registration of the subject.

## Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Evaluation through practical cases and problem	30%	4	0.16	1, 2, 6, 13, 16, 19, 20



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Written evaluation through objective tests	70%	6	0.24	3, 4, 5, 8, 7, 14, 10, 15, 11, 9, 12, 18, 17
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## Bibliography

### Bibliografía específica

- Prats G. Microbiología i Parasitologia mèdiques. Madrid. Editorial Panamericana. 2013
- Murray PR., Rossental KS., Pfaller MA. Medical Microbiology. 8th Ed. Philadelphia. Elsevier. 2016.
- Brooks GF, Carroll KC, Butel JS, Morse SA. Medical Microbiology. 24 Ed. New York: McGraw Hill. 2007

### Bibliografía de consulta

- Mandell GL., Bennet JE., Dolin R. Mandell, Douglas and Bennet's - Principles and Practice of Infectious Diseases. 6th Ed. Philadelphia: Elsevier Churchill Livingstone, 2009.
- Ausina V., Moreno Guillén S. Tratado SEIMC de Enfermedades Infecciosas y Microbiología Clínica. Madrid. Editorial Médica Panamericana. 2006. Farreras-Rozman. Medicina Interna. 16th Ed. Elsevier España, S.L. 2009

### Enllaços web d'interès

- [www.seimc.org](http://www.seimc.org)
- [www.escmid.org](http://www.escmid.org)
- [www.scmimc.org](http://www.scmimc.org)
- [www.asm.org](http://www.asm.org)
- [www.cdc.gov](http://www.cdc.gov)
- <http://www.microbelibrary.org>. Pàgina oficial de la Societat Americana de Microbiologia (ASM). Conté una gran varietat d'imatges i vídeos sobre el contingut de la matèria.
- <http://www.biofarma.net> Clicar "Les cahiers". Llibres molt didàctics en francès i amb imatges molt adequades de les parts principals de la matèria
- <http://www.seimc.org>. Pàgina oficial de la Societat Espanyola de Malalties Infeccioses i Microbiologia Clínica.
- <http://www.microbesome.com>. Conté imatges de microbiologia y malalties infeccioses.
- <http://www.microbiologyinpictures.com>. Conté imatges de cada microorganisme patògen important