

Microbiology

Code: 102651
ECTS Credits: 6

Degree	Type	Year	Semester
2502445 Veterinary Medicine	FB	1	2

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: Yes
Some groups entirely in Spanish: No

Teachers

Maria Lourdes Abarca Salat
Maria Rosa Bragulat Arara
Francisco Javier Cabañes Sáenz
Gemma Castella Gómez
Leyna Diaz Alvarez

Prerequisites

There are no official prerequisites, but students are advised to review the basic concepts of Biology, Biochemistry and Chemistry.

Objectives and Contextualisation

This is a compulsory first-year subject. Students will acquire the knowledge and practical skills of Microbiology. Topics covered include the historical evolution of Microbiology, basic techniques and methods for studying microorganisms, microbial structure, organization, genetics and growth, and their relationships with the host, as well as their control and basic diagnostic techniques.

Students will also acquire a knowledge of the fundamentals of the taxonomy and the bases of bacteria and fungi systematics, as well as the characteristics of microorganisms causing infections and/or poisoning, and those of industrial, biotechnological and ecological interest. The training offered by the subject is fundamental and is oriented to its applications in veterinary medicine, animal health, animal production and the hygiene and food industry.

The specific training objectives are:

- To introduce the student to the basic concepts of Microbiology
- To provide knowledge of microbiological techniques and methods.

-To know and differentiate the main types of microorganisms.

-To recognize and understand the role of microorganisms across many aspects (normal microbiota, causative agents of disease, and those of industrial, biotechnological and ecological use) and the control of microorganisms.

Competences

- Analyse, synthesise and resolve problems and make decisions.
- Comunicar la informació obtinguda durant l'exercici professional de manera fluïda, oralment i per escrit, amb altres col·legues, autoritats i la societat en general.
- Demonstrate knowledge of English to communicate both orally and in writing in academic and professional contexts.
- Demonstrate knowledge, understanding and differentiation of the main biological agents of veterinary interest.
- Perform basic analytical techniques and interpret the clinical, biological and chemical results, and interpret the results of tests generated by other laboratories.

Learning Outcomes

1. Analyse, synthesise and resolve problems and make decisions.
2. Apply basic microbiological techniques.
3. Apply suitable methodologies for the observation, isolation, culture, identification and conservation of bacteria and fungi.
4. Characterise the causal agents of microbial diseases of interest to veterinary science in order to diagnose and control them.
5. Communicate information obtained during professional exercise in a fluid manner, orally and in writing, with other colleagues, authorities and society in general.
6. Demonstrate knowledge of English to communicate both orally and in writing in academic and professional contexts.
7. Describe and appreciate the role of microorganisms in industrial processes, in biotechnology and in ecology.
8. Explain the basic taxonomy and systematics of bacteria and fungi.
9. Interpret the microbial diversity, physiology, metabolism and genetic basis that regulate the functions of microorganisms.
10. Interpret the results of basic microbiological techniques.
11. Recognise the microorganism-host relationship, virulence and the mechanisms of microbial pathogenicity.
12. Recognise the role of microorganisms as causal agents of diseases in animals and in the diseases that are transmissible to human beings.

Content

The subject is structured into the following sections^{*}:

Section a. Introduction to Microbiology: Definition and brief history. Prokaryotic and eukaryotic microorganisms. Viruses and subviral agents. Microscopy: principles and types. Observation of microorganisms: techniques.

Section b. Microbial nutrition: Oxygen function. Nutritional types. Growth, isolation and conservation of microorganisms. Bacterial morphology: structure and function.

Section c. Bacterial genetics. Mutations. Genetic transfer: Transformation, transduction and conjugation. Plasmids. Transposons. Genetic recombination. Recombinant DNA technology. Applications and interest in Veterinary. Bacterial genomics. Regulation of gene expression.

Section d. Microbial metabolism: Fermentation, respiration and photosynthesis. Microbial growth. Measurement methods.

Section e. Microbial-host interactions. Mechanisms of pathogenicity and microbial structures in relation to pathogenicity. Control of microbial growth.

Section f. Systematic bacteriology. Introduction to bacterial taxonomy. Proteobacteria. Other Gram-negative bacteria (spirochetes, chlamydia and non-spore forming anaerobes). Low G+C Gram-positive bacteria. Mycoplasma. High G+C Gram-positive bacteria. Main groups and/or species of medical, industrial, biotechnological and ecological interest.

Section g. Mycology. Introduction to fungal taxonomy. Characteristics of filamentous fungi and yeasts. Techniques. Main groups and/or species of medical, industrial, biotechnological and ecological interest. Mycotoxins.

Laboratory-session content^{*}:

- Aseptic technique and culture methods. Observation of microorganisms and main staining methods.
- Techniques for enumeration and isolation of microorganisms.
- Antibigram.
- Effect of physical and chemical factors on microbial development.
- Study of the microbiota of healthy animals.
- Methods for bacterial and fungal identification.

^{*} Unless the requirements enforced by the health authorities demand a prioritization or reduction of these contents

Methodology

This subject applies the following methodology^{*}:

- Lectures: These lectures allow the acquisition of the basic scientific-technical knowledge of the subject; this knowledge must be complemented with a fuller study of the topics covered.
- Laboratory sessions: practical sessions in the laboratory aim to enhance and apply the theoretical and conceptual knowledge acquired in the lectures. These sessions encourage students to improve technical skills, and reinforce theory with practice.

Students will be issued with a Manual of Laboratory-Practical Sessions at the beginning of the course. To ensure satisfactory performance and acquire the skills corresponding to this subject, it is essential that students read this manual in detail, familiarizing themselves with the practical work to be carried out in each session, as well as with the methodology that should be applied in the various sessions.

In the first session, students must sign the safety document enclosed in the Manual of Laboratory-Practical Sessions. The laboratory safety rules must be read before attending the laboratory sessions. All students are asked to comply with the safety rules and procedures in the Microbiology laboratory.

- Tutorials: these are informative sessions on the content, development and objectives of the different activities. In tutorials, students have the opportunity to clarify any doubts about the course.

- Self-learning activity in small groups (seminar): this activity aims to encourage group work, as well as to enhance the ability to synthesize, communicate and argue for a scientific topic. All necessary material for this activity will be provided in advance. Students will discuss their content in small groups in the classroom. The session will end with an assessment of the acquired knowledge.

All teaching materials used during the course will be posted on the Campus Virtual platform. Before each session, students will find the presentations (in pdf format) used in class by the teacher, as a support for taking notes. The Manual of Laboratory-Practical Sessions must be printed out on the first day of the course in order to facilitate effective following of all laboratory sessions. Students must inform themselves of the news and information published on the Campus Virtual.

*The proposed teaching methodology may experience some modifications depending on the restrictions to face-to-face activities enforced by health authorities.

Review pending. Please see the catalan version

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Laboratory sessions	22.5	0.9	1, 3, 2, 4, 7, 10, 9, 11
Lectures and flipped classroom	29	1.16	3, 4, 7, 8, 9, 12, 11
Seminar	2	0.08	1, 2, 4, 5, 6, 7, 10, 9, 11
Type: Supervised			
Tutorials	2	0.08	3, 4, 7, 8, 9, 12, 11
Type: Autonomous			
Self-learning activity in small groups	8	0.32	1, 2, 4, 5, 6, 7, 10, 9, 11
Study	84.5	3.38	3, 4, 7, 8, 10, 9, 12, 11

Assessment

Assessment is individual and continuous through different activities^{*}:

Laboratory sessions (20% of the overall grade): a continuous assessment will be carried out during the laboratory sessions. Maximum score: 20 points.

Self-learning activity in small groups (20% of the overall grade): Students will work in small groups on a subject proposed by the teacher; all necessary material for this activity will be provided in advance. Assessment for the session is at both group and individual level. Each group will be scheduled for a specific session. Maximum score: 20 points.

Written test 1 (30% of the overall grade): on finishing all the teaching and training activities and on the date specified in the course program, students will take a written test on course content. Maximum score: 30 points.

Written test 2 (30% of the overall grade): on finishing all the teaching and training activities and on the date specified in the course program, students will take a written test on course content. Maximum score: 30 points.

FINAL CONSIDERATIONS

For an average grade for assessment activities to be applicable, the minimum combined grade from the scores obtained in the two written tests must be at least 30.

To pass the subject, a global score of at least 50 points/100 is required.

Students who do not meet the minimum-grade requirements for the written tests (minimum 30 points) or who fail to take the written tests, will be able to retake them on the date scheduled for subject reassessment.

If students do not submit both written tests, they will be graded as Non-assessable.

*Student's assessment may experience some modifications depending on the restrictions to face-to-face activities enforced by health authorities.

Review pending. Please see the catalan version

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Laboratory sessions	20%	0	0	1, 3, 2, 4, 10, 9, 11
Self-learning activity in small groups	20%	0.5	0.02	1, 5, 6, 10, 9, 11
Written test 1	30%	0.75	0.03	4, 7, 8, 9, 12, 11
Written test 2	30%	0.75	0.03	4, 7, 8, 9, 12, 11

Bibliography

Textbooks

- Carter GR, Wise DJ. 2004. 6th ed. "Essentials of Veterinary Bacteriology and Mycology". Wiley-Blackwell. ISBN: 9780813811796.

- Madigan MT, Martinko JM, Dunlap PV, Clark DP. 2015. 14a ed. "Brock Biología de los microorganismos". Pearson Educación, S.A.

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- Willey JM, Sherwood LM, Woolverton CJ. 2013. 7a ed. "Microbiología de Prescott, Harley y Klein". McGraw-Hill-Interamericana, S.A.U.

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