Information about the subject

Degree: Bachelor of Science Degree in Veterinary Medicine

Faculty: Faculty of Veterinary Medicine and Experimental Sciences

Code: 1260209 **Name:** Veterinary Microbiology

Credits: 6,00 **ECTS Year:** 2 **Semester:** 2

Module: Module of Common Basic Training

Subject Matter: Biological Agents of Interest in Veterinary Medicine **Type:** Compulsory

Department: Animal Production and Public Health

Type of learning: Classroom-based learning

Languages in which it is taught: Spanish

Lecturer/-s:

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Module organization

Module of Common Basic Training

Subject Matter	ECTS	Subject	ECTS	Year/semester
Statistics	6,00	Biometrics and Statistics	6,00	1/1
Biology	6,00	Animal and Plant Biology	6,00	1/1
Biochemistry	6,00	Biochemistry	6,00	1/2
Animal Anatomy	18,00	Animal Anatomy I and Embryology	6,00	1/1
		Animal Anatomy II	6,00	1/2
		Animal Cytology and Histology	6,00	1/2
Animal Physiology	12,00	Animal Physiology I	6,00	2/1
		Animal Physiology II and Immunology	6,00	2/2
Genetics	6,00	Genetics	6,00	1/2
Animal Domestication	6,00	Animal Domestication (Ethnology, Ethology and Animal Welfare)	6,00	1/2
Biological Agents of Interest in Veterinary Medicine	12,00	Veterinary Microbiology	6,00	2/2
		Veterinary Parasitology	6,00	2/1
Veterinary Medicine and Society	6,00	Veterinary Regulations and Legislation, Social Morality and Professional Deontology	6,00	5/1

Physics and Chemistry	6,00	Physico-chemical fundamentals of veterinary medicine	6,00	1/1

Learning outcomes

At the end of the course, the student must be able to prove that he/she has acquired the following learning outcomes:

R1 The student has assimilated microbiological knowledge related to: metabolism, genetic variability, taxonomy, pathogenicity and fields of application.

R2 The student knows how to work in a microbiology laboratory, in relation to basic techniques and waste management, with a good attitude and working as a team.

R3 The student consults different bibliographic sources on microbiology and appropriately manages the information individually or in groups.

Competencies

Depending on the learning outcomes, the competencies to which the subject contributes are (please score from 1 to 4, being 4 the highest score):

BASIC		Weighting			
		1	2	3	4
CB1	Students must show that they have and understand knowledge in a field of study that is based on general secondary education on a level that, although supported by advanced text books, includes also some aspects that involve knowledge belonging to the vanguard of their field of study.				x

GENERAL		Weighting			
		1	2	3	4
CG6	Developing professional practice, acquiring skills related to teamwork, with an efficient use of resources and quality management.			x	
CG7	Identifying emerging risks in all areas of the veterinary profession.				x

SPECIFIC		Weighting			
		1	2	3	4
E15	Knowing and applying principles and bases of the study of microorganisms and parasites that affect animals and those who have an industrial, biotechnological or environmental application.				x

TRANSVERSAL		Weighting			
		1	2	3	4
T1	Capacity of analysis, synthesis, implementation of knowledge for problem-solving and decision-making.		x		

T4	Mastering fluency in oral and written mother tongue communication, listening and responding effectively using a language appropriate to audience and context.	x		
T6	Using information technology to communicate, share, search for, collect, analyze and manage information, especially related to the veterinarian practice.		x	
T8	Efficient and effective work, both independently and as a member of a multidisciplinary team or unit, showing respect, appreciation and sensitivity to the work of others.		x	
T10	Ability to learn, to research, and to be aware of the need to keep knowledge updated, and attending training programs.		x	

Assessment system for the acquisition of competencies and grading system

Assessed learning outcomes	Granted percentage	Assessment method
R1	55,00%	Written assessment of acquired knowledge and skills. The test may consist of a series of open-ended questions or multiple-choice questions about the theoretical contents of the module and/or practical exercises (problem-solving).
R2	30,00%	Evaluation of the practical laboratory work, which must demonstrate the competences acquired by the student and his or her ability to use them to solve the different situations and problems that arise in a laboratory; this assessment may consist of one of the following methods, or a combination of several of them: an individual written test, the individual or group performance of a laboratory experience, the delivery of an individual or group report on the work carried out in the laboratory.
R3	15,00%	Evaluation of group work through a system of continuous assessment throughout the course based on the delivery of assignments the objectives and content of which will be proposed by the teacher.

Observations

This course is not eligible for single evaluation. According to the general evaluation and qualification regulations, the preferred evaluation system will be continuous evaluation. Specifically, the delivery of the work will be assessed according to a system of continuous assessment through deliveries where the development of the work will be reviewed.
In order to apply all the percentages indicated in the previous table, the student will have to obtain in each part a score equal to or greater than 5, except for some work according to the lecturer´s criteria. In case of not obtaining this score, the grade of the approved part can be kept in the following courses according to the professor's criteria.
Attendance at practices is mandatory.
Those students who, for various reasons (see Article 10 of current regulations https://www.ucv.es/documentos/normativa/documento11.html), do not attend the assessment of the

subject on the official examination date, may be submit to the final assessment of the subject through an oral or written examination according to the criteria of the teacher.
In all written evaluations carried out on the subject, we will take into account the spelling, so for every misspellings (including accents) we will deducted 0.1 points of the final grade for a maximum of 2 points
*The use of artificial intelligence (AI)-based tools is subject to the discretion of the teacher, who may establish specific limits or conditions depending on the training or assessment activity.

MENTION OF DISTINCTION:
In accordance with the regulations governing the assessment and grading of subjects in force at UCV, the distinction of "Matrícula de Honor" (Honours with Distinction) may be awarded to students who have achieved a grade of 9.0 or higher. The number of "Matrículas de Honor" (Honours with Distinction) may not exceed five percent of the students enrolled in the group for the corresponding academic year, unless the number of enrolled students is fewer than 20, in which case a single "Matrícula de Honor" (Honours with 9 Distinction) may be awarded. Exceptionally, these distinctions may be assigned globally across different groups of the same subject. Nevertheless, the total number of distinctions awarded will be the same as if they were assigned by group, but they may be distributed among all students based on a common criterion, regardless of the group to which they belong. The criteria for awarding "Matrícula de Honor" (Honours with Distinction) will be determined according to the guidelines stipulated by the professor responsible for the course, as detailed in the "Observations" section of the evaluation system in the course guide.

Learning activities

The following methodologies will be used so that the students can achieve the learning outcomes of the subject:

M1 On-site training activity aimed primarily at acquiring knowledge acquisition skills. It is characterised by the fact that students are spoken to. Also called master class or exposition, it refers to the oral presentation made by the teacher, (with the support of blackboard, a computer and a projector for the display of texts, graphs, etc.), in front of a group of students. They are expository, explanatory or demonstrative sessions of contents. The size of the group is determined by the limit or physical capacity of the classroom; therefore, it is a single group.

M2 On-site training activity aimed primarily at obtaining knowledge application and research skills. Knowledge is built through interaction and activities. The activity consists of supervised monographic sessions with shared participation (teachers, students, experts). The size of the group is variable, from one large group to various small groups, with a minimum of 6 students to ensure interaction. The evaluation will be based on follow-up records kept by the teacher. Participation and the development of the capacity to problematize should be taken into account.

M4 On-site training activity in groups that takes place in the classroom. It includes working with documents and formulating ideas without handling animals, organs, objects, products, or corpses (e.g., work with articles or documents, clinical case studies, diagnostic analyses, etc.). It would correspond to "Animal-free supervised practical work", type e1, from the European evaluation of EAEVE. The size of the group is variable, in a range of 10 to 20 students.

M5 On-site training activity in groups that takes place in the Computer Lab where the computer is used as support for learning. It includes work with computer models, specific software, Web queries, etc. It would correspond to "Animal-free supervised practical work", type e1, from the European evaluation of EAEVE. The size of the group is variable, in a range of 10 to 20 students.

M6 On-site training activity in groups carried out in the laboratory. It includes the sessions where the students develop laboratory experiments, make dissections or use the microscopes for the study of histological or histopathological samples actively and autonomously, under the supervision of the professor. It also includes work with healthy animals, objects, products, corpses (e.g., animal handling, bacteriological practices, physiology or biochemistry, meat inspection, etc.). It would correspond to the "Supervised practical non-clinical animal work" type e2 of the European evaluation of EAEVE. The size of the group is variable, in a range of 10 to 20 students.

M8 A set of on-site training activities carried out by the teacher to provide personalised attention to the student or in small groups with the aim of reviewing and discussing the materials and topics presented in classes, seminars, readings, carrying out projects, etc. The aim is to ensure a truly comprehensive education of the student rather than a mere transfer of information. It is, therefore, a personalized assistance relationship in which the tutor assists, facilitates and guides one or more students in the learning process.

M9 Set of processes that attempt to evaluate the learning outcomes of students expressed in terms of acquired knowledge, capacities, skills or abilities developed and manifested attitudes. It covers a wide range of activities that can be developed for students to demonstrate their training (e.g. written, oral and practical tests, projects or assignments). It also includes the Official Calls.

M10 Autonomous training activity, including activities and coursework, bibliographic searches. The results obtained from unsupervised group and teamwork will be evaluated, with particular attention paid at the time of evaluation to the acquisition of specific knowledge development skills through group work.

M11 Autonomous training activities related to personal study, or the preparation of individual course assignments. The individual preparation of readings, essays, problem solving, papers, reports, etc. will be evaluated through presentations or submissions during theoretical classes, practical classes, seminars and/or tutorials. The evaluation of the submitted papers will consider the structure of the paper, the quality of the documentation, originality, spelling and presentation.

IN-CLASS LEARNING ACTIVITIES

	LEARNING OUTCOMES	HOURS	ECTS
Theoretical lessons (TL) M1	R1	43,00	1,72
Laboratory Practice (LP) M6	R2	12,00	0,48
Tutorial M8	R1, R2, R3	2,00	0,08
Evaluation (Ev) M9	R1, R2, R3	3,00	0,12
TOTAL		**60,00**	**2,40**

LEARNING ACTIVITIES OF AUTONOMOUS WORK

	LEARNING OUTCOMES	HOURS	ECTS
Group work M10	R1, R3	25,00	1,00
Individual work M11	R1, R3	65,00	2,60
TOTAL		**90,00**	**3,60**

Description of the contents

Description of the necessary contents to acquire the learning outcomes.

Theoretical contents:

Content block	Contents
UNIT 1: General Microbiology	1. History of Microbiology. Koch postulates. Microorganisms and our environment: beneficial aspects and conditions. Types of microorganisms. 2. Procariotic cell: structure and function. Bacterial morphology, size and grouping types. Cell wall external structures. Cell wall. Cell wall internal structures. 3. Atypical bacterial forms. L forms. Protoplasts and spheroplasts. Spores. Sporogenesis and germination. Microscopy. 4. Microbial nutrition and growth. Growth curve. Bacteria trophic strategies. Carbon metabolism and energy production. Catabolic and anabolic reactions. Cellular uptake of nutrients. 5. Control of microorganisms. Kinetics of microbial death. Conditions affecting the antimicrobial agent. Physical and chemical antimicrobial. 6. The bacterial genome. Mutation and evolution. Structure of DNA. Plasmids, Bacteriophages, Transposons. 7. Bacterial pathogenic mechanisms. Pathogenicity and virulence: concept. Virulence factors. Colonization and tissue tropism. Adhesion and adhesive factors. Cellular invasion and phagocytosis. Tissue damage mediated by exotoxines and enzymes. Endotoxines. 8. Microbial taxonomy. Introduction and overview. Classification systems. Microbial phylogeny. Phylogenetic trees. Bergey Manual microbial systematics. 9. Virus, viroids and prions. Characteristics, structure and viral replication. Viral pathogenicity. Viral infection control.

UNIT 2: Special Microbiology

10. Gram positive cocci: Familia *Streptococcaceae*: Géneros *Streptococcus, Enterococcus* y *Lactococcus*. Familia *Micrococcaceae*: Género *Staphylococcus*.
11. Gram positive rods: non sporulated rods. genus *Lactobacillus, Listeria and Erysipelotrix.*
12. Gram positive rods: irregular non sporulated rods. genus *Corynebacterium, Rhodococcus, Arcanobacterium, Actinomyces, Nocardia and Streptomyces*
13. Sporulated gram positive cocci and rods: genus *Bacillus* and *Clostridium*
14. Gram negative bacteria: non fermentative bacteria. genus *Campylobacter, Helicobacter, Pseudomonas, Burkholderia, Moraxella, Brucella, Bordetella and Francisella*
15. Oxidase positive fermentative bacteria*. Family Vibrionaceae, Aeromonadaceae and Pasteurellaceae.*
16. Oxidase negative fermentative bacteria. Family *Enterobacteriaceae*: genus *Escherichia, Shigella, Salmonella, Klebsiella, Enterobacter, Proteus, Yersinia*. Other interesting veterinary genus.
17. Anaerobic bacteria . Genus *Dichelobacter (Bacteroides*), Genus *Fusobacterium*
18. Order *Rickettsiales*: Family *Rickettsiaceae* and *Ehrlichiaceae*. Order *Chlamydiales*: Family *Chlamydiaceae*. Order *Legionellales*: Family *Coxiellaceae*.
19. Spirochets: Family *Spirochaetaceae, Leptospiraceae, Serpullinaceae*
20. Mycobacteria and related bacteria. Most significant pathogenic species of interest; differential characteristics.
21. Mycoplasms: Family *Mycoplasmataceae*. genus *Mycoplasma, Ureaplasma and Candidatus*
22. Coated double-stranded DNA Virus: Fam. *Poxviridae,* Fam. *Asfarviridae*, Fam. *Iridoviridae*
23. Double-stranded DNA Virus: Fam. *Herpesviridae.*
24. Uncoated Double-stranded DNA Virus: Fam. *Adenoviridae, Papillomaviridae, Polyomaviridae*
25. Uncoated Single-stranded DNA Virus (continued): Fam. *Parvoviridae, Circoviridae.*
26. Uncoated fragmented Double-stranded RNA: Fam.

Reoviridae, Birnaviridae.
27. Coated fragmented negative Single-stranded RNA Fam. *Paramyxoviridae*, Fam. *Rhabdoviridae*, Fam. *Filoviridae, Fam. Bornaviridae*
28 Coated fragmented negative Sin*gle-stranded RNA. Fam. Orthomyxoviridae, Bunyaviridae*
29. Coated non fragmented positive Single-stranded RNA. Fam. *Coronaviridae*, Fam. *Arteriviridae*. Fam. *Togaviridae, Flaviviridae*.
30. Uncoated non fragmented positive Single-stranded RNA. Fam. *Picornaviridae*, *Caliciviridae and Fam. Astroviridae*
31. Positive Single-stranded RNA Virus. Fam*. Retroviridae*

Organization of the practical activities:

	Content	Place	Hours
PR1.	Microbial inoculation according to the type of sample and culture medium.	Laboratory	2,00
PR2.	Stains: simple and differential most used in bacteriology. Differentiation of the morphology, arrangement and staining characteristics of the most common bacteria.	Laboratory	2,00
PR3.	Bacterial count	Laboratory	2,00
PR4.	Microbial susceptibility tests.	Laboratory	2,00
PR5.	Gram negative rods. Biochemical characteristics	Laboratory	2,00
PR6.	Gram positive cocci. Biochemical characteristics	Laboratory	2,00

Temporary organization of learning:

Block of content	Number of sessions	Hours
UNIT 1: General Microbiology	13,00	26,00
UNIT 2: Special Microbiology	17,00	34,00

References

BASIC REFERENCES:

- MARKEY, B., LEONARD, F., ARCHAMBAULT, M., CULLINANE, A. & MAGUIRE, D (2013).“Clinical Veterinary Microbiology”.Philadelphia: Mosby Elsevier.

- MCVEY, D.S., KENNEDY, M., WILKES, R. & CHENGAPPA, M.M. (2022). Veterinary Microbiology (4th Edition). Wiley-Blackwell.

- QUINN, P.J., MARKEY, B.K., LEONARD, F.C., FITZPATRICK, E.S., FANNING, & HARTIGAN, P.J. (2018). Microbiología y enfermedades infecciosas veterinarias (2ª Edición). Zaragoza: Acribia.

- QUINN, P.J., MARKEY, B.K., CARTER, M.E., DONELLY, W.J. & LEONARD, F.C. (2008). Microbiología y enfermedades infecciosas veterinarias. Zaragoza: Acribia.

- TORTORA, G. J., FUNKE, B.R. & CASE C.L. Introducción a la Microbiología (2017). Buenos Aires: Médica Panamericana.

ADDITIONAL REFERENCES:

- MADIGAN, M.T., MARTINKO, J.M., BENDER, K.S., BUCKLEY, D.H. & STAHL, D.A. (2015) Brock Biología de los microorganismos. (14ª Edición). Madrid: Pearson.

- WILLEY, J.M., SANDMAN, K.M. & WOOD, D.H. (2022). Prescott’s Microbiology. McGraw-Hill.

- WILLEY, J.M., SANDMAN, k. & WOOD, D. (2020). Prescott’s Microbiology. McGraw-Hill.

- WILLEY, J.M., SHERWOOD, L.M. & WOOLVERTON, C.J. (2009). Microbiología de Prescott,Harley y Klein. Madrid: McGraw-Hill-Interamericana de España, S.A.U.

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