

## 30804 - Microbiology

### Información del Plan Docente

Academic Year	2017/18
Faculty / School	105 - Facultad de Veterinaria
Degree	568 - Degree in Food Science and Technology
ECTS	6.0
Year	1
Semester	Second semester
Subject Type	Basic Education
Module	---

### 1.General information

#### 1.1.Introduction

#### 1.2.Recommendations to take this course

#### 1.3.Context and importance of this course in the degree

#### 1.4.Activities and key dates

### 2.Learning goals

#### 2.1.Learning goals

#### 2.2.Importance of learning goals

### 3.Aims of the course and competences

#### 3.1.Aims of the course

#### 3.2.Competences

### 4.Assessment (1st and 2nd call)

#### 4.1.Assessment tasks (description of tasks, marking system and assessment criteria)

### 5.Methodology, learning tasks, syllabus and resources

#### 5.1.Methodological overview

The process of learning is based on:

The course is divided into 30 one-hour participatory lectures, 10 hours of seminars in which students prepare the subject in small groups, expose and respond to questions, and 20 hours of laboratory work.

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Documentation for each topic is hosted within the Moodle 2 platform, under the name of the course. Thus, the student can access to it whenever s/he wants along the academic year. The available material consists of a comprehensive set of Power Point notes including all the basic concepts reviewed during the lecture. Student participation will be encouraged during the lecture through problem-based learning activities.

Laboratory practices will be carried out in two-hour sessions. As for the lecture materials, supporting laboratory documentation will be host within the Moodle 2 platform.

In order to maintain permanent contact with students, both the use of electronic mail and personal tutorials are available. In addition, all available supporting material either for individual or group work (seminars) will be provided to the students.

### **5.2.Learning tasks**

#### **Theoretical agenda**

#### **BLOCK 1. GENERAL AND SPECIAL BACTERIOLOGY**

##### **Descriptors:**

Procariotic and eucariotic organisms. Microscopic examination of bacteria. Chemical bacterial composition. Bacterial physiology. Bacterial nutrition. Bacterial reproduction. Bacterial genetics. Factors produced by bacteria. The control of bacterial populations. Bacterial identification. Bacterial taxonomy. Major bacterial groups of interest in Food Technology and Science.

##### **Competences:**

The aim of this first block is to acquaint the student with the general characteristics of bacteria within the microbial world, their taxonomic status, constitution, observation methods, management, metabolism, mechanisms for exchanging information and their influence in relation to food and man

##### **Teaching-learning activities:**

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23 one-hour lectures (theoretical content)

16 hours of laboratory work (bacterial management and identification)

### **BLOCK II. GENERAL MICOLOGY**

Descriptors:

General characteristics of fungi. Methods of study of fungi.

**Competences:**

The aim of this second block is to acquaint the student with the general characteristics of fungi, its constitution, methods of observation, management, metabolism, mechanisms for exchanging information and their role in relation to the food and man

**Teaching-learning activities:**

1 one-hour lecture (theoretical content)

2 hours of laboratory work (fungi management and identification)

### **BLOCK III. GENERAL VIROLOGY**

Descriptors:

Concept and historical development. Virus nature, structure and composition. Viroids and prions. Plant and animal

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viruses. Virus genetics. Virus classification. Virus culture. Intracellular viral reproduction. Multiplication of DNA and RNA virus. Methods of study of virus. Virus titration. Inactivation (disinfection). Bacteriophages. Phagetyping. Micophages and Cianophages.

### **Competences:**

The aim of this third block is to acquaint the student with the general characteristics of the virus, its constitution, methods of observation, management, replication, mechanisms for exchanging information and their role in relation to the food and man

### **Teaching-learning activities:**

2 one-hour lectures (theoretical content)

## **BLOCK IV. PARASITOLOGY**

### Descriptors:

Biological relationship of parasitism. Parasites. Spread of parasites. Biological cycles. Parasite/host relationship. Systematics and taxonomy. Parasites classification. Protozoa, helminths and arthropods: general characteristics, classification, study of the most important genera in relation to food and man.

### **Competences:**

The aim of this fourth block is to acquaint the student with the general characteristics of the biological relationship of parasitism in the microbial world, morphology and biology of parasites, parasite/host/environment relationships and their role in relation to food and man.

### **Teaching-learning activities:**

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4 one-hour lectures (theoretical content)

2 hours of laboratory work (parasite identification)

### **BLOCK V. APPLIED MICROBIOLOGY**

Descriptors:

Microorganisms involved in health and food hygiene. Microorganisms of interest in the food industry. Mycelial fungi and yeasts. Major food-related virus. Industrial microbiology. Fundamentals. Industrial uses of bacterial and fungal microorganisms.

**Competences:**

The objective of this fifth block is to acquaint the student with those microorganisms that are related to food and the effects they have on them, either favourable or unfavourable, as well as pathogenic microorganisms conveyed by food that produce disease in man, and mechanisms they develop to act on the food and/or man. In this block it is also considered the taxonomic position of microorganisms and the relationships between them. The importance of microorganisms in different industry fields is also included.

**Teaching-learning activities:**

Seminars: 10 hours devoted to the development of these issues with active student participation.

Individual work: 5 hours spent reviewing the different topics in the seminars.

### **PERSONAL TUTORIALS**

A fixed schedule for personal tutorials is not set, however professors will be available to students by appointment and through email.

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### PRACTICAL PROGRAMME

It has 5 sessions of compulsory student attendance which will last for approximately 4 hours each. The content of the practical sessions is as follows:

1. Standards for working at microbiology laboratories. Common material and equipment. Cleaning and maintenance of equipments. Distribution of laboratory areas. Equipment sterilization and preparation of culture media. The handling of the optical microscope. Simple staining.

2. Sampling. Culture of aerobic and anaerobic microorganisms on solid medium and broth. Plating techniques. Gram staining. Microscopic observation of bacteria.

3 Quantitative study of bacterial populations. Biochemical study of microbial activity for bacterial identification.

4. Microorganism identification through immunological reactions. This practice will be taught in English.

5 Identification of fungi and yeasts. Parasitology

### 5.3.Syllabus

#### 5.3.1. Lectures

#### I. MICROBIOLOGY

Lecture 1. Introduction to Microbiology for CTA.

Lecture 2. Prokaryotic and eukaryotic organisms.

Lecture 3. Constant elements of bacteria.

Lecture 4. Inconstant elements of bacteria.

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Lecture 5. Microscopic examination of bacteria.

Lecture 6. Chemical constitution of bacteria.

Lecture 7. Bacterial physiology.

Lecture 8. Bacterial metabolism for synthesis.

Lecture 9. Bacterial nutrition.

Lecture 10. Bacterial reproduction.

Lecture 11. Criteria for classification and identification of bacteria.

Lecture 12. Bacterial genetics.

Lecture 13. The genetic transfer phenomena.

Lecture 14. Bacterial factors.

Lecture 15. Physical and chemical agents that act on the life of microorganisms.

Lecture 16. Bacterial taxonomy.

Lecture 17. *Acetobacter* and *Gluconobacter* . *Pseudomonas* ( *P. aeruginosa* ).

Lecture 18. Coliforms.

Lecture 19. *Salmonella* , *Shigella* , *Yersinia enterocolitica* . *Plesiomonas* ( *P. shigelloides* ).

Lecture 20. *Campylobacter* ( *C. coli*, *C. jejuni* ). *Aeromonas* ( *A. hydrophila* ). *Vibrio* ( *V. cholerae*, *V. parahaemolyticus* ).

Lecture 21. *Carnobacterium* , *Lactobacillus* , *Lactococcus* and *Leuconostoc* .

Lecture 22. *Bacillus cereus* . *Clostridium* ( *C. perfringens*, *C. botulinum* ). *Listeria monocytogenes* .

Lecture 23. *Staphylococcus aureus* ( *S. coagulase +* ). *Micrococcus* . *Streptococcus* . *Enterococcus* .

## II. MYCOLOGY

Lecture 24. Mycology. General characteristics of fungi.

### **III. VIROLOGY**

Lecture 25. General virology.

Lecture 26. Bacteriophages.

### **IV PARASITOLOGY**

Lecture 27. General considerations on the study of parasites.

Lecture 28. Overview protozoa.

Lecture 29. Overview of helminths.

Lecture 30. Overview of arthropods as contaminants of animal- and vegetable-derived foods.

#### **5.3.2. Practical sessions**

Session 1: The laboratory of microbiology. Culture media. Optical microscopy. Basic stains.

Session 2: Sampling, plating techniques, interpretation of bacterial growth. Specific stains.

Session 3: Quantitative study of bacterial populations and identification of bacteria.

Session 4: Serological diagnostic techniques.

Session 5: Characterization and identification of fungi and parasites.



## 5.4. Course planning and calendar

### Schedule of lectures, paper presentations and exams

The dates and key milestones of this subject are described in detail, along with the other subjects of the second semester of the first year in the "Programme for the 2<sup>nd</sup> quarter of the 1<sup>st</sup> year of CTA" held in the Faculty of Veterinary Medicine website.

### Planning MICROBIOLOGÍA subject in ECTS

Credits: 6 ECTS (150 hours of student work)

Students and groups: 60 students, one group of theoretical teaching and 6 of practical teaching.

Experimentality factor: 3

## 5.5. Bibliography and recommended resources

- Acha, Pedro N. Zoonosis y enfermedades transmisibles comunes al hombre y a los animales. Volumen III, Parasitosis / Pedro N. Acha, Boris Szyfres. 3a ed. Washington, D.C.: Organización Panamericana de la Salud, 2003
- Brock: Biología de los microorganismos / Michael T. Madigan... [et al.]; coordinación Ricardo Guerrero ; traducción Coral Barrachina ... [et al.]; revisión técnica, Francisco Ruiz Berraquero. - 12<sup>a</sup> ed., reimp. Madrid [etc.]: Pearson Education, D. L. 2011
- Euzéby, Jacques. Los parásitos de las carnes: epidemiología, fisiopatología, incidencias zoonóticas / Jacques Euzéby ; traducido por, Caridad Sánchez Acedo [ et al.] . Zaragoza: Acribia, 2001
- Gállego Berenguer, Jaime. Manual de parasitología: morfología y biología de los parásitos de interés sanitario / Jaime Gállego Berenguer. [2a. ed.] Barcelona: Edicions Universitat de Barcelona, D.L. 2003.
- Meaney, Peter. Insect pests of food premises /by Peter Meaney. Caerphilly: National Britannia Ltd., 1998
- Mossel, David Alexander Antonius. Microbiología de los alimentos: Fundamentos ecológicos para garantizar y comprobar la integridad (inocuidad y calidad) microbiológica de los alimentos / D.A.A. Mossel, B. Moreno García y Corry B. Struijk . 2<sup>a</sup> ed. Zaragoza: Acribia, 2003
- Parasitism: the diversity and ecology of animal parasites / Albert O. Bush. Cambridge : Cambridge University Press, 2001
- Prescott, Lansing M.. Microbiología / Lansing M. Prescott, John P. Harley, Donald A. Klein ; [traducción, Carlos Gamazo de la Rasilla , Iñigo Lasa Uzcudum]. 5a. ed., [traducción de la 5a ed. inglesa] Madrid [etc.] : McGraw-Hill , 2004
- Roberts, Larry S. Gerald D. Schmidt & Larry S. Roberts' foundations of parasitology /Larry S. Roberts, John Janovy. 9th New York : McGraw Hill, 2012
- Tortora, Gerard J. Introducción a la microbiología / Gerard J. Tortora, Berdell R. Funke, Christine L. Case. - 9<sup>a</sup> ed. Buenos Aires [etc.] : Editorial Médica Panamericana, cop. 2007
- Willey, Joanne M.. Microbiología / Joanne M. Willey, Linda M. Serwood, Christopher J. Woolverton. 7<sup>a</sup> ed. (3<sup>a</sup> ed. en español) Madrid [etc.]: McGraw-Hill, cop. 2009