



Universitat de Lleida

# DEGREE CURRICULUM **FOOD MICROBIOLOGY AND PARASITOLOGY**

Coordination: COLAS MEDA, MARIA DEL PILAR

Academic year 2023-24

## Subject's general information

<b>Subject name</b>	FOOD MICROBIOLOGY AND PARASITOLOGY			
<b>Code</b>	102771			
<b>Semester</b>	2nd Q(SEMESTER) CONTINUED EVALUATION			
<b>Typology</b>	<b>Degree</b>	<b>Course</b>	<b>Character</b>	<b>Modality</b>
	Double bachelor's degree: Degree in Human Nutrition and Dietetics and Degree in Physiotherapy	2	COMPULSORY	Attendance-based
<b>Course number of credits (ECTS)</b>	9			
<b>Type of activity, credits, and groups</b>	<b>Activity type</b>	<b>PRALAB</b>	<b>PRAULA</b>	<b>TEORIA</b>
	<b>Number of credits</b>	3.9	0.4	4.7
	<b>Number of groups</b>	2	1	1
<b>Coordination</b>	COLAS MEDA, MARIA DEL PILAR			
<b>Department</b>	FOOD TECHNOLOGY, ENGINEERING AND SCIENCE			
<b>Teaching load distribution between lectures and independent student work</b>	Contact hours: 90 - Lectures: 45 - Lab: 41 - Seminar: 4			
<b>Important information on data processing</b>	Consult <a href="#">this link</a> for more information.			
<b>Language</b>	Catalan (100%)			
<b>Distribution of credits</b>	Lectures: 4.5 Laboratory: 4.1 Seminar: 0.4			

Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
CASTELLS ROCA, LAIA	laia.castells@udl.cat	1,9	
COLAS MEDA, MARIA DEL PILAR	pilar.colas@udl.cat	6,5	
PUJOL CARRION, NURIA	nuria.pujol@udl.cat	4,5	

## Subject's extra information

This course introduces students into the microbial world (viruses, bacteria, fungi, protozoa and helminths), presenting basics about their structure, physiology, genetics and pathogenicity, and making a special impact on microbiology and parasitology of each food group, addressing issues such as spoilage, pathogens and toxicology, prophylaxis and the effect of the main conservation methods used to control food microorganisms.

## Learning objectives

This course introduces students into the microbial world (viruses, bacteria, fungi, protozoa and helminths), firstly presenting basics about their structure, physiology, genetics and pathogenicity, and then make a special emphasis on microbiology and parasitology of each group of food, with a special interest in the way by which alterations occur, key food pathogens, toxicology, prophylaxis and the effect the main conservation methods used on microorganisms.

## Competences

### Basic skills

CB3 That students have the ability to gather and interpret relevant data (usually within their area of study) to make judgments that include a reflection on relevant social, scientific or ethical issues. Specific skills

### Specific skills

CE13 Knowing the microbiology, parasitology and toxicology of foods.

### General skills

CG4. Communicate effectively, both orally and in writing, with people, health professionals or industry and the media, knowing how to use information and communication technologies, especially those related to nutrition and lifestyle habits.

### Transversal skills:

CT5. To acquire essential notions of scientific thinking.

CT2 Mastering a foreign language

## Subject contents

### **PART 1. General Concepts of Microbiology (22 hours)**

Unit 1.- The prokaryotic cell. Bacterial morphology and sizes. The plasma membrane. The cell wall of Gram-positive and Gram-negative bacteria. The bacterial chromosome and ribosomes. Bacterial capsule and other external structures. Bacterial movement. Reserve materials. The endospore.

Unit 2. The eukaryotic cell. Differential properties regarding the prokaryotic cell. Endosymbiont theory. The hydrogenosome. Cytoplasmic organelles. The fungal cell. The protozoan cell.

Unit 3. Bacterial genetics. The bacterial chromosome. Mutagenesis. Conjugation. Transformation. Transduction. Plasmids: concept and types. Transposons.

Unit 4. Microbial metabolism. Energy sources. Nutritional requirements. Culture media, types and preparation techniques. Breathing. Fermentations. Growth curve. Regulation of microbial metabolism: enzyme reactions, regulation final product, catabolite repression, metabolic pathways.

Unit 5. Control of microbial growth. Action of physical and chemical agents. Microbial resistance to cold and heat. Action of moisture and microbial needs. Chemicals. Antibiotics. Antifungals. Microbicides.

Unit 6. Virology. General characteristics. Viruses. Viral infections of the digestive tract.

Unit 7. Human Microbiology. Bases of microbial pathogenicity. Microbial flora of the human body. Opportunistic flora. Infection and disease. Invasiveness, pathogenicity and virulence. Virulence factors and pathogenic mechanisms. Exotoxins and endotoxins. Constitutive defense mechanisms.

Unit 8. Immunology. Immunity to microbial infections.

### **PART 2. Food Microbiology (14 hours)**

#### **I. NATURAL SPOILAGE AND GENERAL PRINCIPLES OF FOOD MICROBIAL ALTERATION**

Unit 9. Natural food contamination. Origin of microbial contamination of food and food products. The food handler as a source of contamination. Microbiological monitoring of the environment.

Unit 10. General principles of food spoilage. Intrinsic factors: water activity ( $a_w$ ), pH, redox potential, nutrients, antimicrobials, structure and composition of food and protective barriers. Extrinsic factors: temperature, humidity, gaseous atmosphere. Technological treatments. Implicit factors. Interaction of factors, synergisms and antagonisms.

#### **II. MICROBIOLOGY OF DIFFERENT KINDS OF FOOD**

Unit 11. Microbiology of drinking water. Native and non-native microbiota. Types of water. Microbiological parameters that determine water quality. Major pathogens: disease and epidemiology. Purification and distribution of water for human consumption.

Unit 12. Microbiology of plant products. Microbiological alteration of: i) cereals, flours and derivatives, ii) fruits, juices, vegetables and derivatives. Major foodborne pathogens.

Unit 13. Microbiology animal products Microbiological alteration of: i) meat and meat products, ii) poultry iii) eggs and egg products, iv) dairy products, v) fish and other foods of aquatic origin. Major foodborne pathogens.

Unit 14. Microbiology of canned foods. Canned foods: definition and types. Classification of canned foods according to their acidity. Biological sterility and commercial sterility. Major pathogens and cause alterations in canned foods. Major alterations and origin. Systematic review of preserves and microbiological analysis.

### **PART 3. Food Parasitology (12 hours)**

Unit 15. Introduction to Parasitology. Definition. Adaptations to parasitism. Effects of the parasite on the host. Host reaction against the parasite. Parasites and host weakened. Economic significance of contamination by parasites.

Unit 16. Main parasites transmitted by water and plants. Relationship between fecal contamination, water and plant food. *Entamoeba histolytica*, *Giardia*, *Cryptosporidium* sp, *Blastocystis hominis*, *Fasciola hepatica*, *Echinococcus* sp, *Enterobius vermicularis*, *Ascaris lumbricoides*. Taxonomy. Morphology. Life cycle. Symptomatology. Epidemiology. Routes of contamination of food. Prevention and control. Situation in Spain.

Unit 17. Main parasites transmitted by meat and fish. *Toxoplasma gondii*, *Taenia* sp., *Trichinella spiralis*, *Anisakis* sp. Life cycle. Symptomatology. Epidemiology. Routes of contamination of food. Prevention and control. Situation in Spain.

## Seminars (4 hours)

1. Applications of microbiology in human nutrition and health.
2. Vaccines.

## Laboratory practical lessons (total 38 hours):

### PART I (19 hours)

Practice 1: Preparation of different culture media. The use and interpretation of differential culture media.

Practice 2: Making a throat swab and isolation of different living organisms. Characterization of different types of microbial colonies. Identification of hemolytic toxin producing bacteria.

Practice 3: Identifying other mechanisms of toxicity carried out by pathogenic bacteria catalase activity.

Practice 4: Identification, to species level, of two different bacteria by biochemical tests (Enterotube gallery).

Practice 5: Test of antibiotic activity.

Practice 6: Analysis of disinfectants.

Practice 7: Immunodetection of a pathogen.

Practice 8: Microbial stains.

Practice 9: Isolation of a plasmid.

Practice 10: Microbial growth curve.

### PART II (19 hours)

Practice 11: Introduction to a Food Microbiology laboratory and sample preparation

Practice 12: General counting of microorganisms:

Aerobic plate count at 30 ° C.

Count of molds and yeasts.

Observation and identification of filamentous fungi.

Enterobacteriaceae and Kligler test.

Anaerobic microorganisms.

Coagulase positive staphylococci.

Enterococci counts.

Interpretation and report of results.

Resolution of practical cases.

Practice 13: Observation of food parasites under microscope.

It is MANDATORY that students have the following individual protection teams (EPI) in the course of teaching practices.

Lab coat

Safety glasses

Gloves for chemical / biological protection

Sanitary masks

The EPI can be purchased at UdL's ÚDELS store

Center for Cultures and Cross-Border Cooperation - Cappellet Campus

Carrer de Jaume II, 67. 25001 Lleida

## Methodology

In principle, and if the health conditions do not prevent it, the methodology of the subject will be that of master classes, seminars and practices. Exams, seminars and internships will be face-to-face, and will be compulsory.

## Evaluation

This subject consists of 6 evaluation blocks

**BLOCK 1.- GENERAL MICROBIOLOGY THEORY. Value 25% => Recoverable. Minimum mark: 5.0**

Activity 1.- Exam of the theory of General Microbiology. Value: 25%.

**BLOCK 2.- FOOD MICROBIOLOGY THEORY. Value 20% => Recoverable. Minimum mark: 5.0**

Activity 2.- Exam of the Food Microbiology part. Value: 20%.

**BLOCK 3.- FOOD PARASITOLOGY THEORY. Value 20% => Recoverable. Minimum mark 5.0**

Activity 3.- Exam of the theory of the Food Parasitology part. Value: 20%

**BLOCK 4.- GENERAL MICROBIOLOGY PRACTICES. Value 15% => Recoverable. Minimum mark: 5.0**

Activity 4.- Practical exam of the General Microbiology part. Value: 15%

**BLOCK 5.- FOOD MICROBIOLOGY AND PARASITOLOGY PRACTICES. Value 10% => Not recoverable.**

Activity 5.- Food Microbiology+Food Parasitology practices exam. Value: 10%.

**BLOCK 6.- SEMINARS. Value 10% => Not recoverable.**

Activity 6.- General Microbiology Seminars. Value: 10%

**The unjustified absence to any of the sessions of blocks 4, 5 or 6 suppose the suspense of that block.**

In relation to block 4, what is recoverable is the exam, the laboratory practices are not repeated.

### Theory and practices:

The subject is evaluated continuously. For this, 3 exams will be carried out throughout the semester. In general, the exams will follow the same scheme: for the theory part, a test and a set of short questions; for the practical part, the evaluation may include questions and/or concept tests presented in practices or in seminars. For the evaluation of the seminars, students must carry out group work and present the results publicly. Attendance control will be carried out, and the public presentation and a written summary of the seminar will be evaluated.

### Passing the subject:

To pass the subject it is essential to obtain a score equal to or greater than 5 in block 1, 2, 3 and 4. The subject is passed with a grade  $\geq 5$ .

### **COPY AND PLAGIARISM:**

In case of detecting copy and/or plagiarism during the evaluation activities, the activity will be withdrawn and it will be suspended. It may also lead to the opening of a disciplinary file.

### **JUSTIFICATION OF ABSENCES**

In relation to the justification of the absences, the reasons for which the absence is considered justified, will be the same as those stated in the **NORMATIVA D'AVALUACIÓ I CALIFICACIÓ DELS APRENTATGES EN ELS GRAUS I MASTERS** for not attending the Assessment tests scheduled in the teaching guide or on the degree

website.

## ALTERNATIVE ASSESSMENT

In the case of students who opt for the alternative assessment, it will consist of the following:

- Compulsory attendance at all practical sessions (blocks 4 and 5).
- Presentation of a seminar on the day, time and modality (face-to-face or videoconference) to be arranged with the CMB teachers: value 10%
- Exam of all the content of theory and practices (blocks 1 to 5). This exam can be recovered. Minimum mark to pass: 5.0.

## Bibliography

### A) BASIC BIBLIOGRAPHY

- Frazier, W.C. y D.C. Westhoff. (1993). Microbiología de los alimentos. Acribia, Zaragoza.
- I.C.M.S.F. (1983). Ecología microbiana de los alimentos. Vol I.: Factores que afectan a la supervivencia de los microorganismos en los alimentos. Acribia, Zaragoza.
- I.C.M.S.F. (2001). Microorganismos de los alimentos 6. Ecología microbiana de los productos alimentarios. Acribia, Zaragoza.
- MADIGAN, M., MARTINKO, J. y PARKER, J. (2003). Brock Biología de los Microorganismos. 10ª Edición. Ed. Prentice-Hall. Madrid.
- MARKELL, E.K., VOGEL, M. y JOHN, D.T. (1990). Parasitología Médica. Editorial Interamericana×McGraw-Hill.
- PRESCOTT, L.M, HARLEY, J.P y KLEIN, D.A (2004). Microbiología. McGraw-Hill Interamericana, Madrid.

### B) COMPLEMENTARY BIBLIOGRAPHY

- ACHA, P.N. y SZYFRES, B. (1989). Zoonosis y enfermedades transmisibles comunes al hombre y a los animales. Organización Panamericana de la Salud.
- ALLAERT, C. y ESCOLÀ, M. (2002). Métodos de análisis microbiológicos de los alimentos. Díaz de Santos, Madrid.
- Jay, J.M. (2002). Microbiología moderna de los alimentos. Acribia, Zaragoza.
- MOSSEL, D.A.A., J.E.L. CORRY, C.B. STRUIJK *et al.* (1995). Essentials of the microbiology of foods. A textbook for advanced studies. John Wiley & Sons, Chichester.
- Mossel, D.A.A. y B. Moreno. (1985). Microbiología de los alimentos: fundamentos ecológicos para garantizar y comprobar la inocuidad de los alimentos. Acribia, Zaragoza.