



## COURSE DATA

### DATA SUBJECT

**Code:** 36371

**Name:** Food microbiology and parasitology

**Cycle:** Undergraduate Studies

**ECTS Credits:** 4.5

**Academic year:** 2026-27

### STUDY (S)

Degree	Center	Acad. year	Period
1212 - Degree in Gastronomic Sciences	Facultat de Farmàcia i Ciències de l'alimentació	2	First quarter

### SUBJECT-MATTER

Degree	Subject-matter	Character
1212 - Degree in Gastronomic Sciences	Food Microbiology and Parasitology	COMPULSORY

### COORDINATION

FUENTES FERRER MARIUS VICENT

DOMINGUEZ MARQUEZ MARIA VICTORIA

## SUMMARY

The subject Food Microbiology and Parasitology is mandatory in the second year of the Gastronomic Science Degree, which is taught at Faculty of Pharmacy of University of Valencia. This course includes a total of 4.5 ECTS credits to be taught in the first quarter of the academic year. The subject is divided in two parts: Food Microbiology and Food Parasitology.

Part of Microbiology of the course is structured around two core themes. The first part provides the student with an overview of the microbial world. It explores the various aspects of the biology of microorganisms: taxonomy, structure/function relationship, metabolism and physiology, growth and its control.

The second module, introduces students to the relationship between the human species and the microbial world, with special emphasis on the significance of microorganisms on health, nutrition and feeding of human beings. With this goal in mind, it addresses the basics of immunology and microbial pathogenesis, and explores the role of microorganisms as food producers, as responsible of food spoilage and as causative agents of foodborne infections and intoxications.



The main objectives of the Parasitology section are: to highlight the importance of food-borne contaminants, typical food parasites and food-spoiling parasites and the presentation of hygienic measures of prevention and control of food-borne parasitic diseases. To achieve these main objectives the Food Parasitology section consists of 15 items grouped into three parts: general concepts; protozoa, food-borne helminths and arthropods; and pest control and hygiene and processes.

Besides the food-borne transmission of microorganisms and parasites, the impact of the control and prevention of diseases aimed at reaching the Sustainable Development Goals (SDGs) of Agenda 2030 will also be reflected upon.

## PREVIOUS KNOWLEDGE

### RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

There are no specified enrollment restrictions with other subjects of the curriculum.

### OTHER REQUIREMENTS

In order to pass this course successfully, the student has to master the fundamentals of subjects such as Biochemistry and Biology.

## COMPETENCES / LEARNING OUTCOMES

### 1212 - Degree in Gastronomic Sciences

Know and know how to evaluate and prevent biological risks in food.

## DESCRIPTION OF CONTENTS

### 1. BASIC PRINCIPLES OF MICROBIOLOGY

Chapter 1.- Introduction to Microbiology.

The microbial world. Concept of microbe. The science of Microbiology. The historical evolution of Microbiology. Microbiology studies of Gastronomic Sciences

Chapter 2.- Types of microorganisms: Prokaryotic cells, Eukaryotic cells , viruses, submicroscopic particles and Prions

Chapter 3.- Structure and function of the prokaryotic cell I. Basics: The Cell Envelope.

Morphology and cell size. Cytoplasmic membrane: structure, function and differences between prokaryotic domains. Cell wall architecture in the domain Bacteria: Gram positive, Gram-negative, Acid-fast. Cell wall architecture in the domain Archaea. Capsules and mucosal layers. Pili and fimbriae. Flagellum of prokaryotes: structure and mobility. Chemotaxis. Protein secretion.



Chapter 4.- Structure and function of the prokaryotic cell II. Basics: Cytoplasmic Inclusions and the cellular matrix.

The cytoplasmic matrix: inclusion bodies, gas vesicles, nucleoid, ribosomes, plasmids. Cellular microcompartments. Bacterial endospores: structure, formation and germination. Comparison between prokaryotic and eukaryotic cells.

## 2. NUTRITION, METABOLISM AND MICROBIAL GROWTH

Chapter 5.- Basics of microbial nutrition.

Nutritional requirements of microorganisms. Nutritional types. Culture Media. Cellular uptake of nutrients: Transport and transport systems of the cell membrane.

Chapter 6.- Basics of microbial metabolism.

Catabolic diversity of the prokaryotic world. Catabolism of chemoorganotrophic heterotrophic microorganisms. Fermentation: concept and characteristics. Alcoholic fermentation. Lactic acid fermentation. Propionic acid fermentation. Fermentation in enteric bacteria. Fermentation in *Clostridium* spp. Anaerobic respiration: general concepts. Aerobic chemoorganotrophic processes: metabolism of sugars, organic acids, amino acids and lipids.

Chapter 7.- Microbial growth.

Bacterial cell division. Growth of bacterial populations: the growth curve. Formulation of exponential growth. Continuous culture: the chemostat. Methods of measurement of microbial growth. Influence of environmental factors on growth: temperature, pH, osmotic pressure, oxygen concentration, radiation, pressure. Microbial growth in natural environments. Biofilms.

Chapter 8.- Control of microbial growth.

Definition of frequently used terms. Methods of microbial control. Kinetics of microbial death. Variables affecting the efficacy of antimicrobial agents. Physical methods of control: heat, low temperatures, radiation, filtration. Antimicrobial chemicals for external use. Evaluation of antimicrobial efficacy. Antimicrobial chemotherapeutic agents, antibiotics and synthetic antimicrobials. Origin, mechanisms and transmission of antimicrobial drug resistance.

## 3. MOLECULAR BIOLOGY OF MICROORGANISMS

Chapter 9.- Basics of bacterial genetics: Genetic organization and mutation

Main characteristics of the processes of DNA replication, transcription and translation in prokaryotes. Mutations: molecular basis, types, effects, mutagens, isolation of mutants. The Ames test.

Chapter 10.- Bacterial genetic recombination

Genetic exchange in prokaryotes: transformation, transduction and conjugation. Plasmids: Concept and types



## 4. FERMENTED FOODS

Chapter 11.- Wine, beer and other fermented beverages.

Chapter 12.- Fermentation of fish and meat products.

Chapter 13.- Fermentation of vegetable products

Chapter 14.- Fermentation of dairy products

## 5. MICROBIAL ROLE IN FOODBORNE DISEASES

Chapter 15.- Introduction to food microbiology. Food as a substrate for microorganisms. Concentration of hydrogen ions. Moisture needs moisture. Redox potential. Nutrients. Inhibiting substances. Combined effects of these factors on growth.

Chapter 16.- Important microorganisms in food microbiology. Molds. Yeast. Bacteria. General characteristics: morphology, growth conditions, physiological properties and major genres.

Chapter 17.- Sources of microorganisms. Contamination by: vegetables and plants, animals, waste water, soil, water and the air. Contamination during handling and treatment.

Chapter 18.- General methods of microbiological analysis of foods.

Principle of food analysis. Sampling and microbiological analysis: general. Microorganisms indicators and indices. Total count of microorganisms. Microbiological examination of surfaces.

Chapter 19.- Foodborne Diseases : toxiinfection and food poisoning . Mechanisms of action of foodborne pathogens. Prevention and prophylaxis

Chapter 20.- Gram-positive cocci: *Staphylococcus aureus*, *Enterococcus*.

Chapter 21.- Bacillus Gram positive spore-forming *Bacillus cereus*, *Clostridium botulinum*, *Clostridium perfringens*.

Chapter 22- Bacillus Gram positive non-spore: *Listeria monocytogenes*, *Corynebacterium diphtheriae*.

Chapter 23.- Gram negative aerobic/microaerophilic: *Campylobacter*, *Brucella*

Chapter 24.- Facultative anaerobic gram-negative bacilli. *Enterobacteriaceae*: *Escherichia*, *Salmonella*, *Shigella*, *Yersinia*.



Chapter 25.- Facultative anaerobic gram-negative bacilli. *Vibrionaceae*: *Vibrio*, *Aeromonas*

Chapter 26.- Virus. Norovirus: Norwalk Virus, Rotavirus, Enterovirus, Hepatitis A Virus, Hepatitis E Virus, Prions

Chapter 27.- Fungi: mycotoxins

## **6. MICROBIAL ROLE IN FOOD SPOILAGE**

Chapter 28.-. Spoilage of cereals and cereal products. Spoilage of sugar and sugary products.

Chapter 29.- Spoilage of vegetables and fruits.

Chapter 30.-. Spoilage of meat and meat products. Spoilage of poultry meats.

Chapter 31. Spoilage of fish and seafood.

Chapter 32.- Spoilage of eggs.

Chapter 33.- Spoilage of milk and dairy products.

Chapter 34.- Spoilage of canned foods.

## **7. INTRODUCTION TO FOOD PARASITOLOGY**

General concepts of food parasitology: host and parasite; parasitism and parasitic diseases; types of hosts and types of parasites; parasitic contaminants, typical parasites of food and food-spoiling parasites. Systematic classification of parasites: protozoa, flukes, tapeworms, nematodes and arthropods.

Biological cycles of parasitic contaminants, food-spoiling parasites and typical parasites of food: basic concepts.

## **8. Parasitic contaminants in food**

Protozoa contaminating of water, fruit and vegetables and other foodstuffs. Basic concepts. Epidemiology and prevention.

Flukes and tapeworms contaminating water, fruit and vegetables and other foodstuffs. Basic concepts. Epidemiology and prevention.

Nematodes contaminating water, fruit and vegetables and other foodstuffs. Basic concepts. Epidemiology and prevention.



Arthropods contaminating water, fruit and vegetables and other foodstuffs. Basic concepts. Epidemiology and prevention.

### 9. PARASITES TYPICALLY FOUND IN FOOD

Protozoa typical of meat products. Basic concepts. Epidemiology and prevention.

Tapeworms typical of meat products. Basic concepts. Epidemiology and prevention.

Nematodes typical of meat products. Basic concepts. Epidemiology and prevention.

Trematodes typical of fish products. Basic concepts. Epidemiology and prevention.

Cestodes typical of fish products themselves. Basic concepts. Epidemiology and prevention.

Nematodes typical of fish products. Basic concepts. Epidemiology and prevention.

### 10. FOOD-SPOILING PARASITES

Food-spoiling parasites. Basic concepts. Epidemiology and prevention.

### 11. HYGIENE OF PRODUCTS AND PROCESSES IN FOOD PARASITOLOGY

Insects. Insect treatment. Pest control. Controls and monitoring. Corrective measures.

Hygiene of products and processes: prevention in the transmission of food-borne parasitic diseases.

## WORKLOAD

### PRESENCIAL ACTIVITIES

Activity	Hours
Theory	45,00
<b>Total hours</b>	<b>45,00</b>

### NON PRESENCIAL ACTIVITIES



<b>Activity</b>	<b>Hours</b>
Attendance at other activities	0,00
Individual or group project	0,00
Independent study and work	67,50
Preparation of lessons	0,00
Preparation for assessment activities	0,00
Resolution of case studies	0,00
<b>Total hours</b>	<b>67,50</b>

## TEACHING METHODOLOGY

Theory (3 ECTS, 30 hours):

Lectures aimed at providing the student with basic knowledge. Attendance: 30 hours; preparation and study: 86 hours

Practical classes (workshops, problem solving) (1.5 ECTS, 15 hours):

Attendance: 15 hours; preparation and study: 4 hours

TOTAL: 135 hours: 45 hours of attendance, 90 hours out of class

## EVALUATION

To evaluate the learning taking place, it is considered essential to direct observation of the level acquired by the student, which may be made at all hours of attendance, especially and primarily in regard to the observation of daily work performed. This should allow the professor directly establish a dynamic picture of the progress of each student through each part of matter.

However, the numerical grade of knowledge and skills acquired must be established based on methods that allow objective and comparable measure of the same, with record results, which means qualifying written tests. In special cases, oral exams may be given as part of the evaluation process

The evaluation of each part of the course will be done through a final review of the theoretical.

The maximum score can get final is 10 points, corresponding to 64% (6,4 points) to the microbiological and the remaining 36% (3,6 points) to the parasite

To pass the whole subject must be obtained in each of the two parts of matter a minimum grade of 5.

Evidence of copying or plagiarism in any of the assessable tasks will result in failure to pass the subject and in appropriate disciplinary action being taken. Please note that, in accordance with article 13. d) of the Statute of the University Student (RD 1791/2010, of 30 December), it is the duty of students to refrain from



using or participating in dishonest means in assessment tests, assignments or university official documents.

In the event of fraudulent practices, the **Action Protocol for fraudulent practices at the University of Valencia** will be applied (ACGUV 123/2020):

<https://www.uv.es/sgeneral/Protocols/C83sp.pdf>

## REFERENCES

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- CURS EN LÍNIA OBERT MASSIU (MOOC) Els paràsits als aliments: tan petits i desconeguts com dolents. Grup d'Investigació UV Paràsits i Salut. Servei de Formació Permanent i Innovació Educativa de la Universitat de València. URL: <https://www.youtube.com/playlist?list=PLiPJNI1xCP1u2vZsU70g2yXAQ9ttvG5dF>
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