



Universitat de Lleida

# DEGREE CURRICULUM **MICROBIOLOGY**

Coordination: TORRES GRIFO, MERCE

Academic year 2019-20

## Subject's general information

<b>Subject name</b>	MICROBIOLOGY			
<b>Code</b>	102214			
<b>Semester</b>	2nd Q(SEMESTER) CONTINUED EVALUATION			
<b>Typology</b>	Degree	Course	Character	Modality
	Bachelor's Degree in Food Science and Technology	1	COMMON	Attendance-based
<b>Course number of credits (ECTS)</b>	6			
<b>Type of activity, credits, and groups</b>	<b>Activity type</b>	PRALAB	PRAULA	TEORIA
	<b>Number of credits</b>	2	0.4	3.6
	<b>Number of groups</b>	4	2	1
<b>Coordination</b>	TORRES GRIFO, MERCE			
<b>Department</b>	FOOD TECHNOLOGY			
<b>Teaching load distribution between lectures and independent student work</b>	Hores presencials: 60 Hores no presencials: 90			
<b>Important information on data processing</b>	Consult <a href="#">this link</a> for more information.			
<b>Language</b>	Català: 90 Anglès: 10			
<b>Office and hour of attention</b>	MERCÈ TORRES GRIFO Centre ETSEA Departament: TECNOLOGIA D'ALIMENTS Despatx: 2.3.03 Horari consulta: A determinar Telèfon: 973702919			

Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
SALA MARTI, NURIA	nuria.sala@udl.cat	4	
TORRES GRIFO, MERCE	merce.torres@udl.cat	8,4	

## Learning objectives

- Be aware of the constant presence in our environment of microorganisms
- Differentiate the members of the microbial world and compare different cellular organizations
- Getting used to the routine microbiology laboratories
- Observe, differentiated and enumerated microorganism
- Use the main techniques of microbial cultere
- Define microbial growth and justify the parameters that influence
- Explain the bacterial reproduction and determine the mechanisms of genetic variability in prokaryotes
- Recognize the basic principles of recombinant DNA technology. Identify the necessary devices for cloning
- Integrate the bases of bacterial classification
- Specify the archaea and the bacteria related to food microbiology and industrial microbiology
- Distinguish the main fungi related to food and industrial mycology
- Describe the subcellular particles capable of producing diseases
- To express the concept of microbial death and physical and chemical agents applied in microbial control.

## Competences

### General competences

CG1: Comprehend the general knowledge acquired in secondary education including advanced cutting-edge knowledge in the field.

CG2: Apply knowledge into practice in a professional setting and have the necessary skills for argumentation, defence and problem solving within the field.

CG3: Gather and interpret relevant data to make judgements involving a reflection on related social, scientific and ethical issues.

CG4: Convey comprehensive information, ideas, problems and solutions both to specialised and non-specialised audiences.

CG6: Analyse specific situations, identify problems, make decisions and implement action plans in search for solutions.

CG7: Interpret studies, reports and data and analyse them numerically.

CG8: Select and manage available written and computerised sources of information related with the professional activity.

CG9: Utilize the existing ICT tools as support to develop the professional activity (strategic competence UdL)

CG10: Be able to work individually and in a multidisciplinary team.

CG11: Be able to comprehend and express concepts using the proper terminology.

CG12: Be able to present oral and written information in a correct fashion (strategic competence UdL)

CG13: Discuss and debate in different situations.

CG17: Analyse and assess the social and ethical implications of the professional activity.

CG18: Have a critical and innovative mind.

CG20: Respect the fundamental rights, equality between men and women, the promotion of the human rights and the values of peace and democracy.

- **Basic Sciences**

CE3: Know and be able to apply the biology and human physiology fundamentals needed to develop the professional activities and other disciplines.

CE5: Know the basic processes of a lab, be able to use lab equipment, work with reagents, comply with safety regulations and draw reports.

CE6: Be able to pose and solve problems applying the concepts learnt to specific situations.

- **Food safety**

CE34. Know the food microbiology and parasitology and the microbial implications in food hygiene and safety.

CE40. Use the food microbiological analysis techniques

CE41. Carry out the chemical, physical, microbiological and sensory analyses for food evaluation.

## Subject contents

### LESSON 1. THE HISTORY AND SCOPE OF MICROBIOLOGY

The discovery of Microorganisms. The spontaneous generation conflict. The recognition of the microbial role in disease. The discovery of microbial effects in organic and inorganic matter. Microbiology today. The scope and relevance of microbiology

### LESSON 2. AN OVERVIEW OF THE MICROBIAL WORLD

Elements of cellular and viruses organization. And overview of prokaryotic and eukaryotic structure. Prokaryotic diversity. The tree of life.

**LESSON 3. PROKARYOTIC CELL STRUCTURE AND FUNCTION**

Size, shape, and arrangement. Prokaryotic cell membranes and cell walls. Capsules, flagella, pili and fimbriae. The cytoplasmic matrix, ribosomes and inclusion bodies. The nucleoid.

**LESSON 4. THE BACTERIAL ENDOSPORE**

Introduction. Sporulation process and endospore structure. Resistance of endospores to external agents. Germination.

**LESSON 5. MICROBIAL NUTRITION AND METABOLISM**

The common nutrient requirements. Growth factors. The role of the oxygen. Bacteria nutritional categories. Culture media. Isolation of pure cultures. The influence of environmental factors of growth.

**LESSON 6. MICROBIAL GROWTH**

Definition and mathematics of growth. The growth curve. Diauxic growth. Measurement of microbial growth. The continuous culture of microorganisms: the chemostat.

**LESSON 7. BACTERIAL GENETICS**

Characteristics of bacterial DNA. Replication, transcription and protein synthesis. Gen structure. Mutation and their chemical basis. Mutagenic agents. Detection and isolation of mutagens. DNA repair.

**LESSON 8. GENE TRANSFER IN BACTERIA**

Importance of the transfer of genes. DNA transformation. Bacterial conjugation. Transduction.

**LESSON 9. RECOMBINANT DNA TECHNOLOGY**

Historical perspectives. Devices for cloning. Restriction endonucleases. DNAS ligases. Cloning vectors: plasmids, phage vectors and cosmids. The polymerase chain reaction.

**LESSON 10. MICROBIAL TAXONOMY**

General introduction and overview. Classification systems. Taxonomic ranks. Species rank. Bergey's Manual of Systematic Bacteriology. Major taxonomic groups related to food microbiology, hygiene and industrial microbiology.

**LESSON 11. THE ARCHAEA**

Introduction to the *Archae*. The methanogens. The halobacteria. The thermoacidophiles.

**LESSON 12. BACTERIA: THE PROTEOBACTERIA**

*Pseudomonas*. Acetic acid bacteria. Enterobacteria. *Vibrio* and *Photobacterium*. *Campylobacter* and *Helicobacter*.

### LESSON 13. BACTERIA: GRAM POSITIVES

The Clostridia and relatives. The Bacilli and Lactobacilli. *Listeria monocytogenes*. The high G+C Gram positives: *Corynebacteria* and propionic acid bacteria, *Mycobacterium*, *Streptomyces*. *Bifidobacterium*.

### LESSON 14. THE FUNGI

Distribution. Importance. Structure. Nutrition and metabolism. Reproduction. Fungal divisions.

### LESSON 15. THE VIRUSES

Early development of Virology. General properties of viruses. The structure of viruses. Principles of virus taxonomy. Reproduction of viruses: adsorption and penetration; synthesis of virus nucleic acids and proteins; assembly and release. Temperate bacteriophages and lysogeny.

### LESSON 16. VIROIDS AND PRIONS

Chemical nature of viroids and prions. Plant diseases caused by viroids. Degenerative nervous system disorders caused by prions.

### LESSON 17. CONTROL OF MICROORGANISMS

Importance of microbial control. Definition of frequently used terms. Conditions influencing the effectiveness of antimicrobial agent activity.

### LESSON 18. PHYSICAL METHODS IN CONTROL

Heat. Low temperature. Filtration. Radiation.

### LESSON 19. CHEMICAL AGENTS IN CONTROL

Phenolics. Alcohols. Halogens. Heavy metals. Quaternary Ammonium Compounds. Aldehydes. Sterilizing gases. Antibiotics.

## Methodology

Activity	Description	Classroom activity		Learning activity		Evaluation	Time total/ECTS
		Objectius	Hores	Treball alumne	Hores	Hores	Hores
Lecture	Lectures (large group)	Explanation of the main concepts	31	Study: Know, understand and knowledge synthesis	45	4	80/3.2

<b>Seminars</b>	Class participation (middle class group)	Carrying out activities for discussion and application	<b>9</b>	Solving cases. Discussing	<b>16</b>		<b>25/1</b>
<b>Laboratory</b>	Laboratory practice (middle class group)	Understanding phenomena, measuring, ...	<b>20</b>	Studying and making reports	<b>25</b>		<b>45/1.8</b>
<b>Totals</b>			<b>60</b>		<b>86</b>	<b>4</b>	<b>150/6</b>

## Evaluation

<b>Activity</b>	<b>Evaluation activity</b>		<b>Rating</b>
	<b>Procedure</b>	<b>Number</b>	<b>(%)</b>
<b>Lecture</b>	Exams	2	<b>25+25</b>
<b>Seminars</b>	Reports, oral and writing work or writing test	2	<b>10+10</b>
<b>Laboratory</b>	Reports, attitude and aptitude	1	<b>30</b>
<b>altres</b>			
<b>Total</b>			<b>100</b>

## Bibliography

### Basic bibliography

INGRAHAM, J.L i INGRAHAM, C.A. 1999 (Volum 1) "Introducció a la Microbiologia" Ed. Reverté.

MADIGAN, M.T., MARTINGO, J.M. i altres 2015. "Brock. Biología de los Microorganismos" 14 ed. Pearson Educación, S.A.

SINGLETON, P. 2004. "Bacterias en Biología, Biotecnología y Medicina". Acibia.

WILLEY, J.M.; SHERWOOD, L.M.; WOOLVERTON, C.J.. 2009. "Microbiología" de Prescott, Harley y Klein 7 ed. McGraw-Hill.

### Further reading

ALLAERT, C. i ESCOLÀ, M. 2002. "Métodos de análisis microbiológicos de los alimentos" Díaz de Santos

BERGEY'S MANUAL OF SYSTEMATIC BACTERIOLOGY. Volumes 1, 2, 3 i 4. Garrity, G.M. Editor. Springer. Volum 1: 2001

SAMSON, R.A.; HOEKSTRA, E.S.; FRISVAD, J.C. i FILTENBORG, O. 2004. "Introduction to food- and airborne fungi" 7a ed. Centraalbureau voor Schimmelcultures.