



DEGREE CURRICULUM

FOOD MICROBIOLOGY AND PARASITOLOGY

Coordination: Antonio Javier Ramos Girona

Academic year 2015-16

Subject's general information

Subject name	FOOD MICROBIOLOGY AND PARASITOLOGY
Code	100610
Semester	FIRST SEMESTER
Typology	Compulsory
ECTS credits	9
Theoretical credits	0
Practical credits	0
Coordination	Antonio Javier Ramos Girona
Office and hour of attention	By appointment
Department	Food Technology/CMB
Teaching load distribution between lectures and independent student work	In class hours: 90 - Lessons 45 - Practical classes 41 - Seminars 4 In home hours: 135
Modality	Presencial
Important information on data processing	Consult this link for more information.
Language	Spanish and Catalan
Degree	Grau en Nutrició Humana i Dietètica
Office and hour of attention	By appointment
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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

General skills

1. To know the chemical, biochemical and biological basis of application in human nutrition and dietetics.
2. To know the basic processes in the production, processing and preservation of food.
3. To know the microbiology, parasitology and toxicology of food.

Transversal skills:

1. Communicate effectively, both orally and in writing with people, health professionals or industry and the media, knowing how to use the information and communications technology, especially in relation to nutrition and lifestyle.

In addition, the student who completes this course must:

1. To know the biology, physiology, genetics, metabolism and biochemistry of microorganisms (viruses, bacteria, fungi and protozoa).
2. To know the endogenous pathogenic flora as a natural barrier against infection and as a producer of essential nutrients for human health.
3. To know the mechanisms of action of toxins of microbial origin.
4. To know and apply the mechanisms of action of antibiotics, antimicrobials and vaccines
5. To know the main spoilage microorganisms and pathogens in food and aspects related to food toxicology.
6. To know the life cycles, symptoms, epidemiology, pathways of contamination and methods of prevention and control of parasites in food.
7. To have ability to work in a laboratory of general microbiology and identify microorganisms by microscopic, biochemical, physiological and serological tests.
8. To isolate and identify human skin and mouth saprophyte microorganisms.
9. To complete a microbiological analysis of food, including the report for results.
10. To recognize the main food parasites under microscopic observation.
11. To work in teams to solve problems related to microbiological food, human nutrition and dietetics.

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. Preservatives.
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. Vaccines.

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 (aw), 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 (9 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 41 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 (22 hours)

11. Introduction to a Food Microbiology laboratory and sample preparation

12. General counting of microorganisms:

Aerobic plate count at 30 ° C.

Mount 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.

Methodology

Lessons. (CM)	Acquisition of basic knowledge of the topic	45 hours of classroom lessons
Seminars. (Sem)	Acquisition of basic knowledge of the topic	2 seminars of 2 h each on general aspects of General Microbiology
Practical lessons. (PL)	Acquisition of skills and capabilities in the Microbiology and Parasitology laboratories	41 hours of laboratory practices (13 practices)
Exams	Evaluation of acquired knowledge	6 hours

Development plan

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	S	S
14 CMB 2h THEORY 15-17	15	16 CMB 2h THEORY 15-17	17 CMB 2h THEORY 17-19	18	19	20
21 CMB 2h THEORY 15-17	22	23 CMB 2h THEORY 15-17	24	25	26	27
28 FESTA UdL	29 S. MIQUEL	30 CMB 2h THEORY 15-17	1 Semin. CMB-A 17-19	2 Semin. CMB-B 17-19	3	4
5 CMB 2h THEORY 15-17	6	7 CMB 2h THEORY 15-17	8 BUTIFARRADA	9	10	11
12 FESTA	13	14 CMB 2h THEORY 15-17	15 CMB 2h THEORY 17-19	16	17	18
19 CMB Practs GA m 8-12 CMB 2h THEORY 15-17	20 CMB Practs GA m 8-12	21 CMB Practs GA m 8-12 MA 2h THEORY 15-17	22 CMB Practs GA m 8-12	23 CMB Practs GA m 8-12	24	25
26 CMB Practs GB m 9-13 MA 2h THEORY 15-17	27 CMB Practs GB m 9-13	28 CMB Practs GB m 9-13 MA 2h THEORY 15-17 Semin. CMB-A 17-19	29 CMB Practs GB m 9-13 Semin. CMB-B 17-19	30 CMB Practs GB m 9-13	31	1
2 MA 2h THEORY 15-17	3	4	5	6	7	8
9 Exam CMB 15-17 Class 0.03	10	11	12	13	14	15
16 MA 2h THEORY 15-17	17	18 MA 2h THEORY 15-17	19	20	21	22
23 MA 2h THEORY 15-17	24	25 PA 2h THEORY 15-17	26	27	28	29
30 PA 2h THEORY 15-17	1	2 PA 2h THEORY 15-17	3	4	5	6
7	8 INMACULADA	9 PA 2h THEORY 15-17	10	11	12	13
14	15 Exam MA 15-17 Class 0.03	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31	1	2	3
4	5	6	7 PA 2h THEORY 16-18	8	9	10
11 Prac GA m 9-14	12 Prac GA m 9-13	13 Prac GA m 9-12	14 Prac GA m 9-14	15 Prac GA m 9-14	16	17
18 Prac GB m 9-14	19 Prac GB m 9-13	20 Prac GB m 9-12	21 Prac GB m 9-14	22 Prac GB m 9-14	23	24

25 Exam PA+Practs 15-17h Class 0.03	26	27	28	29	30	31
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Note:

m: mornings

February 25: Exam 2nd call (15-17h, Class 0.03)

The practical lessons of the weeks of 13 and 20 of October will be from 9 to 13 hours. in the Fac. of Medicine

The practical lessons of the weeks of 11 and 18 January will be at morning, with different schedule each day (it will be advised promptly), in the ETSEA.

CLASS of THEORY: 0.02 or 0.01

CLASS of SEMINARS CMB: 2.04

LABORATORY PRACTICES CMB: 2.05 / 2.10 / 2.06

LABORATORY PRACTICES ETSEA: 3.01

Evaluation

Theory and practice:

The topic is evaluated continuously. To do this, 4 exams throughout the semester are made. Usually exams follow the same pattern: a test of theory and a set of short questions. The evaluation of practical lessons may include large questions and/or test questions.

Each exam has the following value:

Exam 1: questions of theory of General Microbiology. Value: 25% of the course.

Exam 2: questions of practice of General Microbiology. Value: 15% of the course.

Exam 3: questions of theory of Food Microbiology. Value: 15% of the course.

Exam 4: questions of theory of Food Parasitology + questions of practices of Food Microb. and Parasitology. Value 25% of the course

In any case, to pass the course exams 1, 3, and 4 have to get at least a 4.0 (out of 10), so they can average the marks obtained in the four tests to calculate the final mark, together with other evaluation items.

Seminars will be evaluated taking into account attendance and completion of a report (10% of the final grade).

Students must provide, mandatory, individually or in groups, a report of the practices of Food Microbiology, which must contain a summary of what was explained in class and critical discussion of the results. Value: 10% of the course

Practices and seminars are compulsory. In the case of practices, only a 10% of absence is permitted, and only for a justified reason (in case of illness, a medical certificate is required).

Bibliography

A) BASIC BIBLIOGRAPHY

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- 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.