

## MICROBIOLOGY-NHD

MODULE	CONTENT	YEAR	TERM	CREDITS	TYPE
HYGIENE, FOOD SAFETY AND QUALITY MANAGEMENT	MICROBIOLOGY	2 <sup>nd</sup>	1 <sup>o</sup>	6 ECTS	Compulsory Course
<b>LECTURER(S)</b>			<b>Postal address, telephone nº, e-mail address</b>		
<ul style="list-style-type: none"> <li>• Margarita Aguilera Gómez (Group E, Laboratory practices- All Groups)</li> <li>• Ana del Moral García (Group E)</li> <li>• Belén Rodelas González (Group E)</li> <li>• Alfonso Ruiz-Bravo López (Group A)</li> </ul>			<ul style="list-style-type: none"> <li>• Margarita Aguilera Gómez, Office 702, 958245129, e-mail maguiler@ugr.es</li> <li>• Ana del Moral García, Office 702, teléfono 958241743, e-mail admoral@ugr.es</li> <li>• Belén Rodelas González, Office 703, 958241755, e-mail mrodelas@ugr.es</li> <li>• Alfonso Ruiz-Bravo López, Office 421, 958243873, e-mail aruizbr@ugr.es</li> </ul> <p><b><u>TIMETABLE FOR TUTORIZATION</u></b></p> <p><i>Prof<sup>a</sup>. Margarita Aguilera Gómez:</i> Tuesday and Thursday 9:30-12:30</p> <ul style="list-style-type: none"> <li>• <i>Prof<sup>a</sup>. Ana del Moral García:</i> Monday, Wednesday and Friday 9:30-11:30</li> <li>• <i>Prof<sup>a</sup>. Belén Rodelas González:</i> 1<sup>o</sup> Semester Tuesday, Wednesday and Thursday 11:30-13:30. 2<sup>o</sup> Semester Tuesday and Thursday 10:30-13:30</li> <li>• <i>Prof. Alfonso Ruiz-Bravo López</i> 1<sup>o</sup> Semester Monday and Wednesday 11:30-14:30. 2<sup>o</sup> Semester Wednesday 10:30-14:30, Friday 10:30-12:30</li> </ul>		
<b>DEGREE WITHIN WHICH THE SUBJECT IS TAUGHT</b>			<b>OTHER DEGREES</b>		
Human Nutrition and Dietetics			Food and Science Technology		
<b>PREREQUISITES and/or RECOMMENDATIONS (if necessary)</b>					



The criteria established for accessing Title Degree in Human Nutrition and Dietetics. In order to facilitate an adequate learning, it is advisable to have acquired knowledge on Biology from the first year of the Degree.

### **BRIEF ACCOUNT OF THE SUBJECT PROGRAMME (ACCORDING TO THE DEGREE)**

Introduction to the study of the microbial world and the microorganisms of interest in human nutrition. Study of microbial diseases transmitted by food consumption and its control. Alteration and bio-deterioration or food spoiling by microorganisms and finally, their uses in the production of food industrial products.

### **GENERAL AND PARTICULAR ABILITIES**

**General competences (CG):** The subject includes the acquisition (total or partial, in relation to microbiological aspects) of the following general competences:

- CG1. Recognize the essential elements of the dietitian-nutritionist profession, including ethical principles, legal responsibilities and the exercise of the profession, applying the principle of social justice to professional practice and developing it with respect for people, their habits, beliefs and cultures.
- CG2. Develop the profession with respect to other health professionals, acquiring skills to work as a team.
- CG3. Recognize the need to maintain and update professional competence, paying special attention to the learning, independently and continuously, of new knowledge, products and techniques in nutrition and food, as well as the motivation for quality.
- CG4. Know the limits of the profession and its competences, identifying, when necessary, an interdisciplinary treatment or referral to another professional.
- CG5. Carry out communication 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 habits.
- CG6. Know, critically assess and know how to use and apply the sources of information related to nutrition, food, lifestyles and health aspects.
- CG9. Know the basic processes in the elaboration, transformation and conservation of foods of animal and vegetable origin.
- CG11. Know the microbiology, parasitology and toxicology of food.
- CG19. Know the health organizations, national and international, as well as the different health systems, recognizing the role of the Dietitian-Nutritionist.
- CG20. Know and participate in the design, implementation and validation of nutritional epidemiological studies, as well as participate in the planning, analysis and evaluation of intervention programs in food and nutrition in different areas.
- CG21. Be able to participate in activities of health promotion and prevention of disorders and diseases related to nutrition and lifestyles, carrying out food-nutrition education of the population.
- CG22. Collaborate in the planning and development of policies on food, nutrition and food security based on the needs of the population and the protection of health.
- CG23. Advise on the development, marketing, labeling, communication and marketing of food products according to social needs, scientific knowledge and current legislation.
- CG24. Interpret reports and administrative records in relation to a food product and ingredients.
- CG25. Participate in the management, organization and development of food services.
- CG27. Intervene in the quality and food safety of products, facilities and processes.
- CG28. Providing adequate hygienic-sanitary and dietetic-nutritional training to the personnel involved in the restoration service.
- CG29. Acquire basic training for the research activity, being able to formulate hypotheses, collect and interpret information to solve problems following the scientific method, and understanding the importance and limitations of scientific thinking in health and nutrition.



**Specific competences (CE):** The subject includes the acquisition (total or partial, in relation to microbiological aspects) of the following specific competences:

- CE1. Know the chemical, biochemical and biological foundations of application in human nutrition and dietetics.
- CE8. Know the Spanish health system and the basic aspects related to the management of health services, mainly those related to nutritional aspects.
- CE15. Know the microbiology, parasitology and toxicology of food.
- CE17. Prepare, apply, evaluate and maintain good practices of hygiene, food safety and risk control systems, applying current legislation.
- CE18. Participate in the design, organization and management of the different food services.
- CE19. Collaborate in the implementation of quality systems.
- CE20. Evaluate, control and manage aspects of traceability in the food chain.
- CE22. Scientific and technical advice on food products and their development. Evaluate compliance with said advice.
- CE24. Collaborate in the protection of the consumer within the framework of food security.
- CE43. Manage the basic tools in ICTs used in the field of Food, Nutrition and Dietetics.
- CE48. Participate in the analysis, planning, intervention and evaluation of epidemiological studies and intervention programs in food and nutrition in different areas.
- CE52. Acquire the ability to intervene in promotion, prevention and protection projects with a community and public health approach.
- CE54. Final degree project: Cross-disciplinary subject whose work will be carried out in association with different subjects.

#### **OBJECTIVES (EXPRESSED IN TERMS OF EXPECTED RESULTS OF THE TEACHING PROGRAMME)**

The principal aim of the course is to acquire a sufficient systematic background of the microbial world from the perspective of the Degree in Human Nutrition and Dietetics, therefore that the students acquire an adequate knowledge of:

- Microbial structures and metabolisms from microorganisms species naturally present in food or those that can contaminate them (bacteria, fungi, viruses and prions).
- Diseases caused when Humans are consuming food contaminated with microorganisms or their toxins.
- Alterations/spoiling that microorganisms produce in food.
- Use of microorganisms in the food industry.

#### **DETAILED SUBJECT SYLLABUS**

##### **BLOCK 1. MICROBIOLOGY. GENERAL CONCEPTS. HISTORICAL INTRODUCTION**

###### **UNIT 1. Microbiology. GENERAL CONCEPTS. Historical Introduction**

(One theory session and one collective tutoring)

- General concepts
- Historical Introduction

##### **BLOCK 2. OVERVIEW OF MICROBIOLOGY**

###### **UNIT 2. BACTERIA**

(11 theoretical sessions, 2 seminars and one collective tutoring)



### **Topic 2.1. Morphology and structure of prokaryotic cells)**

- Overview of the prokaryotic cell
- Differences between archaea and bacteria
- Cell Forms
- Associations.
- Extracellular Polymers
- Filamentous Appendices: Flagelos
- Filamentous Appendices: fimbriae or pili
- Cellular wall
- Cytoplasmic membrane
- Cytoplasm
- Ribosomes
- Genome
- Organelles and inclusions booking
- Forms of cell differentiation: The endospore

### **Topic 2.2. Nutrition and Metabolism**

- General concepts
- Major nutrients and cellular functions
- Nutritional Types
- Overview of the bacterial metabolism.
- Concepts and differences between fermentation, respiration and photosynthesis
- Types of prokaryotes in relation to their oxygen requirements

### **Topic 2.3. Growth**

- General concepts
- Cell cycle prokaryotic
- Population growth
- Effect of environmental factors on the growth of prokaryotes

### **Topic 2.4. Genetics**

- Genetic recombination
- Mutations
- Horizontal transfer of genetic material
- Genetic engineering of prokaryotes used in feed

### **Topic 2.5. Taxonomy**

- General concepts of nomenclature, identification and classification of prokaryotes
- Major taxonomic groups

## **UNIT 3. FUNGI**

(One theory session)

- General concepts
- Morphology and structure of fungi
- Nutrition and Metabolism
- Habitats and lifestyles
- Reproduction
- Classification of fungi
- Mushrooms of clinical, industrial and ecological interest



#### **UNIT 4. THE VIRUS**

(One theory session)

- General concepts
- Structure of Viruses
- Classification of viruses
- Virus animals. Human diseases caused by viruses
- Plant Virus
- Bacteriophages

#### **UNIT 5. prions**

(One theory session)

- General concepts
- Diseases originating in man and animals

#### **UNIT 6. Antimicrobial Agents: sterilizing agents; Antiseptics and disinfectants; Chemotherapeutic**

(One theory session)

- Definition
- Death of microbial populations and survival curves
- Sterilizing agents
- Disinfectants and antiseptics
- Chemotherapeutic: antimicrobials

#### **UNIT 7. Microbial interactions**

(1 Theory session 1 collective tutoring)

- Human microbiota
- Host-microbe relationship in infectious disease
- Host defense mechanisms and evasion of defense

### **BLOCK 3. MICROBIAL FOODBORNE INFECTIOUS DISEASES AND FOOD POISONING**

#### **UNIT 8. Description of foodborne diseases, micro responsible for the same and methods of control**

(11 theoretical sessions)

Topic 8.1 *Escherichia coli*

Topic 8.2. *Salmonella*

Topic 8.3. *Shigella*

Topic 8.4 *Yersinia* and *Cronobacter*,

Topic 8.5 *Campylobacter* and *Arcobacter*

Topic 8.6. *Vibrio cholerae*, *Vibrio parahaemolyticus*, *Plesiomonas shigelloides*, *Aeromonas hydrophila*

Topic 8.7. *Listeria*

Topic 8.8. *Brucella*

Topic 8.9 Poisoning *Staphylococcus aureus*

Topic 8.10. *Clostridium botulinum* poisoning

Topic 8.11. *Clostridium perfringens* poisoning

Topic 8.12. *Bacillus cereus* intoxication

Topic 8.13. Viral infections

Topic 8.14. Prions Diseases

Topic 8.15. Fungal poisoning: Mycotoxins

### **BLOCK 4. MICROORGANISM AND FOOD SPOILING / BIODETERIORATION**



## **UNIT 9. The growth of microorganisms in food and food degradation. GENERAL CONCEPTS**

(One theory session)

Factors affecting growth and survival of microorganisms in food

A concept and effects of microbial spoilage of foods

## **UNIT 10. Microbial food bio-deterioration/food spoiling**

(4 theoretical sessions)

Topic 10.1 Alteration and bio-deterioration/spoiling of milk and milk products

Topic 10.2 Alteration and bio-deterioration/spoiling eggs

Topic 10.3 Alteration and bio-deterioration/spoiling of the flesh,

Topic 10.4 Alteration and bio-deterioration/spoiling of seafood

Topic 10.5 Alteration and bio-deterioration/spoiling of plant products: fruits, vegetables, grains and legumes

Topic 10.6 Alteration and bio-deterioration/spoiling of flour and bakery products.

Topic 10.7 Alteration and bio-deterioration/spoiling of preserved, canned and ready meals

## **UNIT 11. CONTROL OF FOOD CONTAMINATION AND PARAMETERS**

(1 Theory session 1 seminar)

- Control of food contamination.

- Food Preservation. Types and forms.

- Physical methods.

- Chemical methods for food preservation. Feed additives.

- Biological methods.

- Control methods in the food industry. Microbiological reference values. Standards of good workmanship.

## **BLOCK 5. MAIN USES AND APPLICATIONS OF MICROORGANISMS IN THE FOOD INDUSTRY**

### **UNIT 12. Applications of microorganisms in food industry**

(2 theoretical sessions, 1 seminar, 1 collective tutoring)

- Dairy industry.

- Microorganisms Probiotics,

- Functional Foods:

- Use of microorganisms for therapeutic and nutritional purposes.

- Industry of bakery products, beer and wine.

- Industry fermented products: vegetables, meat and fish. Others

### **LABORATORY PRACTICES AGENDA (1.5 credits)**

1. Preparation of culture media. Sterilization. Control of microorganisms by physical and chemical methods.

2. Effect of temperature on the viability of microorganisms in food.

3. Technical observation of microorganisms: Gram stain. Spore staining.

4. Techniques for cultivation of microorganisms: Enumeration of microorganisms.

5. Human microbiota: Intestinal microbiota. Study of healthy nasal carriers of *Staphylococcus aureus*

## **READING**

### **FUNDAMENTAL REFERENCES:**

#### **General Microbiology**

- Madigan MT, Martinko JM, Bender KS, Buckley DH, Stahl DA. (2015) BROCK. BIOLOGÍA DE LOS



MICROORGANISMOS, 14ª edición. Pearson, Madrid.

- Tortora GJ, Funke BR, Case CL (2007) INTRODUCCIÓN A LA MICROBIOLOGÍA, 9ª edición. Panamericana, Buenos Aires.
- Willey JM, Sherwood LM, Woolverton CJ. (2013) PRESCOTT, HARLEY Y KLEIN. MICROBIOLOGÍA, 7ª edición. McGraw-Hill Interamericana, Madrid.

### **Food Microbiology**

- Doyle MP, Buchanan RL (2013). FOOD MICROBIOLOGY: FUNDAMENTALS AND FRONTIERS, 4ª Edition. American Society for Microbiology Press, Washington.
- Hoorfar J (2011) RAPID DETECTION, CHARACTERIZATION, AND ENUMERATION OF FOODBORNE PATHOGENS. American Society for Microbiology Press, Washington.
- Matthews KR, Kniel KE, Montville TJ. (2017) FOOD MICROBIOLOGY: AN INTRODUCTION. 4ª Edición. American Society for Microbiology Press, Washington.
- Mossel DAA, Moreno B, Struijk CB (2003) MICROBIOLOGÍA DE LOS ALIMENTOS, 2ª edición. Acribia, Zaragoza. (IN SPANISH)

### **COMPLEMENTARY REFERENCES:**

- AENOR (Asociación Española de Normalización y Certificación) Microbiología de los alimentos para consumo humano y animal. Normas UNE (Obtener información para las normas generales en: <http://aenormas.aenor.com/es/normas/microbiologia-de-los-alimentos-para-consumo-humano-y-animal-normas-une-generales> y para las del Reglamento CE en: <http://aenormas.aenor.com/es/normas/microbiologia-de-los-alimentos-para-consumo-humano-y-animal-normas-une-del-reglamento-ce-2073/2005> )
- Álvarez M, Buesa J, Castillo J, Vila J. (2008) DIAGNÓSTICO MICROBIOLÓGICO DE LAS INFECCIONES GASTROINTESTINALES. 30. Vila J (coordinador). Procedimientos en Microbiología Clínica. Cercenado E, Cantón R (editores). Sociedad Española de Enfermedades Infecciosas y Microbiología Clínica (SEIMC), Madrid (Libre acceso en: <http://www.seimc.org/contenidos/documentoscientificos/procedimientosmicrobiologia/seimc-procedimientomicrobiologia30.pdf> )
- Boletín Oficial del Estado (BOE). DECRETO 2484/1967, DE 21 DE SEPTIEMBRE, POR EL QUE SE APRUEBA EL TEXTO DEL CÓDIGO ALIMENTARIO ESPAÑOL. TEXTO CONSOLIDADO (TEXTO CONSOLIDADO (Última modificación: 10 de junio de 2017; aparecen modificaciones periódicas) (DISPONIBLE EN <https://www.boe.es/buscar/pdf/1967/BOE-A-1967-16485-consolidado.pdf> )
- Sperber WH, Doyle MP. (2009) COMPENDIUM OF THE MICROBIOLOGICAL SPOILAGE OF FOODS AND BEVERAGES. Springer, New York.
- Tucker GS. (2011) FOOD BIODETERIORATION AND METHODS OF PRESERVATION. Coles R, Kirwan M (editors). Food and Beverage Packaging Technology, Second Edition. Blackwell Publishing Ltd., pp. 31-57.

### **RECOMMENDED INTERNET LINKS**

*Página web del Grupo de Microbiología de los Alimentos de la Sociedad Española de Microbiología:*  
<http://www.semicrobiologia.org/microalimentos/>



## **DOCENT METHODOLOGY**

- Presentación mediante clases magistrales de contenidos teóricos. El material estará disponible en las plataformas de docencia de la UGR.
- Sesiones de seminarios para la elaboración de temas apropiados por los alumnos.
- Tutorías presenciales para la resolución de las dudas o dificultades planteadas durante la realización de las demás actividades formativas.
- Clases prácticas de laboratorio.

**EVALUATION** (Tools for Evaluation, Criteria, weighted percentages and Final Score, ETC.)

### **CONTINUOUS EVALUATION:**

Evaluation Tests are performed to assess the competencies acquired in a continuous based learning process:

- Attendance to theoretical and practical classes
- Participation in seminars and subject debates
- Evaluation of the practical content classes
- Evaluation of the theoretical content through a theoretical test.

Weighted Percentage on the final Score:

- Evaluation of theoretical content through written tests. There are two parts, general (block 1 and 2) and specific (block 3, 4 and 5). A partial exam will be performed for the general part, and a final one that will include the specific part. The alumni that do not obtain the minimal score established for the partial must do the exam with both parts in the ordinary official exam. The evaluation of each part constitutes 40 % of the final score (**theoretical contents are 80 % of the final score**).
- Evaluation of practical classes: **10 % of the final score**.
- Evaluation of seminars, classes' attendance and several other participations: **10 % of the final score**.

**Alumni to pass the exam of the whole subject must:**

- To Pass the practical evaluation.
- To obtain at least a 50 % of the final score.

## **FINAL UNIQUE EVALUATION**

In order to be able to abide the Unique Evaluation, the student should follow the procedure according to Article 8.2 of the "rules of evaluation and assessment of students in the UGR" adopted on May 20, 2013:

[http://secretariageneral.ugr.es/bougr/pages/bougr112/\\_doc/examenes%21](http://secretariageneral.ugr.es/bougr/pages/bougr112/_doc/examenes%21).

Reminder: "To qualify for the final single assessment, the student, in the first two weeks of the Student enrollment date, it shall submit to the Department Director, who shall transmit the corresponding faculty, proving grounds and the reasons for not attending will be able to follow the continuous assessment system. "





The final evaluation will consist of a written examination of the contents of the theoretical program of the subject, and an examination of the contents of the practical internship program, which may include essay questions and multiple choice as well as the performance of some experimental practice laboratory for examination of the internship program. It is therefore recommended practices, for which you must agree with the teachers.

To pass the subject is essential to pass the exam of theoretical content obtaining at least a score of 5 out of 10. Moreover, it is necessary to pass the practical exam to obtain at least a score of 5 on 10. The final score will be obtained from the theory mark exam, which will up to 90% of the final grade, and the note of practices that involve up to 10% of the final grade.

### **Appendix**

Students are required to act in the assessment tests in accordance with the principles of individual merit and exercise authenticity. Any contrary action to employ means not Allowed, albeit detected with after the evaluation process of the test, shall be subject to numerical final grade 0. In addition, students will assessed in future editions of this subject by oral examination before an academic court constituted for this effect by the Department. In case it is necessary to challenge the authenticity of the information submitted to the evaluation, we will proceed to confirm the acquisition of skills by oral examination.

### **ADDITIONAL INFORMATION**

- Partial Exam: 10 November 2017
- Ordinary Official final Exam: 17 January 2018
- Extraordinary Official final Exam: 3 July 2018

Extraordinary Official final Exam: 23 November 2017 (NHD Degree finalisation)

