Universitat Autònoma de Barcelona

2021/2022

Food Microbiology

Code: 101005
ECTS Credits: 6

Degree	Type	Year	Semester
2500502 Microbiology	OB	3	1

The proposed teaching and assessment methodology that appear in the guide may be subject to changes as a result of the restrictions to face-to-face class attendance imposed by the health authorities.

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Use of Languages

Principal working language: catalan (cat)
Some groups entirely in English: No
Some groups entirely in Catalan: Yes
Some groups entirely in Spanish: No

Prerequisites

There are no official prerequisites to follow the course; nonetheless, it would be desirable if students review basic concepts of the microbial world previously acquired in the first courses of the Bachelor's Degree in Microbiology and good knowledge about the subjects coursed simultaneously in the first semester of the third course.

Objectives and Contextualisation

This is a compulsory subject, a nuclear course from the degree of Microbiology, which introduces students to Food Microbiology. The achievement of the competencies of the course will allow students to acquire new knowledge related to other subjects subsequently coursed in the degree of Microbiology.

The main objectives are:

• Know the ecology and activities of microorganisms in food.

• Know the current methods of analysis, and identification of micro-organisms and/or their metabolic products in food.

• Know the major infections and intoxications caused by micro-organisms and associated with the consumption of food.

• Identify different usual, disrupters and pathogenic microorganisms associated with each type of food.

Competences

- Apply suitable methodologies to isolate, analyse, observe, cultivate, identify and conserve microorganisms.
- Obtain, select and manage information.
- Use bibliography or internet tools, specific to microbiology or other related disciplines, both in English and in the first language.
- Work individually or in groups, in multidisciplinary teams and in an international context.

Learning Outcomes

1. Describe the methodologies used in the analysis of the different types of microorganisms and parasites in foods.
2. Distinguish between pathogenic microorganisms and contamination indicator microorganisms.
3. Distinguish between pathogenic microorganisms and those that spoil foods and other products.
4. Identify the different bioindicators of microbial contamination in foods and other products.
5. Identify the techniques used in the isolation, culturing and identification pathogenic microorganisms.
6. Identify the techniques used in the multiplication, detection and identification of viruses.
7. Know the different methods used to determine the microbiological content of foods, drugs and other products.
8. Know the methods used in the detection of microbial contamination indicators.
9. Obtain, select and manage information.
10. Recognise the habitual microbiota of environments, foods and other products.
11. Use bibliography or internet tools, specific to microbiology or other related disciplines, both in English and in the first language.
12. Work individually or in groups, in multidisciplinary teams and in an international context.

Content

Section I. Introduction to food microbiology

Unit 1. Food microbiology

Unit 2. Microorganisms in foods

Section II. Indicators of food quality and safety

Unit 3. Indicators microorganisms and microbiological criteria in food

Section III. Analysis of microorganisms and their products in food

Unit 4. Sampling and sample preparation.

Unit 5. Conventional and rapid methods.

Unit 6. Advanced techniques I.

Unit 7. Advanced techniques II.

Unit 8. Biosensors

Unit 9. Microbiological examination of the environment in food industries.

Section IV. Food-borne microbial diseases

Unit 10. Microorganisms and food-borne diseases.

Unit 11. Food infections caused by Enterobacteriaceae.

Unit 12. Food infections with other Gram-negative bacteria.

Unit 13. Food infections with not sporulate Gram-positive bacteria.

Unit 14. Food poisoning caused by sporulated Gram-positive bacteria.

Unit 15. Food poisoning of fungal origin.

Unit 16. Food infections caused by viruses and prions.

Unit 17. Foodborne illness caused by parasites.

Section V. Food microorganisms

Unit 18. Fresh meat and meat products.

Unit 19. Fishery products.

Unit 20. Products of vegetal origin.

Unit 21. Milk and dairy products.

Unit 22. Eggs and derivatives.

*Unless the requirements enforced by the health authorities demand a prioritization or reduction of these contents.

Methodology

The course comprises two modules: Theoretical and methodological lectures and the educational wikiproject. These are scheduled in an integrated way so that students must interact throughout the course content and the activities to achieve the competencies indicated previously in this guide.

Both modules are based on the following:

In theoretical lectures, the student must acquire the scientific knowledge of this subject attending these classes and help with the personal study of the topics explained. A detailed timetable of the topics, as well as the bibliography, should be consulted to prepare theoretical classes and for the personal study of the theoretical content of the subject, which will be delivered to the student at the beginning of the course.

The methodological and wikiproject classes will be working in groups with a small number of students where two learning activities will work.

-Methodological lectures: They will consist of complimentary activities regarding the theoretical main lectures, with a special focus on the methodological and applied aspects of the subjects in the course.

-Wikiproject: The students, divided into groups of 4-5 people, will publish a new article or an existing one in the Catalan Wikipedia (*Viquipèdia*). The choice of the articles will come from a pre-selection considering the academic contents of the course and their quality and presence in the Catalan free encyclopedia. To ease the learning skills of Wikipedia and its use in the class, two specific sessions will be assigned to teach how to edit the project and one discussion page will serve as a forum to reply to possible questions and to offer technical support throughout the editing process. On the first day of the methodological class, the professor will present and distribute the selected topics to the students. Once all the groups will have published their articles, they willpresent them in class before getting the final grade for this part.

Additional information:

In order to support the training activities mentioned above, the students able to do individual tutorials on the subject in the office of the teacher Antoni Solé (C3-337), at times previously agreed with by-mail.

For a good follow-up of the subject, the student will have complementary material that the teacher considers necessary, as well as the presentation and the program guide of the subject, in the Moodle classroom. Also, you can consult the coordination of degree teaching space for up-to-date information concerning the degree.

*The proposed teaching methodology may experience some modifications depending on the restrictions to face-to-face activities enforced by health authorities.

Annotation: Within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Methodological classes and Viquiproject	15	0.6	7, 8, 1, 3, 2, 4, 5, 6, 9, 10, 12, 11
Theoretical lectures	30	1.2	7, 8, 1, 3, 2, 4, 5, 6, 9, 10, 11
Type: Supervised			
Tutorial	3	0.12	7, 8, 1, 3, 2, 4, 5, 6, 9, 10, 12, 11
Type: Autonomous			
Bibliography research	12	0.48	9, 12, 11
Forums discussion	4	0.16	7, 8, 1, 3, 2, 4, 5, 6, 9, 10, 12, 11
Preparation of Viquiproject	20	0.8	9, 12, 11
Study	47	1.88	7, 8, 1, 3, 2, 4, 5, 6, 9, 10, 11
Text reading	15	0.6	9, 12, 11

Assessment

The assessment of the course will be individual and continuous through the following modules:

Theoretical lectures (60 % of the final grade): Two written different eliminatory assessment exams will be assigned for this module, each of them weighing 30 % of the grade. Each exam includes two parts: multiple-choice questions (8/10) and short questions (2/10).

Methodological lectures and wikiproject (40 % of the final grade): This module includes:

1. Resolution of the activities proposed in the methodological lectures (10% of the final grade)

2. Submission of the divulgation article in the Catalan Viquipedia (20% of the final grade). In this case, the students must:

Part 1) Search for one or more scientific articles or book chapters about the assigned Viquipedia article (preferably in Open Access), so that they can be used to guide the structure of the content and also cited as the bibliography of the article.

Part 2) Create or improve an existing article on the Catalan Viquipedia, the free and online encyclopedia, of the topic assigned and according to its status at the beginning of the course. The criteria and editing guidelines to be followed are indicated on the wikiproject main page and will be the ones used for the evaluation. The compliance with these criteria will be explained in the first lecture of this module. In addition, it will be evaluated in a particularly critical and exhaustive way that students can synthesize and rewrite academic information already published without falling into plagiarism, or that they opt very limited for similar paraphrasing only if a work is free of rights and authorship is cited correctly. Any changes in these criteria will be reported on the first day of class of this module.

3. Completion of an individual questionnaire (10% of the final grade). This questionnaire will take place in the last lecture of this module. It will consist of test-type and true-or-false questions about the Viquipedia articles submitted by all the groups and discussed during the presentations, as well as about the concept of Viquipedia and its divulgation characteristics.

In theoretical and methodological classes and wikiproject are taken into account the punctuality and attitude of the student. In any case, this assessment does not entail an increase of the mark but may mean the reduction of up to 25 % of the final grade obtained in this subject.

Students who cannot attend an individual test for certified cause (as a health problem, death of a family member of up to second grade, accident, enjoy the status of an elite athlete and have a competition or sports activity of must-attend, etc) and provide official documentation to the coordinator of the degree (an official medical certificate that is done explicitly noted the inability of an examination overcrowded police, justification of the sports authority, etc.) shall be entitled to perform the test on another date. The Coordinator will ensure the realization of the test, after asking the teacher involved.

To pass the course students you must get at least 5 in each module. Students that do not exceed the assessments of the different modules (theoretical and/or methodological and seminar modules) of the course will be a second chance to pass the course at the end of the semester (recovery exam). To be able to attend this exam it is necessary that the student has been previously evaluated for continuous evaluation activities equivalent to 2/3 (67 %) of the final mark. The re-assessment of the theory module will be done in a single written test including multiple choice and short questions. On the other hand, the re-assessment of the methodological classes and wikiproject module will be done in a questionnaire with multiple choice and true/false questions. Students who do not obtain the minimum required grade will not pass the course. In this case, the maximum course final grade will be 4.

The student will be graded as "No Avaluable" if the weighting of all conducted evaluation activities is less than 67% of the final score.

Students who wish to improve the final grade of the course (theory and/or methodological classes and wikiproject) must be submitted to a specific test of evaluation that will take place the same day that the recovery exam. The presentation of the student to this improving exam will involve renouncing the qualification obtained previously.

*Student's assessment may experience some modifications depending on the restrictions to face-to-face activities enforced by health authorities.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Methodological classes and Wikiproject: Informative article delivery to the Viquipèdia	20	0	0	7, 8, 1, 3, 2, 4, 5, 6, 9, 10, 12, 11
Methodological classes and Wikiproject: Resolution of Methodological activities	10	0	0	7, 8, 1, 3, 2, 4, 5, 6, 9, 10, 12, 11
Methodological classes and viquiproject: Questionnaire with multiple choice and true/false questions	10	0	0	7, 8, 1, 3, 2, 4, 5, 6, 9, 10, 12, 11
Theoretical classes: Questionnaire with multiple choice questions	48	3.2	0.13	7, 8, 1, 3, 2, 4, 5, 6, 10, 11
Theoretical classes: Questionnaire with short questions	12	0.8	0.03	7, 8, 1, 3, 2, 4, 5, 6, 10, 11

Bibliography

Text books:-

- Bhunia AK. 2018. Foodborne Microbial Pathogens, 2nd Edition. Springer. ISBN: 978-1-4939-7349-1.(http://link.springer.com/openurl?genre=book&isbn=978-1-4939-7349-1).

- Doyle, MP., Diez-Gonzalez, F., Hill, C. 2019. Food Microbiology: Fundamentals and Frontiers, 5th Edition. American Society for Microbiology (ASM). ISBN: 9781683670476. (https://onlinelibrary.wiley.com/doi/book/10.1128/9781555819972).

- Erkmen, O., Bozoglu, TF. 2016. Food Microbiology: Principles into Practice. John Wiley & Sons, Ltd. ISBN: 9781119237860. (https://onlinelibrary.wiley.com/doi/book/10.1002/9781119237860).

- Frazier, WC., Westhoff, DC. 2003. Microbiologia de los alimentos. 4ª Edición. Ed. Acribia, Zaragoza.

- Jay, JM., Loessner, MJ., Golden, DA. 2009. Microbiología moderna de los alimentos. 5ª edición. Editorial Acribia S.A. Zaragoza. ISBN: 978-84-200-1125-7.

- Lawley, R., Curtis, L., Davis, J. 2012. Food Safety Hazard Guidebook (2nd Edition). Royal Society of Chemistry. ISBN: 978-1-84973-381-6. (https://app.knovel.com/web/browse-a-subject-area.v/catid:216/cat_slug:food-science/)

- Madigan, MT., KS. Bender, DH. Buckley, WM Sattley, DA. Stahl. 2019. Brock Biology of microorganisms. 15th edition. Pearson, S.A. ISBN: 9780134261928.

- Madigan, MT., JM. Martinko, KS. Bender, DH. Buckley, DA. Stahl. 2015 (14 ed). *Brock* Biología de los microorganismos. PearsonEducación, S.A. (https://www.academia.edu/39077515/Biolog%C3%ADa_de_los_microorganismos_BROCK)

- Martín A,V Béjar, JC Gutierrez, M Llagostera, E. Quesada. 2019. Microbiología Esencial. 1ª edición. Editorial Médica Panamericana. ISBN: 9788498357868. (https://www.medicapanamericana.com/VisorEbookV2/Ebook/9788491102427)

- Matthews, KR., Kniel, KE., Montville, TJ. 2017. Food Microbiology: An Introduction. (4th Edition). American Society for Microbiology (ASM). ISBN: 978-1-55-581938-5. (https://app.knovel.com/web/browse-a-subject-area.v/catid:216/cat_slug:food-science/)

- Montville, TJ., Matthews, KR. 2009. Microbiología de los alimentos. Introducción. 1ª edición. Editorial Acribia S.A. Zaragoza. ISBN: 978-84-200-1131-8.

- Mossel, DAA., Moreno, B., Struijk, CB. 2003. Microbiología de los alimentos: Fundamentos ecológicos para garantizar y comprobar la integridad (inocuidad y calidad) microbiológica de los alimentos. 2ª edición. Editorial Acribia. Zaragoza. ISBN:84-200-0998-9.

- Pascual, MR., Calderón, V. 2000. Microbiología alimentaria. Metodología analítica para alimentos y bebidas. 2ª edición. Editorial Diaz de Santos. ISBN: 978-84-7978-424-9. https://books.google.es/books/about/Microbiolog%C3%ADa_Alimentaria.html?id=9EIfkks8uxMC&redir_esc=y

- Tham, W., Danielsson-Tham, ML. 2014. Food associated pathogens. CRP Press. Taylor & Francis Group. A science publishers book. ISBN: 978-1-4665-8498-3. http://lib.myilibrary.com?id=518714

Webs:

Agència Catalana de Seguretat Alimentària (http://acsa.gencat.cat/)

Agència de Salut Pública de Barcelona (https://www.aspb.cat/)

Agencia Española de Seguridad Alimentaria y Nutrición (http://www.aecosan.msssi.gob.es/AECOSAN/web/home/aecosan_inicio.htm)

Codex Alimentarius - Normas internacionales de los alimentos (http://www.fao.org/fao-who-codexalimentarius/es/)

FDA (Food and Drug Administration) (https://www.fda.gov/)

Microbes in food and drink, Micro-Encyclopedia, Society for General Microbiology (https://socgenmicrobiol.org.uk/micro_encyc/default.cfm

OMS sobre seguretat alimentaria (http://www.who.int/foodsafety/en/)

Panel de Riesgos Biológicos (BIOHAZ) de la European Food Safety Authority (EFSA) (http://www.efsa.europa.eu/en/panels/biohaz)

Seguridad Alimentaria en la UE (https://europa.eu/european-union/topics/food-safety_es)

Sociedad Española de Microbiología. Grupo de Microbiología de Alimentos (http://microalimentos.semicrobiologia.org/)

The European scientific journal devoted to the epidemiology, surveillance, prevention and control of communicable diseases (https://ec.europa.eu/food/safety/biosafety/food_borne_diseases_en)

The International Commission on Microbiological Specifications for Foods (ICMSF) (http://www.icmsf.org/)

Scientific journals:

-Applied Microbiology and Biotechnology. Springer (http://www.springer.com/life+sciences/microbiology/journal/253)

- European Food Research andTechnology. Springer (link.springer.com/journal/217)

- Food Control. Elsevier (http://www.journals.elsevier.com/food-control/)

- Food Microbiology. Elsevier (http://www.journals.elsevier.com/food-microbiology/)

- Frontiers in Microbiology (https://www.frontiersin.org/journals/microbiology)

- International Journal of Food Microbiology. Elsevier (http://www.journals.elsevier.com/international-journal-of-food-microbiology/)

- Journal of Dairy Science. ScienceDirect (http://www.journalofdairyscience.org)

Software

No specific software is required to take this subject.