Universitat Autònoma de Barcelona

2023/2024

Food Microbiology

Code: 101005
ECTS Credits: 6

Degree	Type	Year	Semester
2500502 Microbiology	OB	3	1

Contact

Name: Antonio Sole Cornella

Email: antoni.sole@uab.cat

Teaching groups languages

You can check it through this link. To consult the language you will need to enter the CODE of the subject. Please note that this information is provisional until 30 November 2023.

Teachers

Antonio Sole Cornella

External teachers

Xavier Dengra Grau

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. Historical perspective and Microorganisms in foods

Unit 2. Microbial control and food preservation. Predictive microbiology

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.

Unit 23. Other foods.

Methodology

The subject of Food Microbiology comprises two modules: theoretical classes and seminars. These have been programmed in an integrated way so that the student will have to relate throughout the course to the contents and activities programmed to achieve the competencies indicated previously in this guide.

The two modules are based on the following:

In the Theoretical Classes, the student must acquire the scientific-technical knowledge of this subject by attending these classes and complementing them with a personal study of the topics explained. At the beginning of the course, the student will be given a detailed calendar of the topics discussed throughout the course, as well as the bibliography that must be consulted to prepare the theoretical classes and for the personal study of the theoretical contents of the subject.

The Seminars module will be work sessions in two groups, each with half of the students, where two learning activities will be worked on:

- Methodological cases/exercises. Students will carry out complementary activities to theory classes where methodological and applied aspects will be worked on.

- WikiProject. The students, subdivided into groups (4), will have to work on an encyclopedic article in the Catalan Wikipedia. The articles in question will be pre-selected considering the syllabus of the subject and its presence in the free encyclopedia (very deficient or non-existent in Catalan). To facilitate the learning of

Wikipedia and its use in the classroom, there will be two specific sessions to learn how to edit it and a talk page (forum) to answer questions and offer technical support to students throughout the process. On the first day of the seminar class, the teacher will present and distribute among the students the selected topics. Once all the groups have published their articles, they willshow and discuss them in class, and they will be evaluated.

Additional information:

In order to support the training activities indicated above, students will be able to carry out individual tutorials on the contents of the subject in the office of the teacher, Antoni Solé (C3-337), at hours previously arranged by email.

For a good follow-up of the subject, the student will have the complementary material that the teacher deems necessary and the presentation *and the teaching guid in the Moodle classroom.* You can also consult the teaching space of the Degree Coordination to obtain updated information regarding the degree.

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			
Seminars	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 evaluation of the subject will be individual and continuous through the following modules:

Evaluation module of the Theoretical Classes (60% of the final grade): Two written different eliminatory assessment exams will be assigned for this module, the first exam, with a weight of 32%, includes units 1 to 9, and the second exam, with a weight of 28%, includes units 10 to 23. These evaluations will be eliminatory if a minimum grade of 5 is obtained. Each test will include three parts: multiple choice questions; true or false questions and short questions, with a value of 6, 2 and 2 points out of 10, respectively.

Seminar assessment module (40% of the final grade). The evaluation of this module includes:

1.-Resolution of cases / methodological exercises (10% of the final grade). The seminar classes corresponding to this activity, from 1 to 9, will be compulsory attendance. If a student of a seminar group cannot attend one of these sessions, he must communicate and justify it clearly to the responsible teacher, and thus be able to attend the same session of the other group of seminars. If there is no clear justification, the change will not be valid, and like absence in any of the sessions, may entail a penalty in evaluating this training activity.

2.- Deliver an informative article to Wikipedia and defend the WikiProject (17.5% of the final grade). In this case, students must:

- Search for one or more scientific articles or academic book chapters on the subject of the assigned Wikipedia article (preferably in open access) that they can then use to guide the structure of the content and cite it as a bibliography of the article.

- Create or improve an existing article on the Catalan Wikipedia, the free online encyclopedia (depending on its status at the beginning of the subject) on theassigned topic. Compliance with the *specific follow-up guidelines* found on the subject's wikiproject page (Viquiprojecte: Microbiologia dels Aliments UAB) will be evaluated, which will be previously explained during the first classes of the Seminars module. These guidelines consider scientific correctness but also the informative structure, the ability to synthesize and write, the informative vocabulary, the use of infographics and the wiki style guide. In addition, it will be evaluated in a particularly critical and exhaustive way that students are able to 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 the authorship is cited correctly. Any changes in these criteria will be informed on the first day of class of this module.

- In the defense of the WikiProject it will be taken into account that students adjust to the maximum time indicated for the presentation, and that they are able to orally synthesize the information contained in their WikiProject based on the following points to be discussed: assigned topic, the structure of the article, summary explanation of the contents and / or information considered relevant, as well as any other point or aspect that students think interesting about the exposed topic.

3.- Preparation of test questions and true/false (5% of the final grade). The students, individually, will have to prepare 5 test questions and 5 true/false questions about the WikiProject in which they have worked. These questions must be sent to the responsible teacher, by email, no later than the same day assigned for the defense of their WikiProject.

4.- Completion of the individual questionnaire (7.5% of the final grade). This questionnaire will take place on the last day of class of this module and will consist of answering testand/or true/false questions that students will have presented about the Wikipedia articles worked on and discussed in the classroom and that will subsequently have been evaluated by the teacher, and questions about the functioning of Wikipedia as a scientific dissemination tool.

In the theoretical classes and seminars, the student's punctuality and attitude will be considered. In no case this follow-up will entail an increase in the grade, but failure to comply with this may mean a reduction of up to 25% of the final grade obtained in this subject.

Students who cannot attend an individual assessment test for justified reasons (such as a health problem, death of a relative up to a second degree, accident, elite athlete status, and have a compulsory competition or sports activity, etc.) and provide the corresponding official documentation to the degree coordinator (official medical certificate explicitly stating their inability to take an exam, police report, justification from the competent sports body, etc.), will have the right to take the test on another date. The degree coordinator will ensure the concretion of this after consultation with the teacher of the subject affected.

To pass the subject, a minimum grade of 5 must be obtained in each module. Students who do not pass the evaluations of the different modules of the subject will be able to recover them on the scheduled date at the end of the semester (Recovery exam) where the minimum grade to pass will also be 5. In order to be able to attend the recovery exam, the student must have been previously evaluated for continuous assessment activities that are equivalent to 2/3 (67%) of the final grade. In the case of the theoretical classes module, they will only have to submit to the individual evaluation test not passed previously, and that will consist of a multiple-choice questionnaire that will include multiple choice, true/false and short questions. In the case of the

seminar module, theymust be submitted to a written test based on test and/or true/false questions referring to the different activities worked during these classes. Students who do not obtain the minimum required qualification cannot pass the subject. In this case, the maximum final grade for the subject will be 4.

Students will obtain the "Non-Valuable" qualification when the evaluation activities carried out have a weighting of less than 67% in the final grade.

Students who want to improve the final grade of the subject (theory and/or seminars) will have to submit to a specific evaluation test that will take place on the same day that the recovery exam is done. These improvement tests will include all the contents taught during the theoretical classes (theory improvement) and/or all the contents taught during the seminar classes (improvement methodology and wikiproject) and will consist of a questionnaire-type test and/or true/false where the student must demonstrate that he has improved his degree of knowledge of the subject. The presentation of the student to this improvement exam will entail the waiver of the qualification previously obtained.

Single assessment

Single assessment consists of a single examination in which the two modules of the subject will be assessed: theory classes and seminars. Regarding the Theoretical Classes module, all the contents of the entire program of the subject will be evaluated and consist of test questions, true/false questions, and short questions. The note obtained in this part will represent 60 % of the final grade of the subject and must be equal to or greater than 5.

Regarding the Seminars module, in the single assessment, the activities related to the *Resolution of methodological cases/exercises* and the Q*uestionnaire with multiple choice and true/false questions* will be evaluated, both through test questions andtrue/false and will have a weight of 17.5 % of the final grade of the subject and must also be equal to or greater than 5.

As for the rest of the activities programmed within the Seminars module: *Deliver informative article to Viquipèdia and defend the Viquiprojecte* and *Preparation of test questions and true/false*, the same procedure will be followed as in the continuous assessment with a weight of 22.5 % of the final grade of the subject.

The single assessment exam will coincide with the same date set in the calendar for the last partial assessment exam and the same recovery system will be applied as for continuous assessment.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Seminars: Deliver informative article to Viquipèdia and defend the Viquiprojecte	17,5	0	0	7, 8, 1, 3, 2, 4, 5, 6, 9, 10, 12, 11
Seminars: Preparation of test and true/false questions	5	0	0	7, 8, 1, 3, 2, 4, 5, 6, 9, 10, 12, 11
Seminars: Questionnaire with multiple choice and true/false questions	7,5	0	0	7, 8, 1, 3, 2, 4, 5, 6, 9, 10, 12, 11
Seminars: Resolution methodological cases/exercises	10	0	0	7, 8, 1, 3, 2, 4, 5, 6, 9, 10, 12, 11
Theoretical Classes: Questionnaire with true/false questions	12	0.8	0.03	7, 8, 1, 3, 2, 4, 5, 6, 10
Theoretical classes: Questionnaire with multiple choice questions	36	2.4	0.1	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.