Universidad Zaragoza

Academic Year: 2025/26

28409 - Microbiology and Immunology

Teaching Plan Information

Academic year: 2025/26
Subject: 28409 - Microbiology and Immunology
Faculty / School: 105 - Facultad de Veterinaria
Degree: 451 - Degree in Veterinary Science
ECTS: 9.0
Year: 2
Semester: Annual
Subject type: Compulsory
Module:

1. General information

Objective: to acquire the basic training in Microbiology and Immunology necessary to understand the rest of the specific subjects of the Degree. This training includes i) differentiating the types of microorganisms (bacteria, viruses, fungi, etc.); ii) knowing their basic characteristics (structure, composition, pathogenic power, resistance to antibiotics, etc.); iii) learning the basic techniques for handling and studying microorganisms; iv) basic techniques for their identification and diagnosis; v) knowing how the immune system works at the cellular and molecular level and the basic techniques for the analysis of the immune response.

2. Learning results

Upon completion of the subject, the student will:

1. Know from a basic point of view the microorganisms object of study in the different branches of Microbiology, both those that affect animal and human health and those that have an industrial, food, biotechnological or ecological application.

2. Be able to define and adequately use the scientific terminology used in Microbiology.

3. Differentiate microbial diversity from systematic, physiological and ecological points of view.

4. Be able to define the mechanisms used by microorganisms in their metabolism to develop their activities.

5. Be able to interpret the mechanisms that microorganisms use to exchange genetic information with each other and what this exchange of information brings them.

6. Know the characteristics of microbial growth and the alternatives for its control.

7. Know the importance of pathogenicity mechanisms, virulence factors of those microorganisms that are disease-producing agents in animals and humans.

8. Be able to differentiate and evaluate the most common sterilization and sanitization techniques.

9. Acquire basic knowledge of the fundamentals of the immune system at the cellular and molecular level.

10. Know the basic elements of the functional response of the immune system against infectious agents.

11. Know the mechanisms involved in the evasion of immune responses, as well as the basic immunological techniques.

12. Know the immune responses that are developed specifically against different microorganisms.

13. Know the specific surveillance systems of the immune system, such as antitumor, aging, transplant rejection.

14. Plan microbiological analyses and immunological diagnostic techniques, plan the methods to be used, and acquire the ability to carry them out and interpret the results.

15. Work in a team, synthesize the available information on a topic, present and substantiate their opinion on it and present it publicly and orally.

3. Syllabus

Theoretical Program

Block I. General Microbiology and Microbiological Technique. Current concept and historical evolution. Diversity of the microbial world. Microbiology in the current scientific panorama. Microbiology Division. Microscopic examination of bacterial and fungal

microorganisms.

Block II. General Bacteriology. Bacterial taxonomy. Bacterial anatomy and structure. Chemical constitution of bacteria and their nutrition. Bacterial physiology. Culture methods. Bacterial reproduction. Biofilm formation. Bacterial variation and genetics. Pathogenic power of bacteria. Toxinogenesis.

Block III. Special Bacteriology and Taxonomy. Differentiated bacterial groups. Microorganisms involved in animal health and public health.

Block IV. General and Taxonomic Mycology. General characteristics of fungi. Methods for the study of fungi. Fungi producing superficial, subcutaneous and deep mycosis. Mycotoxins and mycotoxicosis.

Block V. General and Taxonomic Virology and Prions. Concept and historical development. Nature and structure of viruses. Viral classification. Viral genetics. Methods for the study of viruses. Multiplication of animal viruses. Virus culture techniques. Bacteriophages. General clinic of virosis. General methods of diagnosis of virus diseases. Viral inactivation. DNA viruses and RNA viruses. Concept of prion. Properties of prions. Replication. Bovine Spongiform Encephalopathy. Scrapie

Block VI. Microbiological diagnosis. Basic rules for the collection and transport of clinical microbiological (pathological) samples. Safety in the microbiology laboratory. Gram and Ziehl-Neelsen methods. Biochemical tests for bacterial identification. Antibiogram. Techniques of observation, culture, isolation and identification of fungi. Multiplication of animal viruses. Methods for the study of viruses. Hemoagglutination and Hemoadsorption. General methods of diagnosis of virus diseases. Immunological tests for diagnosis and identification.

Block VII. Control of Microorganisms. Physical and chemical methods. Antibiotics and antibiotic resistance.

Block VIII. General Immunology. History and current concept. Mechanisms of natural immunity. Inflammation. Acquired immunity. Characteristics of the antigenic molecule. Antigens and Major Histocompatibility Complex. Immunocompetent cells. Lymphoid organs. Antibodies. Immunoglobulins. Antibody synthesis. The complement. Immunological against microbial and parasitic antigens. Non-Microbial Immunology. Local immunity and other immunologic aspects

Block IX. Immunopathology. Immune system alterations. Hypersensitivity reactions. Autoimmunity. Immunodeficiencies.

Block X. Applied immunology and prevention strategies. Immunoprophylaxis. Seroprevention and serodiagnosis. Immunomodulation and immunosuppression.

Practical Program

Practical sessions 1 to 6 (Bacteriology): culture of microorganisms, staining, identification of bacterial microorganisms, evaluation of antimicrobial sensitivity, bacterial counts, sampling, bacterial genetics, study of filamentous fungi and yeasts.

Practical sessions 7 to 9 (Immunology): agglutination and precipitation reactions, immunofluorescence and enzyme-linked immunosorbent assays.

Seminars (problem solving and case studies): introduction to the bibliographic search and approach and beginning of group work in Microbiology and Immunology; work presentation.

4. Academic activities

The learning activities are divided into:

- Participative master classes (60 hours);

- Laboratory sessions (27 hours), where students will put into practice the theoretical knowledge acquired.

- Tutored group work. Students will be assigned work related to the subject that must be developed and defended before the faculty (3 face-to-face hours).

The documentation of each theoretical topic and the practice scripts will be posted in the Digital Teaching Ring (Anillo Digital Docente) of the University of Zaragoza.

Students will have tutoring hours (face-to-face or telematic) to solve doubts about the subject. Tutorials will be arranged in advance with the teachers.

5. Assessment system

A. Theoretical knowledge assessment test

Consisting of multiple-choice questions through the Moodle platform of the University of Zaragoza. The understanding and reasoning of the concepts developed during the term will be assessed. It accounts for 60% of the final grade.

B. Assessment test of laboratory practices

At the end of the practical period of each semester an evaluation of the presentation of the results obtained will be carried out. It will be necessary to obtain a minimum grade of 5 out of 10 in each evaluation. In case of not presenting the results of the practical sessions or not passing the evaluation, the students will have to take a final exam on the practices in the official calls. The exam will be carried out through the Moodle platform and will consist of short questions and/or multiple choice questions on the practices developed. The grade of the practicals is 20% of the final grade (10% of the bacteriology/mycology part and 10% of the immunology part).

C. Assessment test of group work

A presentation of the work will be performed and its design, content, expository clarity and defence will be evaluated. It

represents 20% of the final grade.

In all tests (A, B and C) it will be necessary to obtain a minimum grade of 5 out of 10. For multiple-choice questions, correction factors may be considered to help reduce the risk of randomly answering questions. In this sense, failed answers will be penalized with 20% of the total value of the question.

Students taking a single comprehensive test may only perform the revision work individually (after assignment of the topic by the teacher in charge), and must present it orally immediately after the written tests.

The grade obtained in these tests will be maintained in successive calls for exams of the same academic year. However, the grade of tests B and C may be maintained in consecutive calls for exams within the 3 years following the first enrolment in the subject.

6. Sustainable Development Goals

3 - Good Health and Well-being
4 - Quality Education
12 - Responsible Consumption and Production