

Immunology

Code: 101932
ECTS Credits: 6

Degree	Type	Year	Semester
2501230 Biomedical Sciences	OB	2	2

Contact

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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.

Prerequisites

To enroll in this subject, students must have obtained the basic knowledge of Biochemistry, Molecular Biology and Cell Biology of the subjects that have completed the first year of the Degree

Objectives and Contextualisation

Objectives of the subject:

At the end of the course, students will have to:

- Know the components of the immune system: molecules, cells and lymphoid organs.
- Understand the innate and adaptive immune response, humoral and cellular; the phases of the immune response and the regulation and homeostasis of the immune system.
- Know the communication between components of the immune system through blood and lymphatic traffic; and the anatomical location of the immune response.
- Apply the knowledge of the immune response in infections for viruses, bacteria, protozoa, helminths and fungi.
- Identify the cellular and molecular immunological techniques applicable to the different biological systems.
- Analyse how to apply the reactions of the immune system and its specificity to the study of biomolecules, diagnosis, vaccines and immunotherapy.
- Know the basics of immunopathology

Competences

- Act with ethical responsibility and respect for fundamental rights and duties, diversity and democratic values.
- Display knowledge of the bases and elements applicable to the development and validation of diagnostic and therapeutic techniques.
- Display knowledge of the basic life processes on several levels of organisation: molecular, cellular, tissues, organs, individual and populations.
- Display knowledge of the concepts and language of biomedical sciences in order to follow biomedical literature correctly.
- Display theoretical and practical knowledge of the major molecular and cellular bases of human and animal pathologies.
- Make changes to methods and processes in the area of knowledge in order to provide innovative responses to society's needs and demands.
- Read and critically analyse original and review papers on biomedical issues and assess and choose the appropriate methodological descriptions for biomedical laboratory research work.
- Students must be capable of applying their knowledge to their work or vocation in a professional way and they should have building arguments and problem resolution skills within their area of study.
- Students must be capable of collecting and interpreting relevant data (usually within their area of study) in order to make statements that reflect social, scientific or ethical relevant issues.
- Students must be capable of communicating information, ideas, problems and solutions to both specialised and non-specialised audiences.
- Students must develop the necessary learning skills to undertake further training with a high degree of autonomy.
- Students must have and understand knowledge of an area of study built on the basis of general secondary education, and while it relies on some advanced textbooks it also includes some aspects coming from the forefront of its field of study.
- Take account of social, economic and environmental impacts when operating within one's own area of knowledge.
- Take sex- or gender-based inequalities into consideration when operating within one's own area of knowledge.
- Work as part of a group with members of other professions, understanding their viewpoint and establishing a constructive collaboration.

Learning Outcomes

1. Act with ethical responsibility and respect for fundamental rights and duties, diversity and democratic values.
2. Analyse the relationship between the nature of the immune response and the molecular and physical characteristics of the antigens that induce it.
3. Define the properties of the adaptive immune response that distinguish it from the innate response. Understand the clonal distribution of the antigen receptors of lymphocytes and the theory of clonal selection.
4. Describe the most important groups of pathogenic microorganisms .
5. Describe the principal mechanisms by which the immune system participates in pathology: immunodeficiencies, hypersensitivity, autoimmunity.
6. Describe the theoretical principles of immunological techniques.
7. Display practical skills in performing a diagnostic analysis in immunopathology.
8. Display practical skills in using the technologies applicable to experimentation in immunology.
9. Explain the mechanisms of activation and regulation of the cellular and humoral immune response and their link to immunopathology.
10. Explain the relationships between a possible pathogen and its host.
11. Identify the principal elements intervening in the immune response to infections and tumours, and in the situation of allogeneic transplant.

12. Make changes to methods and processes in the area of knowledge in order to provide innovative responses to society's needs and demands.
13. Recognise the role of microorganisms as agents of disease or toxicological problems in human beings, animals and plants.
14. Reproduce a general vision of the modes of intervention in the immune response, that is, the principles of immunotherapy.
15. Students must be capable of applying their knowledge to their work or vocation in a professional way and they should have building arguments and problem resolution skills within their area of study.
16. Students must be capable of collecting and interpreting relevant data (usually within their area of study) in order to make statements that reflect social, scientific or ethical relevant issues.
17. Students must be capable of communicating information, ideas, problems and solutions to both specialised and non-specialised audiences.
18. Students must develop the necessary learning skills to undertake further training with a high degree of autonomy.
19. Students must have and understand knowledge of an area of study built on the basis of general secondary education, and while it relies on some advanced textbooks it also includes some aspects coming from the forefront of its field of study.
20. Take account of social, economic and environmental impacts when operating within one's own area of knowledge.
21. Take sex- or gender-based inequalities into consideration when operating within one's own area of knowledge.
22. Understand scientific texts and write review papers on immunology and biology.
23. Understand the scientific literature and the databases specialising in problems of immunology and immunopathology, and interpret the results of a scientific project.
24. Understand the structure and function of the immune system on the scale of molecules, cells, tissues and organs.
25. Work as part of a group with members of other professions, understanding their viewpoint and establishing a constructive collaboration.

Content

Contents of the subject:

Block I. Basic immunology (3 ECTS).

Block II. Organization of the Immune Response and its application (3 ECTS).

Block I. Basic immunology (3 ECTS).

Introduction

TOPIC 1: Introduction: general view of the immune system. Basic concepts.

TOPIC 2: Introduction: general view of the immune system. Components and actions of the immune response.

TOPIC 3: Anatomy: organs and tissues immune

Innate immunity

TOPIC 4: Inborn immunity: immediate and induced

TOPIC 5: Inborn immune response cells: macrophages, granulocytes, APC and NK

TOPIC 6: The System of the Complement

Acquired immunity - Antigen-specific cells and receptors and antigen recognition

TOPIC 7: Structure of immunoglobulins and antigen receptor of B cells (BCR)

TOPIC 8: Organization and reordering of immunoglobulin genes

TOPIC 9: Antigen-antibody interaction

TOPIC 10: Lymphocytes B: Selection in bone marrow and subpopulations of lymphocytes B

TOPIC 11: Main Histocompatibility Complex: structure, function and gene organization

TOPIC 12: MHC: antigen processing and presentation

TOPIC 13: Cell T antigen receptor (TCR): structure and genetics

TOPIC 14: Lymphocytes T: thymic selection and subpopulations of T lymphocytes

Block II. Organization of the Immune Response and its application (3 ECTS)

Organization of the immune response

TOPIC 15: Cytokines

TOPIC 16: Chemokines and Adhesion Molecules

TOPIC 17: Lymphocyte trafficking and recirculation: homing.

TOPIC 18: Activation of the immune response: coreceptors and co-stimulation

TOPIC 19: Cellular immune response

TOPIC 20: Humoral Immune Response

TOPIC 21: Regulation of the immune response: tolerance

Applications of Immune responses

TOPIC 22: Immune response in front of pathogens

TOPIC 23: Immunopathology associated with the immune response: immunodeficiencies and autoimmunity

TOPIC 24: Immunotherapy: tumors, vaccines and transplants

TOPIC 25: Cellular and molecular techniques

Methodology

Lectures:

The 25 themes of the program will be held in 29 sessions of teaching and seminars on applied immunology.

Classroom practices:

14 sessions will be scheduled for groups of students (maximum 4 students), who will prepare them cooperatively. In the sessions prior to the first partial exam, each group has to prepare a thematic set of topics already given in class to solve all the doubts or questions that the class, or where appropriate the teacher, asks them in each session. They will also prepare questions to direct to the class so that they can be answered by the students and explain the doubts they generate. In the following sessions, the groups will prepare seminars on the topics of applied immunology (topics 22-25) or articles (problem-based learning) on more specific issues of current interest.

Each classroom practice session will last 50 minutes. The teacher and the rest of the students will ask questions about the subject. The information on each topic and the application guidelines will be accessible in the UAB Virtual Campus (Moodle). Students will raise doubts in tutorial sessions with the teacher.

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.

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Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Lectures	29	1.16	2, 24, 23, 3, 4, 5, 6, 9, 10, 11, 13, 14
Seminars and problem based learning	14	0.56	25
Type: Autonomous			
Autonomous study	57	2.28	23
Interpretation of experimental data	15	0.6	25
Preparation of work in cooperative learning format	25	1	25

Assessment

The evaluation of the subject will be individual and continuous through the following tests, understanding by continuous evaluation the possibility that the student has to evaluate how his learning is and to be able to have time to the improvement during the course.

Partial exams: two partial exams, at the end of Blocks I and II. Each test will be worth 40% of the final grade. They will be exams of test type with questions with 5 options to choose one. In the correction, 1/5 of the value of each question will be subtracted by incorrect answer. The duration of each test will be a minimum of 2 hours. The subject can be approved by partial as long as the average between the two tests and the seminars is 5, taking into account that it can be done only when the student has a minimum grade of 4 in both partials. Partial exams are recoverable matter.

Classroom practices: Seminars and classroom practices help to develop students' self-learning, synthesis and written and oral communication skills. The evaluation will represent 20% of the final grade of the subject and the proven knowledge, the presentation made, the response to and the ability to solve the questions raised and the relevance of the questions proposed to the class will be evaluated.

Recovery exam: A recovery exam will be scheduled for students who have not reached the minimum necessary (that is, do not have a minimum of 4 in both of the two partial or do not reach 5 in the total of the course) or who want to raise the note. The evaluation of this final exam will be by partials and will count 40% each one of them. In order to pass the subject, a minimum grade of 4 in the total exam is required, provided that the final result of the three evaluable activities is ≥ 5 .

To be eligible for the retake process, the student should have been previously evaluated in a set of activities equaling at least two thirds of the final score of the course or module. Thus, the student will be graded as "No Avaluable" if the weighing of all conducted evaluation activities is less than 67% of the final score

Failure to take any of the tests must be justified. The reason must be important enough to consider taking the exam another day. The specific justification must be presented to the teacher as soon as possible.

Single evaluation

The single assessment consists of a single synthesis test that includes the contents of the entire theory program with a weight of 80% and those corresponding to SEM, PAUL with a weight of 20%. The grade obtained in this synthesis test is 100% of the final grade of the subject.

The single assessment test will take place in the same date fixed in the calendar for the last continuous assessment test and the same retake system will be applied as for the continuous assessment.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Cooperative learning (group work)	20%	2	0.08	1, 21, 20, 2, 24, 23, 22, 3, 7, 8, 5, 6, 9, 10, 12, 19, 18, 17, 15, 16, 13, 25
Final exam	Test 1 40% / Test 2 40%	3	0.12	2, 24, 23, 22, 3, 7, 8, 4, 5, 6, 9, 10, 11, 13, 14
Test 1	40%	2.5	0.1	2, 24, 23, 22, 3, 7, 8, 6
Test 2	40%	2.5	0.1	23, 22, 7, 8, 4, 5, 9, 10, 11, 13, 14

Bibliography

TEXT BOOKS

- Janeway's Immunobiology by K. Murphy, C. Weaver. Ltd/Garland Science, NY & London, 9th ed (2016).
- Kuby Immunology by J. Punt, S. Stranford, P. Jones and J. Owen. W. H. Freeman and Co Ltd. 8th Edition, (2019).
- Cellular and Molecular Immunology by A. K. Abbas, A. H. Lichtman, S. Pillai. Elsevier, 10th ed (2021).
- Basic Immunology de A. Abbas, A. H. Lichtman, S. Pillai. Elsevier, 6th ed, (2019)
- Roitt's Essential Immunology by P. Delves, S Martin, D Burton, I Roitt. Wiley-Blackwell Ed., 13th ed (2017).
- Fundamental Immunology by William E. Paul. Wolters Kluwer (LWW); 7th edition (2012).
- The immune system by P. Parham. Ltd/Garland Science, NY & London, 4th ed (2014).

Software

No more software is needed than the Office 365 available from UAB.