COURSE DATA

DATA SUBJECT

Code: 34086
Name: Immunology
Cycle: Undergraduate Studies
ECTS Credits: 4.5
Academic year: 2026-27

STUDY (S)

Degree	Center	Acad. year	Period
1201 - Degree in Pharmacy	Facultat de Farmàcia i Ciències de l'alimentació	2	Second quarter
1211 - Double Degree in Pharmacy and Human Nutrition and Dietetics	Facultat de Farmàcia i Ciències de l'alimentació	2	Second quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
1201 - Degree in Pharmacy	Immunology	COMPULSORY
1211 - Double Degree in Pharmacy and Human Nutrition and Dietetics	Asignaturas obligatorias del PDG Farmacia-Nutrición Humana y Dietética	COMPULSORY

COORDINATION

TOLEDO NAVARRO RAFAEL

SUMMARY

Currently, immunology is one of the areas of greatest interest in the field of biology in general and more specifically in the Health Sciences. In this context, the study of immunology is necessary for the student of pharmacy today. This need is determined by several factors: (i) the immune response is a physiological process central to understanding the functioning of organisms, (ii) the immune response is a process is a key issue in the context of diseases of infectious nature for understanding aspects such as pathology, treatment, etc., (III) immunodiagnostic methods are essential in the current diagnostic laboratory (IV) the immune system abnormalities are a group of diseases of great importance, and (V) the use of pharmacological agents related to the immune system to the treatment and / or prevention of human disease is increasingly prevalent in our environment. Therefore the course aims Immunology give students the necessary knowledge for understanding the immune response as a physiological process and its

implication in various diseases, their importance in the relations of the organism to pathogens and their application in the diagnosis, therapy and prophylaxis of diseases.

p;

PREVIOUS KNOWLEDGE

RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

There are no specified enrollment restrictions with other subjects of the curriculum.

OTHER REQUIREMENTS

Basic knowledge of physiology, anatomy, biochemistry and molecular biology and genetics.

COMPETENCES / LEARNING OUTCOMES

1201 - Degree in Pharmacy

Acquire basic knowledge of basic and applied immunology.

Act with autonomy in learning, making informed decisions in different contexts, issuing judgements based on experimentation and analysis, and transferring knowledge to new situations.

Apply such knowledge to the professional world, contributing to the development of human rights, democratic principles, principles of equality between women and men, solidarity, environmental protection and promotion of a culture of peace with a gender pe

Collaborate effectively in work teams, assuming responsibilities and leadership roles and contributing to collective improvement and development.

Contribute to the design, development and implementation of solutions that respond to social demands, taking into account the Sustainable Development Goals as a reference.

Demonstrate critical and self-critical thinking in the field of the degree programme, considering aspects such as professional ethics, moral values and the social implications of the different activities carried out.

Develop skills to update knowledge and undertake further studies, including pharmaceutical specialisation, scientific research, technological development and teaching.

Have knowledge on immunopathology and pharmacology of the immune system.

Have knowledge on laboratory application of immunological reactions.

Have knowledge on the immune system.

Know and understand, within the field of the degree programme, gender inequalities in society; integrate different needs and preferences based on sex and gender into the design of solutions and problem solving.

Know how to communicate effectively, both orally and in writing, adapting to the characteristics of the situation and the audience.

Know how to interpret, evaluate and communicate relevant data in the different areas of pharmaceutical activity, using information and communication technologies.

Obtain adequate, diverse and up-to-date information.

Possess and understand knowledge in the different areas of study included in pharmacist training.

Propose creative and innovative solutions to complex situations or problems within the field of knowledge, to respond to diverse professional and social needs.

Show skills in presenting oral or written work.

Transmit ideas, analyse problems and solve them with critical spirit, acquiring teamwork skills and assuming leadership when appropriate.

DESCRIPTION OF CONTENTS

1. Module 1: Introduction to Immunology

Introduction to Immunology: Concept of the immune system.- Primary and secondary lymphoid organs: functional anatomy.- Main cells of the immune system: ontogeny, characteristics and functions.- Innate immune response.- Specific immune response.- Humoral response. and cell phone.Introduction to Immunology: Concept of the immune system.- Primary and secondary lymphoid organs: functional anatomy.- Main cells of the immune system: ontogeny, characteristics and functions.- Innate immune response.- Specific immune response.- Humoral response. and cell phone.

Antigens: Concepts of antigen, hapten, epitope and antigenic mosaic.- Immunogenicity: requirements and immunogenic characteristics of different molecules.- T-dependent and T-independent antigens.
B lymphocytes: Cell development and differentiation.- B lymphocyte receptors.- Antigenic recognition.- Functions of B lymphocytes in the immune response: introduction to the concept of antibody.
Antibodies: Structure and properties of immunoglobulins.- Isotypes, idiotypes and allotypes.- Properties of the different isotypes.- Antigen-antibody union.- Avidity, affinity, specificity and cross-reaction.- Concepts of polyclonal and monoclonal antibodies. - Homologous and heterologous immunity. - Mechanism of generation of the antibody repertoire.
T lymphocytes: Cell development and differentiation.- T lymphocyte receptors.- Subpopulations of T lymphocytes.- Antigenic presentation processes: concept of antigen-presenting cells.- Concept of restriction: introduction to the main histocompatibility complex.- Functions of T lymphocytes.
The main histocompatibility complex: Concept and properties.- Class I molecules: processing of intracellular antigens and presentation.- Class II molecules: processing of extracellular antigens and presentation.
Cytokines: General characteristics and properties.- Main cytokines.- Role of cytokines in the innate

2.

Antigens: Concepts of antigen, hapten, epitope and antigenic mosaic.- Immunogenicity: requirements and immunogenic characteristics of different molecules.- T-dependent and T-independent antigens.
B lymphocytes: Cell development and differentiation.- B lymphocyte receptors.- Antigenic recognition.- Functions of B lymphocytes in the immune response: introduction to the concept of antibody.
Antibodies: Structure and properties of immunoglobulins.- Isotypes, idiotypes and allotypes.- Properties of the different isotypes.- Antigen-antibody union.- Avidity, affinity, specificity and cross-reaction.- Concepts of polyclonal and monoclonal antibodies. - Homologous and heterologous immunity. - Mechanism of generation of the antibody repertoire.response and in the specific response.- Cytokines that stimulate hematopoiesis.
Antigenic recognition and activation of T lymphocytes: types of recognized antigens.- Differentiation of CD8+ T lymphocytes.- Cytotoxic T lymphocytes (Tc).- Differentiation of CD4+ T lymphocytes.- T helper lymphocytes (Th): Th1 subpopulations and Th2.- Functions of each subpopulation of T lymphocytes in the immune response.- Polarization of the immune response: Th1 vs Th2.
Antigenic recognition and activation of B lymphocytes: General characterization of the humoral response.- Activation by T-dependent and T-independent antigens.- Cooperation processes of Th lympho

3. Module 3: Mechanisms of the immune response effectors

Cytotoxicity processes: Tc lymphocytes: antigenic recognition and mechanisms of action.- NK cells: recognition of target cells and mechanisms of action.- Cellular cytotoxicity mediated by antibodies.
The complement system: characteristics and properties.- Activation pathways.- The complement cascade.- The membrane attack complex.- Main biological functions of complement proteins.
Phagocytosis: General description of the process.- Opsonization.- Macrophages: characteristics and mechanisms of action.- Neutrophils: characteristics and mechanisms of action.- Antigen destruction mechanisms.

4. Module 4: Regulation of the immune response

Functional anatomy of the immune response: Induction of the response.- Lymphocytic recirculation.- Response in the spleen and lymph nodes.- The cutaneous immune system.- Mucosal immunity.
Inflammatory response: General dynamics of the process.- Cell populations involved.- Mediators of inflammation.- Cell migration, intercellular adhesion and extravasation.- Chronic inflammation and granuloma formation.- Transcendence of the inflammatory response in the immune response.
Homeostasis of the immune system: Mechanisms dependent on antigen elimination.- Mechanisms mediated by CTLA-4 (CD152).- Treg lymphocytes.- Idiopathic regulation.- Feedback by antibodies.- Inhibitory cytokines.

Application of antibodies in the laboratory: antigen-antibody interactions and their usefulness.- Characterization of antigens and antibodies.- Obtaining polyclonal antigens and antibodies.- Monoclonal antibodies: obtaining and applications.
Introduction to immunological diagnosis: Fundamentals.- Advantages and limitations of immunodiagnosis. - Detection of antigens.- Analysis of different biological samples.- Main non-specific markers of disease.

5. Module 5: Applications of the immune response

Application of antibodies in the laboratory: antigen-antibody interactions and their usefulness.- Characterization of antigens and antibodies.- Obtaining polyclonal antigens and antibodies.- Monoclonal antibodies: obtaining and applications.
Exploration of the humoral immune response: General foundations.- Precipitation reactions: foundation and main techniques.- Agglutination reactions: foundation.- Active and passive agglutination.- Hemagglutination.- Reactions that use complement
Immunoenzymatic techniques: Foundation.- Enzymes and substrates.- ELISA: foundation.- Types of ELISA: direct, indirect, sandwich and competitive.- Advantages and limitations of ELISA techniques.
Immunoblotting techniques: General foundation.- Western-blot: foundation, applications and advantages.- Dot-blot: foundation, applications, advantages and limitations.- Immunochromatography.
Immunofluorescence (IF) reactions: General foundation.- Fluorochromes.- Types of IF: direct, indirect and sandwich.- Fluorimetric techniques.- Advantages and disadvantages of IF.
Radioimmunoassays (RIA): General foundation.- Liquid phase methods.- Solid phase methods.- Advantages and disadvantages of RIA.
Lesson 23: Exploration of the cellular response: isolation of lymphocytes.- Lymphocyte proliferation tests.- Immunohistochemistry.- Evaluation of cellular immunity.- Flow cytometry.
Immunization: concept.- Passive immunization: serotherapy.- Active immunization: vaccine concept.- Strategies for vaccine development.- Types of vaccines: attenuated organisms, purified or recombinant molecules and DNA vaccines.- Adjuvants and immunomodulators .- Advantages and limitations of vaccination.

6. Module 6: The immune system and disease

Hypersensitivity: Concept.- Type I hypersensitivity: allergies.- Type II hypersensitivity.- Type III hypersensitivity: immune complexes.- Type IV hypersensitivity.
Tolerance and autoimmunity: Immune tolerance: Concept and significance.- Mechanisms of tolerance.- Central thymic tolerance.- Post-thymic or peripheral tolerance. Concept and types of autoimmune diseases. - Mechanisms of autoimmunity: general principles.- Etiology of the autoimmunity
Immunity against infectious agents: Immunity against extracellular bacteria.- Immunity against intracellular bacteria.- Immunity against fungi.- Immunity against viruses.- Immunity against parasites.- Agent evasion mechanisms infectious.- Immune response caused by arthropods. .
Immunodeficiencies: Concept.- Primary immunodeficiencies: lymphocyte, complement and phagocyte anomalies.- Acquired immunodeficiencies: acquired immunodeficiency syndrome.- Life cycle of the virus and mechanisms of immunosuppression.- Immune response to the HIV virus.- Other acquired immunodeficiencies.
Antitumor immunity: tumor antigens.- Effector mechanisms in antitumor immunity.- Tumor mechanisms of immunoevasion.- Antitumor immunotherapy.
Immune response to transplants: histocompatibility antigens.- Allogeneic and xenogeneic transplants.- Time course of rejection.- Prevention of rejection.
Pharmacology of the immune system: Immunostimulating medications: Concept and applications.- Main immunostimulating medications.- Immunosuppressive medications: Concept and applications.- Main immunosuppressive medications.- Therapeutic application of monoclonal antibodies.

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Tutorials	1,00
Theory	43,00
Seminar	1,00
Total hours	**45,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00
Individual or group project	20,00
Independent study and work	30,00
Preparation of lessons	17,50
Preparation for assessment activities	0,00
Resolution of case studies	0,00
Total hours	**67,50**

TEACHING METHODOLOGY

1 .- Group learning with the teacher:
Lectures in theoretical classes, enabling the teacher to organize how to cover and raise the subject, study and influence the most important aspects of each lesson. Each lecture is accompanied by the appropriate graphic material to help consolidate knowledge. The delivery will be theoretical, although it has active student participation through problem solving and practical assumptions raised throughout the course. In this sense, the teacher will explain the points of greatest interest or importance of each topic, while the student should seek information and / or deduced from what is explained of the most accessories. The student will have a script for each of the issues. For all that the course be raised in two stages. Initially, we address basic aspects of immunology that students can reach a proper understanding of the molecular basis of immune response. Subsequently analyzed in a particular immune response as a physiological process to then study different aspects of experimental and diagnostic immunology. Finally, addressing other aspects of interest the various pathologies associated with the immune system. This will be addressed so that students can engage in teaching and to acquire capacity for analysis and resolution of problems and issues of an experimental nature.

2 .- Tutorial:
This encounter or meeting between a teacher and small groups of students in order to exchange information, analyze, guide or assess a problem or project, discuss a topic, discuss an issue, and so on., Useful for academic and personal student. The appropriate mentoring, the student will receive the proposed theme of the seminar to be prepared in groups and present the day set.

3 .- Group work with colleagues (seminar):
In order to foster personal relationships, enhance speaking, share problems and solutions by working with other people during the seminar should be submitted necessarily assigned work in a team (group of 4 persons), which will be evaluated and exposed orally to the other classmates.

EVALUATION

1.- Evaluation of theory: drawing up a compulsory written examination which includes issues like small issues, concepts, reasoning problems or questions, tests, drawings and diagrams etc issues. The content of the theoretical examination of the lessons that include theoretical and practical lessons that. The written exam grade will be a 80% of the final grade, but will be required to obtain a 5 on the exam in order to pass the course.

2.- Evaluation of team work: 10% of the grade will be the final grade in the development, composition and presentation of compulsory work (seminar).

3.- Continuous Assessment: 10% of what will constitute the final grade for attendance, class participation, motivation and concerns about the course, and so on.

Evidence of copying or plagiarism in any of the assessable tasks will result in failure to pass the subject and in appropriate disciplinary action being taken. Please note that, in accordance with article 13. d) of the Statute of the University Student (RD 1791/2010, of 30 December), it is the duty of students to refrain from using or participating in dishonest means in assessment tests, assignments or university official documents. In the event of fraudulent practices, the "Action Protocol for fraudulent practices at the University of Valencia" will be applied (ACGUV 123/2020):

https://www.uv.es/sgeneral/Protocols/C83sp.pdf

REFERENCES

- ABBAS (A.K.), LICHTMAN (A.H.) & POBER (J.S.), 2004.- Inmunología Celular y Molecular (5ª Ed.). Elsevier Science, Barcelona. 560 pp.
- JANEWAY (C.A), TRAVERS (P.), WALPORT (M.) & CAPRA (J.J.), 2000.- Inmunobiología: El sistema inmunitario en condiciones de salud y enfermedad (1ª Ed.). Masson, Barcelona. 656 pp.
- MARGNI (R.A.), 1996.- Inmunología e Inmunoquímica. Fundamentos (5ª Ed.). Editorial Médica Panamericana, Madrid. 976 pp.
- PARHAM (P.), 2006.- Inmunología (2ª Ed.). Editorial Médica Panamericana, Madrid. 469 pp.
- REEVES (G.) & TODD (I.). 2000.- Lecture Notes on Immunology (4th Ed.). Blackwell Science, Oxford. 267 pp.
- REGUEIRO (J.R.) & LOPEZ-LARREA (C.), 2004.- Inmunología. Biología y patología del sistema inmune (3ª Ed.). Editorial Médica Panamericana, Madrid. 218 pp.

- ROITT (I.) & DELVES (P.J.), 2003.- Inmunología: Fundamentos (10ª Ed.). Editorial Médica Panamericana, Madrid. 559 pp.

- ROITT (I.), BROSTOFF (J.) & MALE (D.), 2000.- Inmunología (5ª Ed.). Ediciones Harcourt S.A., Madrid. 423 pp.

- SANCHEZ-PEREZ (M.) (Edit.), 1997.- Introducción a la inmunología humana. Editorial Síntesis, Madrid. 383 pp.