

TITLE OF COURSE: IMMUNOLOGY

SUBJECT FOCUS: Immunology

MODULE: Medicine and pharmacology

PROGRAM TITLE: Bachelor Degree in Pharmacy

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GENERAL CHARACTERISTICS*

Type: ☐ Basic training, X Compulsory, ☐ Optional ☐ Final degree project,
☐ Required Practical Training in Pharmacy
☐ Structured Practical Training (Practicum)

Duration: Semestral

Semester/s: S4

Number of credits ECTS: 3

Languages/s: English

DESCRIPTION

BRIEF DESCRIPTION AND JUSTIFICATION

The aim of the subject of Immunology is that students acquire the fundamentals of both basic and clinical immunology keeping the focus on the needs of student pharmacists in terms of practical applications and therapy.

Herein, we will unravel the main mechanisms of the immune response and their role in the homeostasis of the organism are addressed. This will put the basis for the comprehension of how different pathological processes lead to different immune responses, and how the fault of the mechanisms of immune tolerance and regulation lead to the development of autoimmune diseases, and/or tumors.

In addition, special emphasis is given to the development of monoclonal antibodies and their application in the diagnosis and treatment of immune-based diseases.

COMPETENCES*

Basic Competences:

- B-5 That students have developed those learning skills necessary to undertake further studies with a high degree of autonomy

General Competences:

- G-7 Identify, evaluate and assess problems related to drugs and medications, as well as participate in pharmacosurveillance activities.

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- G-10 Design, apply and evaluate reagents, methods and preclinical and clinical analytical techniques, knowing the basic fundamentals of clinical analysis and the characteristics and contents of laboratory diagnostic opinions
- G-12 Develop hygienic-sanitary analysis, especially those related to food and environment
- G-18 Being able to incorporate the holistic vision of the person always taking into account all its dimensions (physiological, human, social, psychological or transcendent); to apply it to all areas of action of the pharmaceutical professional

Specific Competences:

- E-MF2 Know and understand the basic fundamentals of clinical analysis and the characteristics and contents of the laboratory diagnosis results
- E-MF11 Evaluate the toxicological effects of substances and design and apply the corresponding tests.
- E-MF15 Know the analytical techniques related to laboratory diagnosis, toxins, food and the environment.

Transversal Competences:

- T-2 be able to function and apply their knowledge and problem-solving skills in complex and specialized work environments that require the use of creative and innovative ideas.

PREREQUISITES*

It is recommended to have previous knowledge of Biology

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CONTENTS

1. BASIC CONCEPTS IN IMMUNOLOGY

- 1.1. **Introduction to immunology:** Basic concepts. Innate and adaptive immunity.
- 1.2. **Anatomy of the immune system:** primary and secondary lymphoid organs.
- 1.3. **Cell communication:** cytokines and chemokines.
- 1.4. **Leukocyte Circulation and Migration into Tissues.** Adhesion molecules.

2. INNATE IMMUNITY

- 2.1. **Recognition of microbes and damaged self by the innate immune system:** pathogen-associated molecular patterns. Cell-associated pattern recognition receptors . Toll-like receptors and cell signaling.
- 2.2. **Non-specific mechanisms of innate immune response.** Physical, chemical and biologic barriers. Complement system. Chemotaxis, opsonization and phagocytosis.
- 2.3. **Cellular components of the innate immune response:** Innate lymphoid cells. NKT cells. Other cells of the innate immune system: PMN, mast cells.
- 2.4. **The Inflammatory response.** Inflammasome. Inflammatory mediators
- 2.5. **The antiviral response**

3. ADAPTIVE IMMUNITY. Molecular and cellular components.

- 3.1 **Antigens.** Antigenic determinants. Immunogenicity and antigenicity.
- 3.2 **Antibodies.** Structure and function. Antigen interaction. Immunoglobulin classes and subclasses.
- 3.3 **Immune Receptors and Signal Transduction**
- 3.4 **Major histocompatibility complex.**

4. ADAPTIVE IMMUNITY. Adaptive immune response: lymphocyte activation, differentiation and effector response.

- 4.1 **Lymphocyte activation**
- 4.2 **Differentiation and functions of T cells CD4 y CD8+**
- 4.3 **Effector mechanisms of humoral responses.**
- 4.4 **Immunologic memory.** B and T memory cells.
- 4.5 **Regulation of the immune response.** Central and peripheral tolerance. Regulatory T cells.

5. IMMUNE RESPONSE IN HEALTH AND DISEASE

- 5.1 **Immune response type 1, type 2 and type 3.**

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- 5.2 **Immunity to microbes.** Immunity to extracellular and intracellular bacteria, fungi, viruses and parasites.
- 5.3 **Immunity to tumors.** Tumor antigens. Immune responses to tumors.
- 5.4 **Transplantation immunology.** Recognition of Alloantigens by T Cells. Patterns and mechanisms of allograft rejection.
- 5.5 **Hypersensitivity reactions.** Type I, II, III and IV hypersensitivity reactions. Allergy: sensitization and effector mechanisms. **Hypersensitivity reaction to drugs**
- 5.6 **Autoimmune diseases.** Immunologic Abnormalities Leading to Autoimmunity.
- 5.7 **Immunodeficiency diseases.** Congenital and Acquired Immunodeficiencies
- 6. **DIAGNOSTIC APPLICATIONS OF IMMUNOLOGY.**
 - 6.1 **Laboratory techniques commonly used in immunology**
 - 6.2 **Assessing the innate and adaptive response**
 - 6.3 **Application of monoclonal and polyclonal antibodies in diagnostic tests**
- 7. **THERAPEUTIC APPLICATIONS OF IMMUNOLOGY**
 - 7.1 **Modification of the immune response:** Immunotherapy and vaccines. Suppression of unwanted responses: immunosuppressive drugs. Passive immunization. Active immunization. Vaccines: types. Vaccination schedule.
 - 7.2 **Biologic therapies in autoimmune and inflammatory diseases.**
 - 7.3 **Monoclonal antibodies**
 - 7.4 **Immunotherapy for tumors**

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METHODOLOGY

TRAINING ACTIVITIES*

Training Activities* (Degree Technical Memory)	Training Activities (Sigma)	Credits* ECTS	Competences*
Lectures	Lectures	0,6	B-5, G-7, G-10, G-2, G-18, E-MF2, E-F11, E-MF15,T-2
Sessions for resolution of exercises and problems	Sessions for resolution of exercises, problems and cases (1)	-	-
Knowledge integration activities: cases, seminars, supervised tasks and cooperative learning	Seminars	1,1	B-5, G-7, G-10, G-2, G-18, E-MF2, E-F11, E-MF15,T-2
Practical work: laboratory or simulations	Practical work / laboratory	-	-
-	Oral and writing presentations (3)	-	-
Student's personal study activities	Personal study activities by students	1,2	B-5, G-7, G-10, G-2, G-18, E-MF2, E-F11, E-MF15,T-2
Evaluation activities	Evaluation activities (exams, tests,)	0,1	B-5, G-7, G-10, G-2, G-18, E-MF2, E-F11, E-MF15,T-2
	TOTAL	3,0	

Degree in Pharmacy: DPharm

(1) For DPharm "cases" from Sigma are included in "Knowledge integration activities"

(2) It does not apply, in DPharm, activities to address students questions are included in "Student's personal study activities"

(3) For Dpharm "Oral and writing presentations" from Sigma, are included in "Knowledge integration activities"

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EXPLANATION OF THE TEACHING METHODOLOGY *

Expository method. participative master lesson, working through the expositions of the different theoretical-practical contents and involving the student with activities and exercises in the classroom. Encouraging the student to ask questions that involve personal reasoning. Teaching of content, explanation and demonstration of abilities, skills and knowledge in the classroom or through audiovisual media

Exercises and problem solving: developing appropriate solutions by performing routines, applying formulas or algorithms and interpreting results. It is usually used as a complement to the lecture.

Evaluation activities. Exercises to evaluate the degree of assumption of competences (knowledge, skills, values) by students. On a continuous or occasional basis

EVALUATION

EVALUATION METHOS

Evaluation methods * (Degree Technical Memory)	Evaluation methods (Sigma)	Weight*(2)	Competences*
Final Exam	Final Exam	60%	B-5, G-7, G-10, G-2, G-18, E-MF2, E-F11, E-MF15,T-2
-	Partial/s Exam/s (1)	-	-
Learning follow-up activities (quizzes, cases, exercises, problems, participation, On-Line evaluation, autoevaluation)	Learning follow-up activities	40%	B-5, G-7, G-10, G-2, G-18, E-MF2, E-F11, E-MF15,T-2
Task and presentations	Tasks and presentations	-	-
Field or experimental work	Field or experimental work	-	-
Evaluation Final degree work	Projects	-	-
External practices	Evaluation by a Company or	-	-

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(Required Practical Training in Pharmacy, Structured Practical Training)	institution		
-	Participation (1)	100%	-

GF: Grado en Farmacia

1) En el GF los epígrafes "Examen/es parcial/es" y "la Participación" de la ficha de la asignatura en Sigma están incluidos en "Seguimiento del aprendizaje"

(2) Los valores pueden oscilar $\pm 5\%$ respecto el valor definido en la memoria del GF (sumatorio final 100%)

LEARNING OUTCOMES*

- Understand how the different mechanisms of the immune response to infections, vaccines, peptides, proteins and xenobiotics in general work in an integrated way.
- Learn in depth the molecular bases and physiology of pathologies produced by abnormalities in the immune response.
- Understand the main mechanisms of modulation of the immune response and its role in the general homeostasis of the organism.
- Know and understand the basic fundamentals of clinical analysis in the field of immunology and its diagnostic value.

QUALIFICATION

First call

The evaluation of the subject will consider the qualifications of the follow-up activities (AS) and the final exam (EF). Thus, the grade for the course will be obtained from:

- **Follow-up activities (FA)** that consist of carrying out a control exam (C), exercises on practical cases (PC) and group presentations (P)
- **A final exam (FE)** which includes all the content of the programme.

The mark of the follow-up activities (SA) will be calculated as the simple average of the different activities carried out. This mark must be greater than or equal to 5 in order to apply the weighting criteria established for the subject. The control exam mark must be higher than 5 to pass.

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The final exam grade (EF) must be greater than or equal to 5 in order to apply the weighting criteria established for the subject.

If the control or the exam mark is less than 5, the final mark for the subject will be the lowest of the two and the first call will be failed.

If the control grade is less than 5, this mark can be improved in the final exam

If all the marks (FA and FE) are higher than the minimum mark set, the final mark (FM) for the subject is calculated as follows:

$$FM = 0,60 \times FE + (P \times 0,1 + PC \times 0,05 + C \times 0,25)$$

Only if this mark is greater than or equal to 5 will the subject be passed.

Second call:

The subject final mark (FM) will be calculated as follows:

$$FM = 0,80 \times FE + 0,2 \times FA$$

In the case of attending to successive calls, the control grade will not be saved, all the theoretical content will be evaluated with a final exam.

The qualifications of the follow-up activities (in this case only practical cases (PC) and group presentations (P) will be those obtained during the development of the course corresponding to the first call

EVALUATION OF COMPETENCES (Defining expressions of calculation for each competence based on corresponding evaluations activities.)

For the evaluation of the competences B-5, G-7, G-10, G-12, G-18, E-MF2, E-MF11, E-MF15 and T-2 the final qualification of the grade will serve as indicator.

Following calls:

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The subject final mark (FM) will be calculated as follows:

$$FM = FE$$

BIBLIOGRAPHY

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K.P. Murphy. Janeway's Immunobiology, 9th International Student Edition. WW Norton & Co, 2021.

D. Male, S. Peebles, V. Male. Immunology. 9th ed. Elsevier, 2020

J. Punt, S. Stranford, P. Jones, JA. Owen. Kuby Immunology. 8th Edition. Ed. WH Freeman. 2018

HISTORICAL DOCUMENT

EARLIER CHANGES

17/12/2021. Dra. Olga Luengo

LAST REVISION 17/12/2021. Dra. Olga Luengo 25/07/2022, Dr. Joel Montané