

MODULE	CONTENT	YEAR	TERM	CREDITS	TYPE
Biology	Parasites and Immunity	3 rd	2 nd	6	Optional
LECTURER(S)			Postal address, telephone no, e-mail address		
<ul style="list-style-type: none"> Margarita Campos Bueno, PhD. Manuel Morales Yuste, PhD. 			Department of Parasitology. Faculty of Pharmacy, 4th floor. University of Granada. Margarita Campos: mcampos@ugr.es . Tutoring hours: Monday and Wednesday (10:00-13:00 h.) Phone: +34 958243861 Manuel Morales: yuste@ugr.es . Tutoring hours: Monday, Wednesday and Thursday (11:30-13:30 h.) Phone: +34 958243858		
DEGREE WITHIN WHICH THE SUBJECT IS TAUGHT					
Pharmacy					
PREREQUISITES and/or RECOMMENDATIONS (if necessary)					
Have an adequate knowledge of English language. Computer user-level. It is recommended that students have completed the subjects of Parasitology, Immunology, Biochemistry and Cellular Physiology.					
BRIEF ACCOUNT OF THE SUBJECT PROGRAMME (ACCORDING TO THE DEGREE)					
Parasitic antigens and host immune response. Mechanisms of evasion of the immune response. Immunomodulation of parasitic agents. Immunopathology of parasitic diseases. Parasites and Immunosuppression. Immunoprophylaxis against protozoa, helminths and arthropods parasites.					



GENERAL AND PARTICULAR ABILITIES

General abilities

CG1. Identify, design, obtain, analyze, control and production of drugs, as such as other products and raw materials with sanitary interest for human and veterinary use.

CG3. Know how to apply the scientific method and acquire skills for the management of legislation. Also, knowledge of sources of information, bibliography, protocol making and other components required to the design and critical evaluation of clinical and preclinical trials.

CG7. Identify, evaluate and assess issues related with drugs. Additionally participate in pharmacovigilance functions.

CG9. Take part in activities related with health promoting and illness prevention from the community, individual and familiar point of view. To acquire an integral and professional vision of the process.

CG13. Develop communication and information abilities to relate with patients and users in working area. Improve capabilities of team working with multidisciplinary groups, including other sanitary experts.

CG15. Be able to identify the personal limitations in order to update professional competences. In this line is important the self-learning based on the last available scientific evidence.

Specific abilities

CE20. To understand the interrelation between life cycle of infectious agents and properties of active principles.

CE21. To be able to detect therapeutic targets and biotechnological production of medicines, as well as the use of gene therapy.

CE23. To know the properties of cell membranes and drugs distribution.

CE24. To know the nature and behaviour of infectious agents.

OBJECTIVES (EXPRESSED IN TERMS OF EXPECTED RESULTS OF THE TEACHING PROGRAMME)

- To know how the parasites are presented to the host and the impact of parasitic antigens on fundamental aspects of diagnosis, therapy and prophylaxis.
- To know how the host reacts to the presence of the parasite.
- To understand how parasites evade the immune response developed by the host and its impact on the pathology of parasitic diseases.
- To study some interactions of the parasites with the host's immune system and its consequences.
- To know basic aspects of immunoprophylaxis of parasitic diseases.
- To understand the importance of some parasitic diseases in immunosuppressed individuals.
- To know and understand the pathologic manifestations caused by some species in man.



DETAILED SUBJECT SYLLABUS

Theoretical contents

Knowing how parasites are presented to the host:

Item 1. Parasitic antigens. Study of its key features. Impact on parasitic diseases in terms of immunodiagnostic, treatment and immunoprophylaxis (1.5 h).

Knowing how the host reacts to the presence of parasite:

Item 2. Host immune response to parasitic evasion: particularities of the cellular immune response. Consequences of the immune response in leishmaniasis (1.5 h).

Unit 3. Host immune response to parasitic evasion: particularities of the humoral immune response. Immunity of vertebrates against helminths. Intestine as parasite environment (2 h).

Understanding how parasites evade the immune response of the host:

Unit 4. Evasion of host immune response: principal mechanisms. Evasion tools of the innate immune response and its significance in parasitic protozoa (1 h).

Unit 5. Evasion mechanisms of phagocytosis in protozoa parasites. I. *Trypanosoma cruzi* and its leakage to the cytosol (1.5 h).

Unit 6. Evasion mechanisms of phagocytosis in protozoa parasites. II. Study of the deep adaptation of *Leishmania* spp. to intracellular environment (1.5 h).

Unit 7. Evasion mechanisms of phagocytosis in protozoa parasites. III. *Toxoplasma gondii* and the transformation of its intracellular compartment (1.5 h).

Unit 8. Antigenic variation in the *Trypanosoma brucei* complex. Influence in the host immune response and in the pathology of the sleeping sickness (2 h).

Unit 9. Antigenic variation and adhesive properties of *Plasmodium falciparum*. Impact on the pathology of malaria. Malaria and pregnancy (2.5 h).

Unit 10. Molecular mimicry: definition and classification. Consequences on the host and the parasite. Study of the thrombospondin family in *Plasmodium falciparum* and its significance in the biology of the parasite. Chagas disease and autoimmunity (2.5 h).

Studying some of the interactions host immune system-parasites and its effects:

Unit 11. Immunomodulation: definition and main mechanisms. Helminths as the host's immune system modulators: therapeutic applications (2 h).

Unit 12. Concomitant immunity in parasitic infections. Consequences for parasite and host. Study in congenital toxoplasmosis (1 h).

Unit 13. Immunopathology of parasitic diseases. Relevant examples in protozoa and helminths. Anisakiosis



as a health problem: situation in Spain (2.5 h).

Knowing the basic aspects of immunoprophylaxis in parasitic diseases:

Unit 14. Immunoprophylaxis in Parasitology. I. General considerations. Obstacles in obtaining parasite vaccines for human use. Types of vaccines: advantages and drawbacks (1 h).

Unit 15. Immunoprophylaxis in Parasitology. II. Study of malaria vaccines. Current status of main trials against parasitic diseases. Veterinary vaccines and its biological and economic impact (2 h).

Understanding the significance of some parasitic diseases in immunosuppressed individuals:

Unit 16. Protozooses and immunosuppression. I. Emerging and opportunistic parasites. Importance in VIH (+) patients. Study of the epidemiological and pathological changes experienced in major tissue protozosis in immunosuppressed individuals. Study of human babesiosis (2 h+1 h seminar).

Unit 17. Protozooses and immunosuppression. II. Intestinal coccidiosis. Study of cryptosporidiosis in immunosuppressed patients and related issues. (2.5 h).

Unit 18. Helminthiasis and immunosuppression. Strongyloidiasis: current importance in endemic and non-endemic areas. Situation in Spain (2.5 h).

Knowing and understanding the pathological manifestations caused by the establishment of some parasite species in man:

Unit 19. *Sarcoptes scabiei* and scabies. Paper as a marker for immunodeficiency syndromes. Study of genus *Demodex* and demodectic mange. Dermatitis caused by ticks and study of their role as vectors of infectious agents (1 h+2 h seminar).

Unit 20. Dust mites as producers of respiratory allergies and contact dermatitis. Major allergens. Prophylaxis and control strategies (1 h, seminar).

Practical contents

Seminar/Workshops:

- Exercises based on syllabus and its resolution.
- Allergies caused by dust mites.
- *Sarcoptes scabiei* and scabies. Importance in immunodeficiency syndromes.
- Study of human babesiosis.
- Dermatitis caused by ticks. Study of their role as vectors of infectious agents.

Laboratory practices:

- Practice 1. Obtaining parasite antigens: somatic and excretory-secretory antigens.
- Practice 2. Study and identification of species causing allergies and contact dermatitis.



- Practice 3. Study and identification of common parasites in immunosuppressed individuals.
- Practice 4. Detection of antigens and antibodies in parasitic infections. Direct and indirect techniques.

READING

FUNDAMENTAL BIBLIOGRAPHY:

- Algarra López de Diego I., García Olivares E., Garrido Torres-Puchol F., Molina Pineda de las Infantas I. 2001. Inmunología. Imprenta-Editorial Ave María. Granada.
- Immune Reponse to Parasitic Infections. Volume 1: Protozoa. 2015. Ed. Jirillo E. Co-editor Brandonisio O. Bentham Science Publisher Ltd.Sharjah, U.A.E.
- Immune Reponse to Parasitic Infections. Volume 2: Immunity to Helminths and Novel Therapeutic Approaches. 2015. Editors: Jirillo E., Magrone T., Miragliotta G. Bentham Science Publisher Ltd.Sharjah, U.A.E.
- Kennedy M.W., Harnett W. 2001. Parasitic nematodes: molecular biology, biochemistry and immunology. CABI, Oxon.
- Mansour T.E., Mansour J.M. 2005. Chemotherapeutic Targets in Parasites: Contemporary Strategies, Cambridge University Press.
- Marr J.J., Nilsen T.W., Komuniecki R.W. (eds). 2003. Molecular medical parasitology. Academic Press, Londres.
- Mehlhorn H. (ed). 2001. Encyclopedic Reference of Parasitology. Springer-Verlag, Berlín.
- Regueiro González J.R., López Larrea C., González Rodríguez S., Martínez Naves E. 2011. Inmunología. Biología y patología del sistema inmunitario. 4ª edn revisada. Ed. Médica Panamericana S.A., Buenos Aires.
- Roberts L.S., Janovy J. jr. Foundations of Parasitology. 2004. 7th edn, McGraw-Hill Publishers, Dubuque.
- Roitt I.M., Delves P.J. 2003. Inmunología. Fundamentos. 10ª edn. Ed. Médica Panamericana S.A., Buenos Aires.
- Wakelin D. 1996. Immunity to parasites. How parasitic infections are controlled. 2nd edn. Cambridge University Press, Londres.
- Guía Práctica de Parasitología. Departamento de Parasitología. Universidad de Granada.
- Singer L.M., Igea J.M. 2005. Glosario trilingüe (EN-PT-ES) de términos, abreviaturas y siglas usados con frecuencia en inmunología. *Panace*. Vol. VI, nº 20.
- Website of Department of Parasitology: <http://www.ugr.es/~parasito/otros%20enlaces.html>

The main periodical scientific journals are available for the university community by the UGR. These publications are selected to cover the topics described in the syllabus and updated:



- Advances in Parasitology.
- Annual Review of Immunology.
- Annual Review of Microbiology.
- Clinical Microbiology Reviews.
- International Journal for Parasitology.
- Nature Reviews. Immunology
- The Journal of Infectious Diseases.
- The Lancet.
- Trends in Parasitology.
- And others.

COMPLEMENTARY BIBLIOGRAPHY

- Additional bibliography will be recommended to students depending on specific work to be performed

RECOMMENDED INTERNET LINKS

<http://www.ugr.es/~parasito/otros%20enlaces.html>
<http://www.who.int/es/index.html>
<http://www.who.int/tdr/>
<http://www.dpd.cdc.gov/dpdx/>

EVALUATION (EVALUATION INSTRUMENTS, EVALUATION CRITERIA AND FINAL RATING PERCENTAGE, ETC.)

CONTINUOUS ASSESSMENT

The evaluation will be according to the work performed by the student during scheduled activities. To pass the subject must demonstrate a sufficient level of knowledge in the written tests. The following criteria will be considered:

- Written tests based on the contents of the theoretical program. A uniform and balanced knowledge of all the topics will be required.
- Attendance and participation in face-to-face activities.
- Realization with use of the practices.
- Realization of class exercises.
- Participation with use in seminars.
- Autonomous work and exposure, if necessary.

Written tests: eliminatory control, with score ≥ 6.5 : April 02, 2020. Final control: June 08, 2020. Extraordinary call: July 01, 2020.



Practical classes: daily compulsory attendance. To pass, the results obtained must be delivered at the end of each session. Also, a brief discussion on the interest of the techniques and the advantages/disadvantages identified must be included.

Final qualification: it will summarize all of the marks obtained in the First Partial + Second Partial and practices. Furthermore, the work during the course must indicate a good participation and use by the student.

Percentage on the Final Rating:

- Evaluation of the theoretical contents of the first partial: 45%, and the second partial: 45%.
- In the case that student fail the first partial: the qualification is failed or exam not executed (in this situation it would be 0): 20%; qualification of the second partial (which would be the final exam with all the contents): 70%.
- Evaluation of practical classes, seminars, general assistance and other options of student participation: 10%.

DESCRIPTION OF THE TESTS THAT WILL BE PART OF THE FINAL SINGLE EVALUATION ESTABLISHED IN THE "RULES OF EVALUATION AND QUALIFICATION OF STUDENTS OF THE UNIVERSITY OF GRANADA"

In order to qualify for the *Evaluación única final* or "Final single evaluation" rights, the student must follow the procedure set forth in article 8.2 of the *Normativa de evaluación y calificación de los estudiantes de la UGR* or "Regulation about evaluation and qualification for students of the UGR" since May 20, 2013.

The final single evaluation will consist on a written examination including the contents of the theoretical program, and an examination of the contents of the practical program. Extended answer-questions or multiple choice tests could be included, as well as the experimental realization of any laboratory practice (then, it is recommended to assist to practices, for which you should contact with professor).

To approve it is essential to pass the theoretical contents exam, obtaining at least a score of 5 out of 10. It is also essential to pass the practicum exam, obtaining at least a score of 5 out of 10.

The final score will be obtained from the theory exam (90% of the final mark), and from the practical one (10% of the final qualification).

