

**COURSE DATA****Data Subject**

<b>Code</b>	40349
<b>Name</b>	Human Protozoosis
<b>Cycle</b>	Master's degree
<b>ECTS Credits</b>	15.0
<b>Academic year</b>	2021 - 2022

**Study (s)**

<b>Degree</b>	<b>Center</b>	<b>Acad. year</b>	<b>Period</b>
2038 - M.U. en Enfermedades Parasitarias Tropicales 09-V.1	Faculty of Pharmacy and Food Sciences	1	Annual
3145 - Human and Animal Parasitology	Doctoral School	0	First term

**Subject-matter**

<b>Degree</b>	<b>Subject-matter</b>	<b>Character</b>
2038 - M.U. en Enfermedades Parasitarias Tropicales 09-V.1	1 - Human protozoa	Obligatory
3145 - Human and Animal Parasitology	1 - Complementos de Formación	Optional

**Coordination**

<b>Name</b>	<b>Department</b>
MUÑOZ ANTOLI-CANDELA, CARLA TERESA	358 - Pharmacy, Pharmaceutical Technology and Parasitology

**SUMMARY**

The Module includes an updated overview on the main parasitic human protozoans and their relationship with the host, including the study of the aetiological agent, their evolutionary cycle, epidemiology, transmission, pathology and clinical manifestations, diagnoses, treatment and control. After acquainting the student with generalities of parasitic diseases, the module on human protozoa includes the study of amoebae, flagellates and ciliates of the digestive and urogenital system, diseases caused by flagellated haematophagous: leishmaniasis, Chagas's Disease and sleeping sickness, human coccidiosis, malaria and opportunist protozoosis. Finally, the module concludes with an overview on molecular biology in drug and insecticide design. The impact of parasites produced by protozoa is made aware of the Sustainable Development Goals (SDG), specifically with Goal 3 aimed at guaranteeing a healthy life and promoting well-being.



## PREVIOUS KNOWLEDGE

### Relationship to other subjects of the same degree

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

### Other requirements

It will be necessary to be in possession of one of the following degrees: pharmacy, medicine, veterinary medicine, microbiology, biology, food science and technology, human nutrition and dietetics, environmental sciences, nursery, physiotherapy. In case of foreign students, these will have to be in possession of an official degree similar to one of the aforementioned qualifications.

## OUTCOMES

### 2038 - M.U. en Enfermedades Parasitarias Tropicales 09-V.1

- Students should apply acquired knowledge to solve problems in unfamiliar contexts within their field of study, including multidisciplinary scenarios.
- Students should be able to integrate knowledge and address the complexity of making informed judgments based on incomplete or limited information, including reflections on the social and ethical responsibilities associated with the application of their knowledge and judgments.
- Contemplar en conjunto y tener en cuenta los distintos aspectos y las implicaciones en los distintos aspectos de las decisiones y opciones adoptadas, sabiendo elegir o aconsejar las más convenientes dentro de la ética, la legalidad y los valores de la convivencia social.
- Know how to work in multidisciplinary teams reproducing real contexts and contributing and coordinating their own knowledge with that of other branches and participants.
- Ser capaz de asumir cualquiera de las tareas y responsabilidades relacionadas con las enfermedades parasitarias humanas: preparación práctica y formación teórica actualizadas de sanitarios para desempeñar trabajos, funciones y cargos de todo tipo y nivel en el amplio campo de la lucha, control, diagnóstico, difusión, enseñanza y estudio de las enfermedades parasitarias en todo el mundo.
- Conocer las enfermedades parasitarias en todos sus aspectos de etiología (caracterización morfoanatómica y molecular, ciclo biológico), epidemiología, clínica (síntomatología y patología), diagnóstico (etiológico, inmunológico y molecular), profilaxis y control.
- Conocer la terapéutica antiparasitaria.
- Ser capaz de diseñar antiparasitarios e insecticidas contra vectores transmisores de enfermedades infecciosas.



## LEARNING OUTCOMES

- Every student who finishes and passes this module must know the concepts, definitions and basic terminology related to the phenomenon of parasitism and parasitic disease, the overview of the morphologic and evolutionary aspects of the main parasitic groups, and the general immunological mechanisms of the host response to parasitic invasion.
- To provide knowledge on amoebae, flagellates and ciliates of the digestive and urogenital tract, of their parasitisms, of the parasite-host relationship and the factors that influence the above-mentioned relationships, to obtain an integral knowledge of the different parasitic diseases, their symptomatology, pathology, methods of diagnosis and suitable treatments.
- Training in all the multidisciplinary aspects of leishmaniasis, Sleeping sickness and Chagas's disease, and also of the way these insect vectors transmit them. Acquisition of specific knowledge on aetiology, vectors, biology, transmission, epidemiology, symptoms and pathology, diagnosis, treatment, prevention and control.
- Every student who finishes and passes this module is in condition to be able to assume any of the tasks and responsibilities related to human coccidiosis: practical preparation and updated theoretical training for healthcare professionals to develop work, functions and charges of all kinds and level in the wide field of the fight, control, diagnosis, diffusion, education and study of human coccidiosis.
- Training in all multidisciplinary aspects of Malaria, in the four different species of *Plasmodium* causing infection and disease, according to the different epidemiological situations related to different countries.
- Acquisition of specific knowledge on aetiology, vectors, biology, transmission, epidemiology, symptoms and pathology, diagnosis, treatment, prevention and control in endemic zones and cases of imported Malaria.
- Training in all multidisciplinary aspects related with opportunistic protozoa.
- Acquisition of specific knowledge on biology, pathology, epidemiology, clinical manifestations, diagnosis, treatment, prevention and control of opportunistic protozoa.
- Practical training for the diagnosis of clinical samples.
- Acquisition of the concepts of the QSAR methodology.
- Acquisition of theoretical and basic database training in molecular topology.
- Skills in software management for the development of the 'in silico' methodology.

## DESCRIPTION OF CONTENTS



## **1. Generalities of Parasitic Diseases**

Concepts, definitions and terminology related to the phenomenon of parasitism and parasitic disease. Likewise, the general characterization of the main parasitic groups and the general mechanisms of the hosts immunological response to parasitic invasion is analysed.

## **2. Amoebae, Flagellated and Ciliated of the Digestive and Urogenital systems**

Contents is divided into 5 paragraphs: 1) characterization and general study of the morphology, structure and biology of amoebae, flagellates and ciliates; 2) characterization of the main amoebae of the digestive tract and detailed analysis of Amoebosis and amoebic dysentery; 3) characterization of the main parasitic groups of flagellates of the digestive and urogenital tract; 4) detailed analysis of Giardiasis and Trichomonosis; 5) characterization of the main intestinal ciliates and detailed analysis of Balantidosis.

## **3. Diseases caused by flagellated in blood and tissues: leishmaniasis, Chagas disease and sleeping sickness**

Leishmaniasis: general analysis of the aetiology, biological cycle, transmission, pathogenesis, symptomatology, diagnosis, treatment and control.

Sleeping sickness or African Trypanosomiasis: general analysis of the aetiology, life-cycle, transmission, pathogenesis, symptomatology, diagnosis, treatment and control.

Chagas Disease or American Trypanosomiasis: general analysis of the aetiology, life-cycle, transmission, pathogenesis, symptomatology, diagnosis, treatment and control.

## **4. Human Coccidiosis**

Multidisciplinary analysis of human Coccidiosis;

Theoretical and practical study of the main human Coccidiosis;

Specific analysis of the problem of these diseases in tropical and subtropical countries, as well as in other parts of the world;

Analysis of these diseases considering their aetiology (morphoanatomics and life-cycle), epidemiology, clinical presentation (symptomatology and pathology), diagnosis (aetiological and immunological), treatment, prevention and control.

## **5. Malaria**

Malaria: general analysis of the aetiology, life-cycle, pathogenesis, symptomatology, diagnosis, treatment and prevention.

Malaria: specific study of the transmission, epidemiology and control.

Problems in Malaria control.- Practical training on real life cases and discussion of the results organized by work groups.- Debate and analysis of the results guided by the tutor.- Practical design of an anti-vectorial fight scheme.



**6. Opportunistic protozooses**

*Pneumocystis jiroveci*: study of biological characteristics, life-cycle, epidemiology, pathogenesis, clinical manifestations, diagnosis, treatment and control.

*Blastocystis hominis*: study of biological characteristics, life-cycle, epidemiology, pathogenesis, clinical manifestations, diagnosis, treatment and control.

*Cryptosporidium*: study of biological characteristics, life-cycle, epidemiology, pathogenesis, clinical manifestations, diagnosis, treatment and control.

*Microspora* (Microsporidia) and *Myxozoa*. Myxosporea. Classification. Diagnostic characteristics. Biology and life-cycle. Hosts. Phylogenetic relationships. Importance of Myxosporidia as potential opportunists in immunosuppressed patients. The role of Myxosporidia as allergens through the ingestion of infected fish.

**7. Molecular Topology in drug and insecticide design**

Theory: molecular topology: introduction. - QSAR analysis methods - Prediction of molar, molecular and biological properties. - Analysis of multilinear and discriminant regression. - Design of active compounds for parasitic diseases and against vectors.

Practice: Management of computer programs used in the calculation of topological indices. - Analysis of multilinear and discriminant regression. - Studies of prediction and of discrimination of biological and pharmacological activity. - Design of new active compounds.

**WORKLOAD**

ACTIVITY	Hours	% To be attended
Theory classes	150,00	100
Attendance at events and external activities	0,00	0
Development of group work	10,00	0
Development of individual work	10,00	0
Study and independent work	55,00	0
Readings supplementary material	45,00	0
Preparation of evaluation activities	45,00	0
Preparing lectures	50,00	0
Preparation of practical classes and problem	10,00	0
Resolution of case studies	5,00	0
<b>TOTAL</b>	<b>380,00</b>	



## TEACHING METHODOLOGY

Theoretical master class, allowing the teacher to highlight the most important aspects of every lesson. Each master class will be accompanied by graphical material. Tutorial or meeting between the teacher and a group of students with the purpose of exchanging information, analysing, orientating or evaluating a problem or a project, of debating a topic etc. useful for the academic and personal development of the student. Participative model in the practical classes, guiding the work of the student in the laboratory, so that the knowledge acquired in the theoretical classes is practically applied and correct microscopic vision of the studied parasites is achieved.

## EVALUATION

A student will pass the module with a minimum of 5 points out of 10.

The mark of the module will be the sum of:

- a) a **written obligatory examination**, which includes questions, topics to be developed, concepts, problems or questions of reasoning, tests, drawings or schemes with questions, etc. The contents will include that of the all theoretical lessons with exception of "Molecular Topology in drug and insecticide design" (72%);
- b) in "Molecular Topology in drug and insecticide design", **questionnaires** in virtual classroom (9%) and written **work** of a topic (9%);
- c) **continuous evaluation** (partial questionnaires, partial tasks, participation, motivation, assistance, etc.) (10%).

Only if the COVID19 situation is still very dangerous, the exam will be carried out on BBC platform online.

## REFERENCES

### Basic

- MEHLHORM H & PIEKARSKI G, 1993.- Fundamentos de Parasitología. Parásitos del hombre y de los animales domésticos. Editorial Acribia, S.A. 391 pp
- CORDERO M, ROJO FA y col.,1999.- Parasitología Veterinaria. Ed. McGraw-Hill Interamericana
- ASH LR & ORIHIL TC, 1997.- Atlas of Human Parasitology. 4<sup>o</sup> edition. American Society of Clinical Pathologist (ASCP) Press, Chicago
- BEAVER PC, JUNG RC & CUPP EW, 2003.- Parasitología Clínica de Craig Faust. Masson Editores, Barcelona



- BOGITSH BJ & CHENG TC, 1999.- Human Parasitology. 2<sup>o</sup> edition. Academic Press, Orlando
- ALVAR J.), 2001.- Las Leishmaniasis: de la Biología al Control. Laboratorios Intervet Edit., Salamanca, 236 pp
- DE LA ROCQUE S et al., 2001.- Le risque trypanosomien. Une approche globale pour une décision locale. CIRAD-EMVT, Montpellier, 151 pp.
- JOYNSON DHM, 2001.- Toxoplasmosis: a comprehensive clinical guide. Cambridge University Press. 410 pp.
- SHIELDS JM, OLSON BH., 2003.- Cyclospora cayetanensis: a review of an emerging parasitic coccidian. Int J Parasitol. 33(4):371-391
- FAYER R, 2004.- Sarcocystis spp. in human infections. Clin Microbiol Rev. 17(4):894-902
- SCHMIDT GD & ROBERTS LS, 2004.- Foundations of Parasitology. McGraw-Hill College.
- BURTON BJ, CARTER CE & OELTMANN TN, 2005.- Human Parasitology. Editorial: ACADEMIC PRESS, Inc, 3<sup>a</sup> Ed
- PETERS W & PASVOL G, 2002.- Tropical Medicine and Parasitology (5th edition). Mosby Inc,. ISBN: 0723431914
- THOMPSON RC, OLSON ME, ZHU G, ENOMOTO S, ABRAHAMSEN MS, HIJJAWI NS, 2005.- Cryptosporidium and cryptosporidiosis. Adv Parasitol. 59:77-158
- LOM J & DYKOVA I, 2006. -Myxozoan genera: definition and notes on taxonomy, life cycle terminology and pathogenic species. Folia Parasitol 53: 1-36
- KIER LB & HALL LH, 1986.- Molecular Connectivity in Structure-Activity Studies. Research Studies Press LTD, Letchworth. England
- DEVILLERS J & BALABAN AT, 1999.- Topological Indices and Related Descriptors in QSAR and QSPAR. Amsterdam: Overseas Publishers Association (1999).
- KIER LB & HALL LH, 1999.- Hall Molecular Structure Description: The Electrotological State, Academic Press, San Diego
- WORLD HEALTH ORGANIZATION, 1991.- Basic Malaria Microscopy. Part I. Learners Guide. WHO, Geneva, 72 pp.
- WORLD HEALTH ORGANIZATION, 1991.- Basic Malaria Microscopy. Part II. Tutors Guide. WHO, Geneva, 69 pp.
- WORLD HEALTH ORGANIZATION, 2000.- Bench Aids for the diagnosis of malaria infections. WHO, Geneva, Plates 1-12.
- HOFFMAN SL, SUBRAMANIAN GM, COLLINS FH & VENTER JC, 2002.- Plasmodium, human and Anopheles genomics and malaria. Nature, 415: 702-709
- LONG CA & HOFFMAN SL, 2002.- Parasitology. Malaria-from infants to genomics to vaccines. Science, 297: 345-347.
- FREZIL JL, 1990.- Epidemiologie des Trypanosomiasés Humaines Africaines. ORSTOM, 38 pp



- SUN T , 1999.- Parasitic Disorders: Pathology, Diagnosis and Management. 2<sup>o</sup> edition. Williams & Wilkins, Maryland

## **ADDENDUM COVID-19**

**This addendum will only be activated if the health situation requires so and with the prior agreement of the Governing Council**

The face-to-face classes will be carried out adapting the individual protection measures and limiting the capacity. If the health situation worsened, teaching would become hybrid, so that the non-attendance part would be taught by videoconference on the BBC to explain concepts that need clarification. The virtual classroom forum will be used to answer questions.

If any student, due to the COVID19 situation, had to delay their face-to-face incorporation, they will be able to retrieve the theoretical information with materials deposited in the virtual classroom.