RESEARCH IN LEISHMANIASIS: APPLIED ANALYSIS AND METHODOLOGIES

CU characterization:

CU name:

Research in Leishmaniasis: applied analysis and methodologies

Scientific area acronym:

PM

Duration:

Modular

Working hours:

60

Contact hours:

28

ECTS:

2

Observations:

Optional CU; The classes will be taught in Portuguese.

Teacher in charge and respective teaching load in the CU:

Sofia Cortes – 19 hours

Other teachers and respective teaching load in the CU:

Carla Maia – 11 hours
Andreia Albuquerque-Wendt – 2 hours
Armanda Rodrigues – 1,5 hours
Docentes convidados - 3 hours

Intended learning outcomes (knowledge, skills and competences to be developed by the students):

At the end of this CU, students should be able to:
O1. Identify molecular techniques used in the diagnosis and research of leishmaniasis. Recognize the importance of immunological studies;
O2. Integrate fundamental knowledge about canine and feline leishmaniasis, recognizing its veterinary importance;
O3. Use molecular tools applied to the gene editing of trypanosomatids;
O4. Integrate knowledge about the potential impacts of climate and environmental changes on sandfly species and on the vector transmission of *Leishmania*;

O5. Perform some of the parasitological, serological, and molecular techniques used in the research and laboratory diagnosis of infections caused by *Leishmania* spp.;
O6. Recognize the potential application of different methodologies in leishmaniasis research.

Syllabus:

C1. Immunology applied to leishmaniasis.
C2. Canine leishmaniasis: clinical and laboratory aspects.
C3. Gene editing tools applied to trypanosomatids; practical examples and the use of online tools for the planning and generation of genetically modified parasites.
C4. Implementation of laboratory techniques used in the diagnosis and research of human and canine leishmaniasis: cultures, PCR-RFLP, indirect immunofluorescence, and ELISA.
C5. Climate change and its impacts on the vector-borne transmission of *Leishmania*, including changes in sand fly expansion and density, as well as vector activity periods; definition of monitoring, control, and mitigation strategies for vector transmission.
C6. Presentation of different research lines applied to the control of leishmaniasis.

Evidence of the syllabus coherence with the CU intended learning outcomes:

In general, and in alignment with the topics covered throughout the course unit, the learning objectives are interrelated with the syllabus content. Objectives O1, O3, and O5 are achieved through the implementation of laboratory techniques and theoretical–practical exercises within contents C1, C3, and C4. Objective O2, which focuses on animal leishmaniasis, is addressed through content C2. Objective O4 is fulfilled through content C5. Objective O6 explores the applicability of diverse methodologies, promoting the integration of research topics, as reflected in content C6, delivered in a seminar format with a guest lecturer.

Teaching/learning methodologies articulated with pedagogical model:

This course unit aims to provide students with learning experiences in the field of leishmaniasis that they can apply in their future professional activities, with a strong emphasis on a practical approach to various tools used in research and diagnosis, as well as their interconnection with vector bioecology and the environment. It also seeks to foster critical thinking and peer discussion.
A range of teaching methodologies will be employed, including expository, interrogative, demonstrative, and active approaches, supported by gamification, group work, and perception and knowledge consolidation questionnaires.
The course unit will consist of theoretical lectures, theoretical–practical sessions, laboratory practicals, a seminar, tutorials, and a final exam. During practical sessions, students will work in groups, carrying out different laboratory techniques and discussing results based on case studies.

Assessment:

Student assessment will be both qualitative and quantitative. The final grade is composed of:

i) Active participation in classes, completion of proposed exercises, and discussion of results (30%weighting);

ii) ii) A final in-person written test (70% weighting), consisting of multiple-choice, true/false, and short-answer questions.

To obtain course approval (attendance status), students must attend at least 75% of the scheduled classes and achieve a final average grade of ≥ 10 (on a 0–20 scale).

Students who fail or wish to improve their grade may take a second assessment (resit exam), which will account for 100% of the final grade and will cover all course contents.

At the end of the course unit, students are required to complete an anonymous course evaluation questionnaire.

Evidence of the teaching methodologies coherence with the CU intended learning outcomes:

The different objectives aim to explore the various methodological approaches common to both the human and animal aspects of leishmaniasis, equipping students with laboratory skills for the identification and diagnosis of *Leishmania* spp., as well as exposure to selected research areas. These methodologies are also suited to the development of transferable skills applicable to other pathogenic agents. Students will additionally develop interpersonal skills through the preparation, analysis, interpretation, and group discussion of results obtained in practical classes, as well as through the analysis of case studies.

Objective O4, which focuses on the importance of climate change in vector-borne diseases, enables the acquisition of knowledge and critical reflection on present and future relationships between ecosystems and the capacity for infection transmission.

Using diverse tools, gamification, and group discussion, students will progressively consolidate their knowledge through continuous assessment within a more dynamic and inclusive learning environment. The final test will provide an objective measure of knowledge acquisition regarding the course unit's subject matter.

References for consultation / mandatory existence:

- Beneke T., et al (2017). A CRISPR Cas9 high-throughput genome editing toolkit for kinetoplastids. Royal Society Open Science 10.1098/rsos.170095. https://doi.org/10.1098/rsos.170095
- Rocha, R., Pereira, A., & Maia, C. (2023). A global perspective on non-autochthonous canine and feline Leishmania infection and leishmaniosis in the 21st century. Acta tropica, 237, 106710. https://doi.org/10.1016/j.actatropica.2022.106710
- Wang D, Hof AR, Matson KD, van Langevelde F; CLIMOS data providers. Understanding and predicting the geographic distributions of phlebotomine sand flies in and around Europe. Clim Change. 2025;178(11):205. doi: 10.1007/s10584-025-04009-z
- Van der Auwera G et al. (2016). Comparison of Leishmania typing results obtained from 16 European clinical laboratories in 2014. Euro surveillance: bulletin Europeen sur les maladies transmissibles = European communicable disease bulletin, 21(49), 30418. https://doi.org/10.2807/1560-7917.ES.2016.21.49.30418