COURSE DATA

Data Subject	
Code	46468
Name	Virosfera
Cycle	Master's degree
ECTS Credits	4.5
Academic year	2022 - 2023

Study (s)

Degree	Center	Acad. year	Period
2251 - M.U. en Virología	Faculty of Biological Sciences	1	First term

Subject-matter

Degree	Subject-matter	Character
2251 - M.U. en Virología	2 - Virosfera	Obligatory

Coordination

Name	Department
SANJUAN VERDEGUER, RAFAEL	194 - Genetics

SUMMARY

The subject "Virosphere" provides an overview of viral diversity, delving into the biology and fundamental properties of the different groups of viruses and subviral agents. Virosphere avoids the usual anthropocentric approach. Emphasis will be placed on omics approaches aimed at the detection and characterization of viruses, including non-culturable viruses. Animal, plant, fungal, bacterial and archaeal viruses will be addressed. From this perspective, the most relevant pathologies caused by viruses in plants and animals will be studied, as well as the process of transmission from animals to humans (zoonosis) and its consequences.

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

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

Other requirements

No specific prior knowledge is required, beyond that necessary to access the Master's program.

OUTCOMES

2251 - M.U. en Virología

- 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.
- Students should demonstrate self-directed learning skills for continued academic growth.
- Students should possess and understand foundational knowledge that enables original thinking and research in the field.
- To understand natural processes relevant to the field of specialization.
- To achieve an integrative knowledge, drawing general conclusions from specific case studies, transferring conclusions to other speciality areas and establishing connections between different subjects.
- To develop critical thinking, identifying the limits and biases of knowledge in the field of specialization.
- Place the specialty in the context of other fields and general knowledge.
- Achieve a broad and integrated knowledge of virology that encompasses human, animal, plant and prokaryotic viruses, to identify molecular processes shared by large groups of viruses, and to transfer concepts and techniques from one viral system to another.
- To understand the population dynamics of viruses and their evolution, as well as to establish associations between virology and different ecological concepts, such as biodiversity, ecosystem characteristics, or climate change.
- To identify relevant factors in viral infection processes beyond the virus itself and its host, such as co-infections, the composition of the microbiome and others, and to understand how they condition the outcome of a viral infection.

LEARNING OUTCOMES

To achieve a broad and integrated knowledge of virology covering human, animal, plant and prokaryotic viruses and to identify molecular processes common to large groups of viruses in order to be able to transfer concepts and techniques from one viral system to another.

To understand the population dynamics of viruses and their evolution, as well as to establish associations between virology and different ecological concepts, such as biodiversity, ecosystem characteristics, or climate change.

To identify relevant factors in viral infection processes beyond the virus itself and its host, such as co-infections, microbiome composition or others, which may condition the outcome of a viral infection.

DESCRIPTION OF CONTENTS

1. Global viral diversity

Viral diversity in natural environments. Gene networks in the virosphere. Paleovirology. Viral metagenomics and virus discovery.

2. Prokaryotic viruses

Introduction to bacterial viruses. Model phages. Phages as regulators of bacterial populations. Phages as gene transfer systems in prokaryotes. Genomic approaches to investigate bacterial-phage interactions. Introduction to archaeal viruses.

3. Plant and fungal viruses

Introduction and main plant viral diseases. Tolerance and virulence in plant viruses. Evolution of host range in plant viruses. Multipartite viruses. Viroids, Geminiviruses. Introduction to viruses in fungi.

4. Invertebrate viruses

Baculoviruses. RNA viruses in arthropods. Ecology of insect viruses. Relevant viruses in other invertebrates. Insects as viral vectors.

5. Vertebrate and veterinary viruses

Pet viruses. Rabies. Fish viruses and their economic importance. Animal coronaviruses. Pestiviruses. Arteriviruses. Asfarviruses. Parvoviruses. Viral vaccination programs in domestic animals and livestock.

6. Zoonoses and emergent viruses

Animal reservoirs of viruses. Factors determining host range. Viral transmission between species. Zoonotic origins and evolution of HIV-1. Pandemic potential of avian influenza viruses. Climate change, insect-borne viruses and viral emergence. Origins and evolution of emerging coronaviruses. Population factors in the emergence of Ebola.

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	45,00	100
Readings supplementary material	12,00	0
Preparation of evaluation activities	4,00	0
Preparing lectures	49,00	0
TOTAL	110,00	

TEACHING METHODOLOGY

The course is based on the use of different teaching/learning activities among which the following are included:

- **Lectures**, in which the teacher will provide an overview of the fundamental concepts in each of the topics. Prior to the class, the material presented will be accessible to students through the university's teaching support platform.

- **Invited talks** by national or international experts on a topic related to the subject.

- **Face-to-face review of content** and discussion led by the faculty, which will function as group tutorials. It will serve for the follow-up and, if necessary, continuous evaluation of the students. Likewise, students will raise doubts and questions about the subject.

- **Discussion and debate in the classroom of scientific articles and current issues**, usually as a final part of the subject, where topics of interest will be addressed. For example, questions such as how many different viruses are estimated to exist in nature, whether there are evolutionary relationships between different virus families or whether they have independent origins, whether viroids are relics of the RNA world, why certain types of viruses are more abundant in plants/animals/bacteria than others, whether it is possible to predict pandemics, etc. will be discussed.

- **On-line tutorials**, for the resolution of doubts and specific problems, the raising of questions of interest and debate on current scientific and social issues related to the subject.

- **Autonomous self-evaluation activities**, such as performing tests through Aula Virtual, which allow the students to evaluate their own learning.

- **Autonomous study of materials and contents**, where students will review and, if necessary, expand the knowledge imparted by using notes, presentations, relevant bibliography, etc.

Bibliographic review and synthesis carried out by students (individually or in teams), a voluntary activity where students may review a topic of their choice and preferably present it during class time.

EVALUATION

- **Exam.** It will be held at the end of the course and it will be an indispensable condition to pass the course to obtain at least a score of 5 out of 10. It will preferably be a written test, although it may also be oral if the teacher considers it more convenient.

- **Continuous evaluation** by means of partial tests on each subject through the Aula Virtual platform. This mode of evaluation is optional and will be carried out if the teacher considers it appropriate. If implemented, it will determine between 20% and 40% of the grade obtained in the subject, the rest corresponding to the final exam (the need to obtain a 5/10 in the final exam is maintained regardless of the continuous assessment). In case of failing the course, the grade obtained in the continuous evaluation will be maintained for the next call, but not for the next enrollment.

- **Assessment of voluntary work presented by the students**, preferably orally and during class time. These works may increase the final grade by up to 2 points out of 10. In case of failing the course, the grade of this work will be maintained for the next call and also for the following enrollment.

It will not be possible to renounce the grade obtained in the course once it has been published.

REFERENCES

Basic

- Christon J. Hurst (Ed). 2021. Studies in Viral Ecology. Wiley-Blackwell. ISBN-10: 1119608368.

- Joshua S. Weitz. 2016. Quantitative Viral Ecology: Dynamics of Viruses and Their Microbial Hosts. Princeton University Press. ISBN-10: 0691161542.

Additional

- Carl Zimmer. 2021. A Planet of Viruses: Third Edition. University of Chicago Press, ISBN-10: 022678259X.
- Pranay Lal. 2022. Invisible Empire: The Natural History of Viruses. India Viking. ISBN-10: 0670095761.
- David Quammen. 2013. Spillover: Animal Infections and the Next Human Pandemic. W. W. Norton & Company. ISBN-10: 0393346617.
- Michael G. Cordingley. 2017. Viruses: Agents of Evolutionary Invention. Harvard University Press. ISBN-10 : 0674972082.
- Vitantonio Pantaleo, Michela Chiumenti (Eds). 2018. Viral Metagenomics: Methods and Protocols. Humana Press. ISBN-10: 1493976826.
- Forest Rohwer, Merry Youle. 2014. Life in Our Phage World. Wholon. ISBN-10 : 0990494306.
- Yashpal Singh Malik, Raj Kumar Singh, Mahendra Pal Yadav (Eds). 2020. Emerging and Transboundary Animal Viruses. ISBN-10: 9811504016.
- Referencia c8: LinFa Wang, Christopher Cowled (Eds). 2015. Bats and Viruses: A New Frontier of Emerging Infectious Diseases. John Wiley & Sons Inc. ISBN-10: 1118818733.