VNIVERSITAT DE VALÈNCIA

Course Guide
46471 Virología Aplicada

COURSE DATA

Data Subject	
Code	46471
Name	Virología Aplicada
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	5 - Virología Aplicada	Obligatory

Coordination

Name	Department
DOMINGO CALAP, PILAR	194 - Genetics
HERRERO SENDRA, SALVADOR	194 - Genetics

SUMMARY

The subject aims to address the most applied aspects related to the prevention and treatment of viral diseases, as well as the use of viruses as therapeutic agents in the health and agronomic field. This subject will also review the biotechnological applications of viruses and their components.

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 apply acquired knowledge to solve problems in unfamiliar contexts within their field of study, including multidisciplinary scenarios.
- 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 combine theoretical contents with their practical application and appreciate the importance of both fundamental and applied knowledge.
- To develop critical thinking, identifying the limits and biases of knowledge in the field of specialization.
- To explore and value the socio-economic implications of the field of specialization.
- Place the specialty in the context of other fields and general knowledge.
- To apply fundamental virology concepts to practical problem solving, including antiviral therapy, prevention, public health, and the biotechnological applications of viruses.
- To understand the main features that define fundamental and translational research in viruses, as well as the most important communities and institutions in the field of virology (journals, societies, congresses, schools, research centers, etc.) and their functioning (peer review, etc.).
- To develop creative thinking aimed at the search for new applications in virology.

- Approach the same virological process from different angles, such as mechanistic, evolutionary, biomedical and biotechnological.

LEARNING OUTCOMES

Know the practical utility of epidemiological monitoring of viruses.

Become familiar with the process of invention, development and use of vaccines for the control of viral diseases.

Understand the mode of action of different types of antivirals, as well as their discovery and development process.

Know the main biotechnological applications of viruses.

Know the use of viruses as therapeutic agents

Understand the applications of viruses to control diseases and pests of agronomic interest.

Discern the best strategies for the control of diseases caused by viruses.

DESCRIPTION OF CONTENTS

1. Virology and public health

Epidemiological surveillance and control. Implementation of vaccination campaigns. The current role of vaccination in public health. Hygiene and prevention of viral transmission.
Viruses as environmental indicators.

2. Drugs and antiviral agents

Drug discovery. Design and regulation of clinical trials. Broad-spectrum antivirals. Specific antivirals. Serotherapy. antiviral nanoparticles.

3. Vaccination

Types of vaccines. Vaccine development. Vaccine failure. Virus-like particles (VLPs)

4. Biotechnological applications of viruses

The historical role of viruses in molecular biology. Viruses as expression vectors. Baculovirus. Phage display. Virus-induced gene silencing. Directed evolution of viruses. Viral proteins with biotechnological application. Use of antiviral systems in biotechnology such as RNAi and CRISPR. Directed evolution of viruses

5. Therapeutic viruses

Gene therapy using viral vectors. oncolytic viruses. Phage therapy. Phage engineering. Antimicrobial viral components. Therapeutic interfering particles.

6. Virus of agronomic interest

Insect viruses in pest control. Experiences with the use of viruses as epidemiological control agents. Attenuated viruses for the control of plant viruses. Phages and biocontrol of plant bacterial diseases.

7. Social and ethical aspects

Risks associated with the use of therapeutic viruses and social perception. Forensic virology. Pros and cons of virus release. Virus-related patents. Nagoya Protocol. Animal research versus new research methods in virology.

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	45,00	100
Study and independent work	49,00	0
Readings supplementary material	12,00	0
Preparation of evaluation activities	4,00	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 make an exposition of the fundamental concepts of each of the topics, using the appropriate audiovisual resources. Prior to the class, the material presented audiovisually will be accessible to students through the university's teaching support platform. Students will be oriented on the appropriate bibliography and the resources to be used for a deeper study of the concepts and will be related to the topics of the remaining activities that are part of the program of the course.

- **Research seminars**. Throughout the course, national and international researchers, specialists in the different topics covered in the course, will give research seminars where they will present their research and/or the current state of the subject of study. Student participation will be encouraged through the elaboration of questions for the speaker, as well as the subsequent discussion of the presentations.

- **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

A continuous evaluation of each student will be carried out, based on the different activities described in the section dedicated to Methodology, assessing attendance at all face-to-face activities, participation and the degree of involvement in the teaching-learning process. The specific aspects to be assessed will be the following:

• Written test on the syllabus of the subject consisting of an exam that will consist of theoretical-practical questions. The mark of this test will represent 75% of the final mark. In this exam, special importance will be given to the understanding of basic concepts for the development of their biological training and for the achievement of the general objective of the subject. It will be an essential condition to pass the subject, to achieve at least a score of 4 out of 10 in this exam.

• Evaluation of participation in scientific seminars. Among other things, this section will assess the ability to raise doubts, propose answers and resolve the issues raised in the various seminars given. The grade for this section will represent 25% of the final grade.

The final grade will be the weighted sum of the grades achieved in the different sections. To pass the subject it will be necessary to obtain a global grade equal to or greater than 5 out of 10.

Those students who do NOT show up for the written test will appear with the note of NOT PRESENT in the minutes.

Finally, it is recalled that it is not possible to waive the grade obtained in the subject once it has been published.

REFERENCES

Basic

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- Carter J., Saunders, V. (2013). Virology: Principles and Applications. John Wiley & Sons. ISBN-10 : 9781119991434
- Tennant P., Fermin G., Foster J. (Eds.). 2018. Viruses: Molecular Biology, Host Interactions, and Applications to Biotechnology. Academic Press. ISBN-10 : 0128112573

Additional

- Odstone MBA (2020). Viruses, Plagues, and History: Past, Present, and Future. Oxford University Press. ISBN-10: 0190056789.
- Referencia c2: Saiz JC. (2020). Vaccines against RNA Viruses. MDPI-Ag. ISBN-10: 3039436236.
- Goodman y Gilman. Las bases farmacológicas de la terapéutica. 13ª ed. McGraw-Hill, 2019
- Brenner and Stevens, Farmacología Básica 5ª ed. Elsevier 2019
- Strathdee S., Patterson T., Barker T. (2020). The Perfect Predator: A Scientist's Race to Save Her Husband from a Deadly Superbug: A Memoir. Hachette Books. ISBN-10: 0316418110.
- Buttimer C., Coffey A. (2020). Bacterial Viruses: Exploitation for Biocontrol and Therapeutics. Caister Academic Press. ISBN-10: 1913652513.
- Blass B.E. (2021). Basic Principles of Drug Discovery and Development. Academic Press. ISBN-10: 0128172142.
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- Recursos web:
  Centro de información de medicamentos (CIMA). Agencia Española de Medicamentos y Productos Sanitarios: https://cima.aemps.es/cima/publico/home.html

  Grupo de estudio del SIDA-SEIMC (GESIDA): https://gesida-seimc.org/category/guias-clinicas/antirretroviral-vigentes/