VNIVERSITAT DE VALÈNCIA

Course Guide
33157 Molecular pharmacology

COURSE DATA

Data Subject	
Code	33157
Name	Molecular pharmacology
Cycle	Grade
ECTS Credits	4.5
Academic year	2022 - 2023

Study (s)

Degree	Center	Acad. year	Period
1109 - Degree in Biochemistry and Biomedical Sciences	Faculty of Biological Sciences	4	Second term

Subject-matter

Degree	Subject-matter	Character
1109 - Degree in Biochemistry and Biomedical Sciences	14 - Materia de asignaturas optativas	Optional

Coordination

Name	Department
D'OCON NAVAZA, MARIA PILAR	135 - Pharmacology
IVORRA INSA, MARIA DOLORES	135 - Pharmacology

SUMMARY

This subject will allow the student to gain essential knowledge about the action principles of drugs from a molecular perspective. To achieve this, the most recent experimental approximations will be studied, those regarding the action mechanisms of drugs at molecular and cellular levels and those regarding the identification of new therapeutic targets. The different drug families will be addressed, considering various biological targets with which they interact and taking into account their pharmacological activity, pharmacokinetic, therapeutic aspects and adverse effects. A special attention will be payed to the validation methods in the development of new drugs and to the use of specialized data bases.

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

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

Other requirements

OUTCOMES

1101 - Degree in Biochemistry and Biomedical Sciences

- Tener una visión integrada de las técnicas y métodos utilizados por las ciencias Biomédicas.
- Capacidad para trabajar correctamente en los laboratorios de Biomedicina incluyendo seguridad, manipulación, eliminación de residuos y registro anotado de actividades.
- Utilización de terminología específica de la biomedicina.
- Conocer los principales métodos y técnicas experimentales aplicadas al estudio de la salud y enfermedad humanas, su etiología y la efectividad de los tratamientos.
- Conocer los organismos patógenos de humanos, las patologías que provocan y conocer los fundamentos de las principales estrategias terapéuticas.
- Conocer las variables de interferencias intra- y extra-analíticas (nutrientes, fármacos, patologías) en los métodos habituales del laboratorio.
- Conocer los principales grupos farmacológicos, aplicaciones terapéuticas, mecanismos moleculares de acción y sistemas de transducción de la señal.
- Conocer los principios básicos de la interacción fármaco-receptor y los aspectos cuantitativos de la acción de los fármacos.
- Conocer los principios básicos de la farmacogenética.

LEARNING OUTCOMES

Acquisition and comprehension of basic knowledge about molecular pharmacology: therapeutic targets, strategies in drug design, development of new drugs.

Application of knowledge in biochemistry and in molecular biology to the pharmacological modulation of therapeutic targets.

Ability to solve theoretical and practical problems of pharmacological nature.

Use of methods and instrumental and conceptual basic techniques to address the design and development of pharmacological research.

Use of data and interpretation of results derived from pharmacological research.

Critical analysis of pharmacological information resources.

DESCRIPTION OF CONTENTS

1. INTRODUCTION TO PHARMACOLOGY

TOPIC 1. Therapeutic principles. Definition and classification of drugs.

TOPIC 2. MOLECULAR ASPECTS OF THE INTERACTION OF DRUGS WITH THEIR BIOLOGICAL TARGETS. Target proteins for the union of drugs: receptors, chanels, enzymes, transport molecules. Other pharmacological targets.

TOPIC 3. BASIC PRINCIPLES OF BIODISPONIBILITY AND PHARMACOKINETICS (LADME). Liberation, absorption, distribution, metabolism and elimination of drugs.

TOPIC 4. DEVELOPMENT OF NEW DRUGS. Basic design principles and molecular modelization of new drugs. Obtaining methods. Preclinic development. Basic principles of clinical trials.

2. DRUGS ACTING ON RECEPTORS

TOPIC 5. Types of receptors. Drug-receptor interaction. Concepts of agonist, antagonist, parcial agonist and inverse agonist. Quantitative aspects of the drug-receptor interaction. Determination of characteristic parameters of the linking receptor-ligand interaction.

TOPIC 6. PHARMACOLOGICAL REGULATION OF VOLTAGE-DEPENDENT IONIC CHANELS.

TOPIC 7. PHARMACOLOGICAL REGULATION OF IONIC CHANELS CONTROLED BY LINKING.

TOPIC 8. PHARMACOLOGICAL REGULATION OF G PROTEIN-COUPLED RECEPTORS (GPCRs).

TOPIC 9. PHARMACOLOGICAL REGULATION OF CATALYTIC RECEPTORS.

TOPIC 10. PHARMACOLOGICAL REGULATION OF NUCLEAR RECEPTORS.

3. DRUGS ACTING ON OTHER PHARMACOLOGICAL TARGETS

TOPIC 11. ENZYMES AS TARGETS OF THE DRUG ACTION. Therapeutic applications of the enzymatic activation and inhibition. Main groups of drugs acting at this level.

TOPIC 12. DRUGS ACTING ON TRANSPORT MOLECULES.

TOPIC 13. Drugs acting at DNA level. Molecular basis for antibacterian action, antimicotics, antivirics

and antiparasitics. Molecular basis of antineoplastic chemotherapy.

TOPIC 14. BIODRUGS. Proteins and polypeptides. Monoclonal antibodies. Use of genes for therapeutic aims.

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	30,00	100
Laboratory practices	12,00	100
Tutorials	3,00	100
Study and independent work	20,00	0
Readings supplementary material	10,00	0
Preparation of evaluation activities	10,00	0
Preparing lectures	10,00	0
Preparation of practical classes and problem	5,50	0
Resolution of case studies	12,00	0
TOTAL	**112,50**	

TEACHING METHODOLOGY

Theoretical classes: basically, the model of master class together with the heuristic method will be used to present fundamental concepts and the most relevant contents of the subject, using audiovisual media to develop them. Previous to the theory classes, teachers will provide students with bibliographic and audiovisual material in the teaching support platform “Virtual Classroom”. There will be a total of 20 one-hour sessions. The participative method will be encouraged by asking students either at the beginning or at the end of every topic / unit subject matter to solve some questions; they will serve for the autoevaluation and / or the continued evaluation of the student.

Practical laboratory sessions: There will be a total of three sessions lasting 4 hours each. During these sessions the drug action mechanisms will be analysed, together with their pharmacological effects and the characteristic parameters of the drug-receptor interaction by carrying out “in vivo” and “in vitro” experiments, by using support videos and specific computer simulation programmes.

Seminars: The method of “problems based learning” will be applied. Different problems will be proposed to reinforce diverse aspects related with the theoretical content of the syllabus. The students will be asked to solve them and then discuss them on site under teacher supervision, which will imply an active participation on behalf of the student. A total of 6 one-hour sessions will be carried out.

Tutorials: The tutorials are organized in reduced student groups according to the established calendar. In them the teacher may ask individually or collectively specific questions, which will be more complex than the ones solved in normal seminars, according to the students' needs. Moreover, the tutorials will help solve any doubts derived from the theory classes and will assess students on strategies to overcome any difficulty that may appear. A total of 3 one- hour sessions will be carried out.

EVALUATION

In the students' learning evaluation all the aspects exposed in the teaching methodology section of this guide will be taken into account and it will be done in a continuous way by the teacher.

55% of the mark: will come from the mark of the theoretical exam (50%) and of the continuous evaluation of questions solved during the year (5%).

25% of the mark: will come from the mark of the practical sessions. This mark will be given taking into account the student's participation, the work in the laboratory and the exam mark. If the student does not pass the exam, this mark will only be kept until the following year.

15% of the mark: will come from the evaluation of the work done in seminars.

5% of the mark: will come from the teacher's direct evaluation in tutorials.

In order to pass the subject it is necessary to have done and passed the practical sessions and the theoretical exam.

REFERENCES

Basic

- Referencia b1: Lorenzo P. y cols. Velázquez. Farmacología Básica y Clínica. 19ª ed. Med. Panamericana, 2018.
  Referencia b2: Florez J. Farmacología humana 6ª ed. Elsevier Masson, 2013.
  Referencia b3: Rang y Dale. Farmacología. 9ª ed. Elsevier, 2019.
  Referencia b4: Katzung B. G. Farmacología básica y clínica. 13ª ed. McGraw-Hill, 2016.
  Referencia b5: Fernández Alfonso S. y Ruiz Gallo M. Fundamentos de Farmacología básica y clínica. 2ª ed. Panamericana, 2013.
  Referencia b6: Goodman y Gilman. Las bases farmacológicas de la terapéutica. 13ª ed. McGraw-Hill, 2019.

Referencia b7: Golan DE Tashijan AH, Armstrong EJ, Armstrong AW. Principios de Farmacología : Bases fisiopatológicas del tratamiento farmacológico. 4ª ed. Wolters Kluver, 2017.
Referencia b8 Brenner y Stevens. Farmacología básica. 5ª ed. Elsevier, 2019.
Referencia b9: Offermanns S. y Rosenthal W. Encyclopedia of Molecular Pharmacology . 2ª ed. Springer, 2008.

Additional

- Referencia c1: Annual Review of Pharmacology and Toxicology (Journal) ISSN: 0362-1642
Referencia c2: Pharmacological Reviews (Journal) ISSN: 0031-6997
Referencia c3: Molecular Pharmacology (Journal) ISSN: 0026-895X

Referencia c4: Trends in Pharmacological Sciences (Journal) ISSN: 0165-6147

Referencia c5: Biochemical Pharmacology (Journal) ISSN: 0006-2952

Referencia c6: British Journal of Pharmacology (Journal) ISSN: 1476-5381
Referencia c7: Nature Reviews Drug discovery (Journal) ISSN: 1474-1776