VNIVERSITAT DE VALÈNCIA

Course Guide
34088 Pharmacology II

COURSE DATA

Data Subject	
Code	34088
Name	Pharmacology II
Cycle	Grade
ECTS Credits	9.0
Academic year	2022 - 2023

Study (s)

Degree	Center	Acad. year	Period
1201 - Degree in Pharmacy	Faculty of Pharmacy and Food Sciences	4	Annual
1211 - D.D. in Pharmacy-Human Nutrition and Dietetics	Faculty of Pharmacy and Food Sciences	4	Annual

Subject-matter

Degree	Subject-matter	Character
1201 - Degree in Pharmacy	21 - Pharmacology	Obligatory
1211 - D.D. in Pharmacy-Human Nutrition and Dietetics	1 - Asignaturas obligatorias del PDG Farmacia-Nutrición Humana y Dietética	Obligatory

Coordination

Name	Department
TERENCIO SILVESTRE, MARIA CARMEN	135 - Pharmacology

SUMMARY

The subjects Pharmacology I and Pharmacology II have 15 credits (6 + 9) in the curriculum and are taught in two consecutive years, the second semester of third year and both semesters of fourth year in the Bachelor's Degree in Pharmacy.

Pharmacology is the science that studies the actions and properties of drugs in organisms, understood as drug any chemical used in the treatment, prevention or diagnosis of a disease, or to avoid the appearance of an unwanted physiological process. Bearing in mind this general definition, in Pharmacology I students will first learn the general principles of drug action (general Pharmacology), and will continue with the detailed study of the pharmacological groups acting at the Central Nervous System, inflammatory and immunological processes and neoplasms. This study will be completed wit the subject Pharmacology II

(4th year of the Degree in Pharmacy) with drugs that act on the rest of the physiological systems (Autonomous Nervous System, cardiovascular, respiratory, digestive,...). Fundamental knowledge of the drugs at the theoretical level is complemented with practical lessons in the laboratory of experimental Pharmacology, as well as simulation of experiments using computer programs.

The 9 credits of Pharmacology II, are distributed as follows: 56 h of theory (lectures two days a week throughtout the year), 15 h of practical classes, 6h of seminars, 4h in group tutorials and 9 h in evaluation.

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

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

Other requirements

Students must have acquired knowledge of pathophysiology, biochemistry, Physiology and pharmacokinetics necessary to understand the actions of drugs and their therapeutic effects. Besides, students must study Pharmacology I, In order to understand the contents of Pharmacology II. It is not possible to do both together, because temporally are coincident.

OUTCOMES

1201 - Degree in Pharmacy

- To possess and to understand the knowledge in the different areas of study included in the formation of the pharmacist.
- To know how interpret, value and communicate relevant data in the different aspects of pharmaceutical activity, making use of information and communication technologies.
- Skill to communicate ideas, analyze problems and solve them with a critical mind, achieving team-working abilities and assuming leadership whenever required.
- Development of skills to update their knowledge and undertake further studies, including pharmaceutical specialization, scientific research and technological development, and teaching.
- To promote the rational use of medicines and health products
- To participate in the activities of health promotion, prevention of illness, at individual, family and community levels; with an integral and multi-professional vision of the health-disease process.
- To develop communication and information skills, both oral and written, to deal with patients and other health professionals in the center where they carry out their professional activity. To promote the capacity of work and collaboration in multidisciplinary teams and those related to other health professionals.
- To recognize personal limitations and the need to keep up to date professional competence, paying particular attention to the self-learning of new knowledge based on available scientific evidences.

- To acquire basic concepts in Pharmacology (concept of drug, agonist, antagonist, mechanism of action, pharmacological action and interactions, etc.).
- To know and to understand the different mechanisms by which the drugs exert their actions and pharmacological effects.
- To know the pharmacological actions and to relate them with the therapeutic effects and the adverse reactions.
- To relate the physicochemical characteristics of drugs with their pharmacokinetic and pharmacodynamic properties.
- To know the indications and contraindications of the medicines, as well as, the posology and precautions of use.
- To know the methodology for the evaluation of substances with pharmacological activity at the level of experimental pharmacology (in vitro and in vivo).

LEARNING OUTCOMES

- Knowledge of the physico-chemical characteristics of the drugs and understanding of the influence of the human body on them.

- Knowledge and understanding of general principles of the mechanism of action of drugs, bases of drug interactions and adverse reactions.

- Knowledge and understanding of the effects, mechanisms of action, pharmacokinetics, therapeutic indications and contraindications of the most representative drugs that act on the nervous system and that are used in the pharmacotherapy of infections and skin diseases.

- To stimulate the student in pharmacological research, introducing him/her to the reality of the laboratory by facing experimental problems that he/she must be able to solve.

- Application of theoretical concepts and general methods in the computer classroom and the laboratory.

- Acquisition of skills in search of information necessary to perform their tasks and to interpretation of results.

DESCRIPTION OF CONTENTS

1. PHARMACOLOGY OF AUTONOMOUS SYSTEM

Automic drugs. Review of autonomic physiology and introduction to autonomic pharmacology
Unit 1.- Drugs Acting on the Sympathetic Nervous System. Adrenoceptor agonists. Indirect sympathomimetics.
Unit 2.- Adrenoceptor antagonists
Unit 3.- Cholinergig transmission. Muscarinic Cholinergic agonists and antagonists
Unit 4.- Ganglionic blockers. Neuromuscular- blocking drugs. Anticholinesterases

2. PHARMACOLOGY OF BLOOD

Drugs with important actions on blood. Agents used in anemias and hematopoietic growth factors. Drugs used in coagulation disorder. Drugs used in the treatment of hyperlipidemias..
Unit 5 .- Drugs acting on the hematopoietic system
Unit 6 .- Pharmacology of hemostasis and fibrinolysis
Unit 7 .- Antiplatelet
Unit 8 .- Anticoagulants
Unit 9 .- Pharmacology of atherosclerosis

3. PHARMACOLOGY OF RENAL AND CARDIOVASCULAR SYSTEM

Topics in this module are devoted to drugs that primarily act on the kidney and heart. Examines its therapeutic use in cardiovascular diseases primarily hypertension, myocardial ischemia, heart failure, peripheral vascular, etc.
Unit 10.- Diuretic drugs
Unit 11 .- Drugs acting on the renin-angiotensin-aldosterone
Unit 12 .- Calcium-channel blocking agents
Unit 13 .- Antiarrhythmic Drugs
Unit 14 .- Organic nitrates. Pharmacology of angina and myocardial infarction
Unit 15 .- Positive inotropic drugs
Unit 16 .- Pharmacotherapy of heart failure
Unit 17 .- Pharmacotherapy of hypertension. Arterial hypertension. Pulmonary hypertension
Item 18 .- Pharmacology of vascular insufficiency, shock and hypotensive states

4. PHARMACOLOGY OF GASTROINTESTINAL SYSTEM

This module examines those drugs used in disorders related to the digestive tract such as peptic ulcer, diarrhea, constipation, biliary tract disease, pancreatic, intestinal inflammation, etc.
Unit 19 .- Pharmacology of gastric, hepatobiliary and pancreatic exocrine.
Unit 20 .- Pharmacology of gastrointestinal motility and vomiting. Laxatives and anti-diarrhea drugs.

5. PHARMACOLOGY OF RESPIRATORY SYSTEM

We study the drugs useful in the treatment of asthma, chronic obstructive pulmonary disease, mucolytic and antitussive drugs.
Unit 21.- Bronchodilators and antiasthmatic drugs,
Unit 22.- Antitussive drugs. Expectorants and mucolytics. Antifibrotic drugs

6. PHARMACOLOGY OF ENDOCRINE SYSTEM

Review of physiological endocrine system, hormones and regulatory mechanisms. Specific drugs are studied in this system applicable to many diseases of endocrine origin such as diabetes mellitus, hypothyroidism, etc. and other applications such as oral contraceptives, anti-inflammatory drugs.
Unit 23. - Pancreatic hormones. Pharmacotherapy of diabetes mellitus
Unit 24. Pharmacology of hypothalamic and pituitary hormones.Neurohypophysis hormones.
Unit 25. Adrenal Pharmacology. Pharmacology of growth hormone
Unit 26. Pharmacology of Thyroid. Antithyroid drugs
Unit 27.-Pharmacology of reproduction and sexual hormones. Gonadotropins. Prolactin
Unit 28. - Pharmacology of androgens
Unit 29. - Pharmacology of estrogens and progestins
Unit 30. - Contraceptives. Pharmacotherapy of infertility. Other
Unit 31. Pharmacology of bone metabolism. Pharmacotherapy of osteoporosis

7. PHARMACOLOGY OF INFECTIOUS PROCESSES

This module examines the different groups of antimicrobial and antiparasitic agents, specifying their mechanisms of action, spectrum, adverse reactions, therapeutic indications and emphasizes the rational use of them, emphasizing the serious problem of resistance to anti-infectives and lack of solutions to health problems like malaria or tuberculosis.
Unit 32 .- Basic principles of antimicrobial therapy.
Unit 33 .- Antibiotics that interfere with the synthesis of bacterial cell wall: Beta-lactam antibiotics, glycopeptides and other. Agents that alter the permeability of cell membrane.
Unit 34 .- Antibiotic inhibitors of protein synthesis in bacteria: Aminoglycosides. Macrolides. Tetracyclines. Others.
Unit 35 .- Antifolate drugs: Sulfonamides. Trimethoprim
Unit 36 .- Antibacterials that modify nucleic acids: Quinolones and others
Unit 37 .- Antimycobacterial drugs.
Unit 38 .- Pharmacotherapy in bacterial infections.
Unit 39 .- Antifungal drugs. Pharmacotherapy of fungal infection.
Unit 40 .- Antiprotozoal drugs. Anthelmintics and ectoparasiticides drugs.
Unit 41 .- Antiviral Drugs. Pharmacotherapy of viral infections.

8. PHARMACOLOGY OF ONCOLOGICAL DISEASES

Classification of antineoplastic drugs. Cytotoxic drugs. Antimetabolites. Inhibitor of mitosis. Topoisomerases inhibitors. Alkylating agents. Antibiotics. Hormonal agents. Monoclonal antibodies. Other antineoplastic compounds. New perspectives in cancer treatment. An overview of antineoplastic therapy. Aim of the therapy. Examples of treatment regimens. Palliative messures and supportive pharmacotherapy.
Chapter 42.- Antineoplastic drugs.
Chapter 43.- Cancer Chemotherapy.

9. DERMATOLOGICAL PHARMACOLOGY

This module collects in a precise and concrete the pharmacology of some skin diseases like psoriasis and atopic dermatitis. Most drugs have already studied in other sections of Pharmacology and so the themes have a nuance pharmacotherapy. Something similar happens with the drugs used in ophthalmology (glaucoma, uveitis, conjunctivitis, etc.).
Unit 44 .- Dermatological pharmacotherapy: Psoriasis, atopic dermatitis, acne, etc.
Unit 45 .- Ocular pharmacotherapy: Glaucoma, uveitis, etc.

10. PHARMACOLOGY II PRACTICE

This module includes the development of practical classes. Students perform both experimental protocols in the laboratory and computer simulations about the pharmacological effect and mechanism of action of various therapeutic groups studied in the theoretical part of the course
Practice 1. Study of anti-inflammatory effect on the skin. Auricular edema induced by dPPA in mice. Myeloperoxidase activity
Practice 2. Study of cardiovascular active drugs on blood pressure and heart rate in anesthetized rats. Virtual simulation
Practice 3. In vitro assays for antitumoral drugs : MTT test

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	65,00	100
Laboratory practices	15,00	100
Seminars	6,00	100
Tutorials	4,00	100
Development of group work	12,00	0
Study and independent work	112,00	0
Readings supplementary material	2,00	0
Preparation of evaluation activities	3,00	0
Resolution of case studies	3,00	0
Resolution of online questionnaires	3,00	0
TOTAL	**225,00**	

TEACHING METHODOLOGY

The subject is designed to facilitate the teaching-learning process and is structured in different classroom activities, coordinated throughout the semester to provide an overview as complete as possible of the developed topic:

* **Theoretical Lessons.-** The students should acquire basic knowledge covered by the syllabus through lecture attendance and personal study. In these lessons, the teacher gives an overview of the topic object of study focusing on the most relevant and complex aspects. To facilitate personal study and preparation of the issues in depth, the proper literature and necessary support material will be indicated or provided to students through the Virtual Classroom; will be meade avalableself-correcting questionnaires as well, so they can assess their level of knowledge and understanding of the programme.

* **Seminars**.- In the seminars, students will be also proposed in order to allow the studient to relate and integrate concepts taught in the various subjects. In these seminars students will participate in complementary activities (debates, analysis of readings, press news,...) covering current issues related to the subject.

* **Laboratory Practical Lessons.-** Laboratory lessons are carried out in 3 sessions and are related to the theoretical aspects of the various pharmacological groups studied in Pharmacology II. At the beginning of each session, the Professor will point the most important aspects of experimental work and will assist the student during the session. Once the experimental part is carried out, the students will analyze the observed facts and will resolve some issues raised by the teacher at the beginning of the session or during the development of the practical lesson. At the last session students will take a practical exam.

* **Tutorials.-** Tutorials are organized in small groups of students, according to the established timetable. In these sessions, the tutor will evaluate the learning process of the students in a global way. The tutor may raise specific issues of greater complexity to the ones undertaken in regular seminars according to the needs of the students either individually or collectively. Besides, the tutorials will serve to solve doubts that might arise during the lectures and to advise students on strategies to circumvent difficulties that might encounter.

It should be noted that the focus of the theoretical classes, practices, seminars and tutorials, as well as the competencies to be achieved, integrates the Sustainable Development Goals (SDG) promoted by the United Nations. Among others, it is worthy highlighting the Rational Use of Medicine and the promotion of Community Health (Good Health: Objective 3) and Quality Education (Objective 4). In addition, aspects related to SDG 5 (gender equality) and 10 (reduction of inequalities) are also worked on throughout the subject, addressing the differences in the response to drugs according to gender and access to medicines of the entire population.

EVALUATION

All aspects set out in the section on methodology of this guide will be considered in the assessment of student learning and you will take place in a continuous manner by the professor.

- **70% of the grade**: will come from the score of the theoretical exam. Student who pass the first part of the course in January only will be examined of the second part in June, and the final score will be the average between the two parts (the score of both parts must be > 5) . The mark of the first part will be saved to the second call (July).
- **10% of the grade**: will come from the score obtained for practical lessons, which will be compulsory. The score will take into account the marks of the practical exam and the participation

and performance in the laboratory. Practical lessons are mandatory and in case a student fails the subject the year that they were taken, the score obtained will be applicable to only the consecutive year.

- **10% of the grade:** will come from the evaluation of the work done and presented in seminars (5%) as well the participatory attendance to all activities, includding tutorials (5%). The ability to collaborate with the rest of the group will be considered**.**
- **10% of the grade:** will correspond to the continuous assessment exercises carried out throughout the course.
- **It is an essential requirement** to pass the subject to have taken and passed the practical lessons and the theoretical exam.

According to the guidelines of the CAT of Pharmacy (May 14, 2012), students who do not show the theory exam but have participated and note any / s of the teaching activities carried out (seminars, laboratory, computer room, tutorial , etc..) will be assessed as not shown in the first round, but still not submitted for consideration by theory, the final grade on the second call will take into account the marks obtained in the various activities and thus may appear as SUSPENSE .

REFERENCES

Basic

- Flórez J. (editor). Farmacología humana 6ª ed. Elsevier Masson, 2013.
- Lorenzo P y cols. Velázquez. Farmacología Básica y Clínica. 19ª ed. Med. Panamericana, 2018
- Katzung B. G. Farmacología básica y clínica. 13ª ed. McGraw Hill, 2016
- Rang & Dale. Farmacología.9ª ed. Elsevier, 2019
- Howland R.D. Lippincotts Illustrated Reviews: Pharmacology. 5th ed. Lippincott Williams &Wilkins, 2012 6th ed. 2015
- Goodman y Gilman. Las bases farmacológicas de la terapéutica. 13ª ed. McGraw-Hill, 2019
- Golan DE, Tashijan AH, Armstrong EJ, Armstrong AW. Principios de Farmacología: Bases fisiopatológicas del tratamiento farmacológico. 4ª ed. Wolters Kluver 2017
- Fernandez Alonso S y Ruiz Gallo M. Fundamentos de Farmacología básica y clínica 2ª ed. Panamericana, 2013
- Brenner and Stevens, Farmacología Básica 5ª ed. Elsevier 2019

Additional

- Agencia Española de Medicamentos y Productos Sanitarios: http://aemps.es/
- European Medicines Agency: www.ema.europa.eu/
- International Vademecum: www.vademecum.es/

- Catálogo de especialidades farmacéuticas. Consejo General de Colegios Oficiales de Farmacéuticos (Blot plus 2.0) 2013: http://www.portalfarma.com/
- e-libros disponibles a través del Servicio de Biblioteca y Documentación de la Universidad de Valencia: http://trobes.uv.es/