UNICAMILLUS

Degree in Medicine and Surgery Integrated
Course of Pharmacology

SSD: **BIO/14**
CFU: **8**
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PREREQUISITES

The teaching course of Pharmacology requires previously acquired knowledge of the following subjects: Chemistry and Biochemistry, Biology and Genetics, Histology and Embryology, Molecular Biology, Human Anatomy I and II, Physiology I and II, Microbiology, General Pathology.

LEARNING OBJECTIVES

The teaching course aims at the knowledge of the general principles of pharmacokinetics (absorption, distribution, metabolism and elimination/ADME of drugs); of pharmacodynamics (cellular and molecular mechanisms underlying the action of drugs); of main classes of drugs, of their therapeutic uses and adverse effects; of drugs toxicity; of how new drugs are developed, and related experimental clinical studies.

LEARNING OUTCOMES

At the end of the learning process, the following results are expected, in line with the following "Dublin Descriptors":

Knowledge and understanding
The student will have to demonstrate understanding of the information learned, in the field of general and special pharmacology

Applying knowledge and understanding
The student must be able to apply the acquired knowledge to the identification of the best therapeutic approach (based on Evidence Based Medicine), depending on the variability of response to drugs linked to gender, age, genetic factors, main comorbidities and most important drug interactions

Communication skills
The student will have to acquire a correct use of the names of the drugs and the technical terms related to the field of pharmacology, reporting the acquired knowledge with a clear exposition.

Making judgements
The student will be required to make general assessments regarding the covered topics.

Learning skills
The student will have to demonstrate the ability to link the acquired knowledge concerning the mechanisms of action of drugs to their therapeutic and side effects.

COURSE SYLLABUS

UNICAMILLUS

- **PHARMACOKINETICS**

Definition of drug
ADME of drugs: routes of drug administration, distribution in our body, metabolism and elimination
Concepts of bioavailability and bioequivalence of drugs
Drug kinetics, after single and repeated administration
Trade mark and generic drugs, biotechnologic drugs (monoclonal antibodies and tyrosine-kinase inhibitors), biosimilar drugs

- **FARMACODYNAMICS**

Drugs mechanism of action: receptorial and non-receptorial drugs. Different types of drug receptors
Therapeutic, unwanted and adverse effects of drugs
Agonists, partial agonists, antagonists, allosteric and orthosteric modulators
Conformational changes in drugs receptor after drug binding

- **DRUGS EFFECTS**

Therapeutic index and risks/benefits ratio evaluation
Dose-effect and time-effect curves, of wanted and unwanted reactions to drugs
Tolerance and dependence

- **VARIABILITY IN DRUGS RESPONSE**

Pharmacogenomics: individual variability in drugs response, due to genetic variants of target proteins and enzymes involved in drugs metabolism
Concept of personalized medicine (related to gender, age, comorbidity).
Drug interactions

- **DRUGS DEVELOPMENT**

Methods of development and discovery of new drugs
Experimental pre-clinical e clinical studies aimed at new drugs marketing

- **AUTONOMIC NERVOUS SYSTEM DRUGS**

Agonists and antagonists (nicotinic and muscarinic) of cholinergic system
Cholinesterase inhibitors
Adrenergic drugs: selective α-β stimulants; selective and non-selective α-β antagonists

- **CENTRAL AND PERIPHERAL NERVOUS SYSTEM DRUGS**

Neurotransmitters, neuromodulators and neurohormones
Neuromuscular blocking agents
Drugs for migraine
Antiemetics
Local and general anesthetics
Anxiolytics (benzodiazepines e non-benzodiazepines)
Hypnotics and sedatives (benzodiazepines and non-benzodiazepines)
Antipsychotics
Antidepressants and mood stabilizers
Antiepileptics
Anti-Parkinson drugs
Medications used to treat dementia and multiple sclerosis
Histamine and anti-histamine
Antispastics

- **DRUGS USED TO RELIEVE PAIN, TO TREAT INFLAMMATION AND FEVER**

Prostaglandins, tromboxans, prostacyclins
Non-Steroidal Antiinflammatory Drugs (NSAIDs), analgesics and antipyretics, COX-1 and COX-2 selective inhibitors
Steroidal Antiinflammatory Drugs (SAIDs)
Drugs used to treat gout
Disease Modifying Anti-Rheumatic Drugs (DMARDS)
Opioids

- **DRUGS AFFECTING THE CARDIOVASCULAR FUNCTION**

Antihypertensives
Myocardial infarction medications
Drugs used to treat heart failure and acute pulmonary edema
Antianginal drugs
Antiplatelet drugs
Thrombolytic drugs
Anticoagulants
Antiarrhythmic drugs

- **GASTROINTESTINAL PHARMACOLOGY**

Antiulcer drugs
Laxatives, anti-diarrheal agents
Drugs used to treat gallstones
Drugs used to treat inflammatory bowel diseases

- **DRUGS AFFECTING THE RESPIRATORY FUNCTION**

Drugs for asthma and chronic obstructive pulmonary disease (COPD)
Bronchodilators: β-agonists; PDE inhibitors, anticholinergics
Antileukotrienes
Corticosteroids
Mast cell stabilizers
Antihistamines, decongestants, antitussives, expectorants

- **ENDOCRINE PHARMACOLOGY**

Hypothalamic and pituitary hormones
Adrenal gland hormones
Insulin, glucose-lowering agents and agents used to treat hypoglycemia
Androgens, estrogens, progestins and antagonists
Contraceptives
Drugs use in pregnancy. Drugs that affect uterine motility

- **IMMUNOPHARMACOLOGY**

Immunosuppressants and immunostimulants

- **ANTIMICROBIAL AGENTS**

Principles of antimicrobial chemotherapy: resistance, drugs selection, drugs combination, side effects.
Inhibitors of bacterial cell wall synthesis

Inhibitors of β-lactamase
Cell membrane targeting antibiotics
Protein synthesis inhibitors
Antibiotic that inhibit nucleic acid synthesis
Antituberculosis
Antifungals
Antiprotozoans
Anthelmintics
Antivirals

- **ANTICANCER AGENTS**

Principles of cancer chemotherapy
Innovative targets of anticancer drugs
Alkylating agents
Antimitotic agents
Topoisomerase I e II inhibitors
Antimetabolites
Antineoplastic antibiotics
Antihormones
Immunomodulators
Monoclonal antibodies
Kinases inhibitors
Proteasome inhibitors
PARP inhibitors

COURSE STRUCTURE

The teaching course is made of 80 hours of traditional frontal lessons (live-streaming lesson are considered for students who are not allowed to stay in classroom). Frequency is mandatory.

COURSE GRADE DETERMINATION

Pharmacology final exam is made of two parts: a written exam and an oral exam.
The final written exam will be 30 minutes long, including 31 multiple-choice questions (1 point/correct answer). A minimum score of 18/30 at the written exam is required to do the oral exam, where the student will demonstrate his/her preparation, talking about topics of the teaching course and evaluating related issues. The final score will be the average between the score of the written and the oral exam.
The student should demonstrate: a correct use of terminology and a clear exposition; he/she should be able to connect the acquired knowledge of basic principles of pharmacology with the therapeutic action of the single classes of drugs; he/she should be able to select the best pharmacologic approach when evaluating a hypothetical clinical case; he/she should be able to individually develop a deeper knowledge of the topics treated in the frontal lessons.

READING MATERIALS

a) LL Brunton, R Hilal-Dandan, BC Knollmann. “Goodman and Gilman’s. The pharmacological basis of therapeutics”, XIII edition, McGraw Hill, 2018.
b) BG Katzung, AJ Trevor. “Basic and clinical pharmacology”. 14th Edition, McGraw Hill Education, 2018.
c) JM Ritter, Rj Flower, G Henderson, YK Loke, D MacEwan, HP Rang. Rang & Dale's Pharmacology, 9th Edition, Elsevier, 2019