

**IV year (1st – 2nd semester)  
A.Y. 2021-22**

Scientific Field	<b>PHARMACOLOGY</b>	TUTOR	ECTS
BIO/14	Pharmacology 1	Barbaccia Maria Luisa	3
BIO/14	Pharmacology 1	Battaini Fiorenzo Maria	1
BIO/14	Pharmacology 1	Franzese Ornella	1
INF/01	Informatics	Barbaccia Maria Luisa	1
MED/01	Medical Statistics	Barbaccia Maria Luisa	1
BIO/14	Pharmacology 2	Graziani Grazia	3
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**BARBACCIA M.L.  
COORDINATOR**

#### **SPECIFIC AIMS**

The course of Pharmacology will cover the most important topics of modern pharmacology through formal lectures, seminars and lectures on specific topics, such as pediatric clinical pharmacology (by Prof. Gregory Kearns), that will be accessed by students of the course through the IAD platform.

At the end of the course, the students should demonstrate knowledge on:

- a) the principles of pharmacokinetics, pharmacodynamics and pharmacogenetics;
- b) the molecular/cellular mechanisms of action of different classes of therapeutic drugs,
- c) their therapeutic indications and d) their adverse effects/contraindications.

Students should also learn the principles of toxicology, the major and clinically important drug-drug interactions, methodology of clinical pharmacological research and of pharmacovigilance and how to critically read clinical study reports.

#### **PROGRAM OF THE PHARMACOLOGY EXAMINATION**

Legend:

- D = deep knowledge of the topic is required;
- G = general knowledge of the topic is required.

PROGRAM	<ul style="list-style-type: none"> <li>- Pharmacokinetics;</li> <li>- Pharmacodynamics;</li> <li>- Pharmacogenetics;</li> <li>- Drug side effects and basic principles of toxicology;</li> <li>- Drugs acting at the autonomic nervous system;</li> <li>- Drugs acting at the central and peripheral nervous system;</li> <li>- Drugs for pain, inflammation and fever;</li> </ul>
PHARMACOLOGY	<ul style="list-style-type: none"> <li>- Cardiovascular drugs;</li> <li>- Drugs for gi tract, lung, kidney and biliary tract diseases;</li> <li>- Drugs acting on the endocrine system;</li> <li>- Immunopharmacology;</li> <li>- Antimicrobial agents;</li> <li>- Anti-bacterial agents;</li> <li>- Anti-mycobacterial agents;</li> <li>- Antifungal agents;</li> <li>- Antiviral drugs;</li> <li>- Antiprotozoal drugs;</li> <li>- Anthelmintic drugs;</li> <li>- Anti-cancer chemotherapy;</li> <li>- Cytotoxic agents;</li> <li>- Differentiating agents;</li> <li>- Targeted therapies and other anticancer drugs;</li> <li>- Hormonal agents for cancer treatment.</li> </ul>

TOPICS	<ul style="list-style-type: none"> <li>- Routes of drug administration, dynamics of drug absorption and distribution;</li> </ul>
PHARMACOKINETICS	<ul style="list-style-type: none"> <li>- Drug metabolism; drug elimination;</li> <li>- Drug kinetics after single or repeated administration;</li> <li>- Bioavailability and bioequivalence.</li> </ul>

TOPICS	<ul style="list-style-type: none"> <li>- Mechanisms of drug action and relationships between drug concentration and effect;</li> </ul>
PHARMACODYNAMICS	<ul style="list-style-type: none"> <li>- On-target and off -target effects of drugs;</li> <li>- Drug-receptor interaction, structure-activity relationship (agonist, antagonist, partial agonist, allosteric modulator);</li> <li>- Receptor modulation by drug exposure.</li> </ul>

TOPICS PHARMACOGENETICS	Genetically determined variability of response to drugs.	D
TOPICS DRUG SIDE EFFECTS AND BASIC PRINCIPLES OF TOXICOLOGY	<ul style="list-style-type: none"> <li>- Risk/benefit ratio of drugs – therapeutic index;</li> <li>- Adverse drug reactions (ADRs), suspected unexpected serious adverse reactions (SUSARs);</li> <li>- Tolerance and physical dependence; mechanisms of drug-drug interactions</li> </ul>	D
	<ul style="list-style-type: none"> <li>- Evaluation of drug and xenobiotic toxicity (dose-effect and time-effects relationships)</li> </ul>	G
TOPICS DRUGS ACTING AT THE AUTONOMIC NERVOUS SYSTEM	<ul style="list-style-type: none"> <li>- Cholinergic (muscarinic and nicotinic) agonists and antagonists;</li> <li>- Anticholinesterase agents;</li> <li>- Catecholamines, sympathomimetic drugs and adrenergic antagonists.</li> </ul>	D
	<ul style="list-style-type: none"> <li>- Agents active at autonomic ganglia.</li> </ul>	G
TOPICS DRUGS ACTING AT THE CENTRAL AND PERIPHERAL NERVOUS SYSTEM	<ul style="list-style-type: none"> <li>- Drugs acting at the neuromuscular junction</li> <li>- Neurotransmitters, neuromodulators and neurohormones and their receptors</li> <li>- Drugs for: migraine; emesis; anxiety; hypnosis/sedation psychosis; mood disorders (depression/bipolar disorder); epilepsy; Parkinson disease; Alzheimer's and non-Alzheimer's dementia; pain (opiates); spasticity;</li> <li>- Histamine antagonists; drug dependence (alcohol, opiates, barbiturates, psychostimulants)</li> <li>- General and local anesthetics; drugs for appetite control; psychostimulants and hallucinogens</li> </ul>	G D D D G
TOPICS DRUGS FOR PAIN, INFLAMMATION AND FEVER	<ul style="list-style-type: none"> <li>- Prostaglandins, thromboxanes, prostacyclins.</li> <li>- Non steroidal anti-inflammatory drugs (NSAIDs) COX-1 and COX-2 selective;</li> <li>- Steroidal anti-inflammatory drugs (glucocorticoids);</li> <li>- Drugs for gout;</li> <li>- Anti-rheumatics (symptomatic, DMARDs, biologics).</li> </ul>	G D

TOPICS	- Renin-angiotensin inhibitors; - Anti-hypertensives; drugs for shock;	
CARDIOVASCULAR DRUGS	- Drugs for myocardial infarction; - Drugs for heart failure (acute and chronic/pulmonary edema); - Drugs for coronary artery disease (CAD); - Drugs for dyslipidemia; inhibitors of platelet aggregation; - Thrombolitics; - Anti-hemorrhagics; anticoagulants; - Drugs for anemia (erythropoietin, iron, folic acid, vitamin B12)	D
	- Antiarrhythmic drugs	G
TOPICS	- Drugs for gastric acid control (anti-H2, antacids, proton pump inhibitors); - Prokinetics, drugs to treat constipation and diarrhea;	
DRUGS FOR GI TRACT, LUNG, KIDNEY AND BILIARY TRACT DISEASES	- Drugs for ulcerative colitis, Crohn's disease, irritable bowel syndrome; - Drugs for gallstones; - Drugs for asthma.	D
TOPICS	- Oral and implantable contraceptives; - Androgens, estrogens, progestins and their antagonists/synthesis inhibitors and receptor modulators;	
DRUGS ACTING ON THE ENDOCRINE SYSTEM	- Adrenal hormones and their antagonists/synthesis inhibitors; - Drugs for the thyroid; - Insulin, oral and parenteral hypoglycemic drugs; - Drugs for uterine motility.	D
	- Anabolic steroids	G
TOPICS	- Leukocytes stimulating factors;	G
IMMUNOPHARMACOLOGY	- Immunosuppressive drugs	

TOPICS ANTIMICROBIAL AGENTS	General Principles of anti-microbial therapy (classification; drug resistance; pharmacokinetics; mechanisms of action; rational basis for drug selection and drug association; empirical, definitive and prophylactic therapy).	D
TOPICS ANTI-BACTERIAL AGENTS	Penicillins; cephalosporins; monobactam; carbapenems; $\beta$ -lactamase inhibitors; glycopeptides; lipoglycopeptides; lipopeptides; cycloserine; fosfomycin; aminoglycosides; tetracyclines and glycylcyclines; macrolides and ketolides; lincosamides; streptogramins; chloramphenicol; oxazolidinones; sulfonamides and trimethoprim; fluoroquinolones; polymyxins; bacitracin; metronidazole.	D
TOPICS ANTI-MYCOBACTERIAL AGENTS		D
TOPICS ANTIFUNGAL AGENTS		D
TOPICS ANTIVIRAL DRUGS	Anti-herpesvirus, anti-influenza, anti-hepatitis virus, anti-HIV agents.	D
TOPICS ANTIPROTOZOAL DRUGS		G

<p>TOPICS</p> <p>ANTHELMINTHIC DRUGS</p>	<p>G</p>
<p>TOPICS</p> <p>ANTI-CANCER CHEMOTHERAPY</p>	<p>General Principles of anti-cancer chemotherapy (classification, drug resistance, pharmacokinetics mechanisms of action; rational basis for drug selection and drug association).</p>
<p>TOPICS</p> <p>CYTOTOXIC AGENTS</p>	<ul style="list-style-type: none"> <li>- Alkylating and platinum agents;</li> <li>- Antimetabolites: folic acid analogues, purine and pyrimidine analogues;</li> <li>- Microtubule damaging agents: vinca alkaloids, taxanes, epothilones, estramustine;</li> <li>- Camptothecin analogues;</li> <li>- Antibiotics: dactinomycin, anthracyclines, mitoxantrone;</li> <li>- Bleomycin;</li> <li>- Mitomycin C;</li> <li>- Epipodophyllotoxins;</li> <li>- Trabectedin;</li> <li>- L-asparaginase;</li> <li>- Hydroxyurea.</li> </ul> <p style="text-align: right;">D</p>
<p>TOPICS</p> <p>DIFFERENTIATING AGENTS</p>	<ul style="list-style-type: none"> <li>- Retinoids;</li> <li>- Arsenic trioxide;</li> <li>- Histone deacetylase inhibitors.</li> </ul> <p style="text-align: right;">G</p>
<p>TOPICS</p> <p>TARGETED THERAPIES AND OTHER ANTICANCER DRUGS</p>	<ul style="list-style-type: none"> <li>- Tyrosine kinase inhibitors, monoclonal antibodies;</li> <li>- Proteasome inhibitors;</li> <li>- mTOR inhibitors;</li> <li>- Thalidomide and lenalidomide;</li> <li>- DNA repair inhibitors.</li> </ul> <p style="text-align: right;">D</p>

## TOPICS

### HORMONAL AGENTS FOR CANCER TREATMENT

- Selective estrogen-receptor modulators and downregulators, aromatase inhibitors, gonadotropin-releasing hormone agonists and antagonists;
- Anti-androgens. G

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## TEXTBOOKS

The Goodman and Gilman The Pharmacological Basis of Therapeutics, 12th edition (or updated edition), Laurence L Brunton, Bruce A. Chabner, Björn C. Knollmann, McGraw Hill.

## EXAM METHOD

The knowledge acquired by each student will be assessed through an oral examination. According to the student's preference, the exam can be taken in one session or may be divided in two parts :

- a) general pharmacology (PK/PD), antimicrobial agents and anti-cancer drugs
- b) general pharmacology (PK/PD) and the remaining program.

## EXAM COMMISSION

The Coordinator, full Professors of the disciplines, Professors of similar disciplines, Specialists of the subject, compose the exam Commission of the Integrated Course.

Barbaccia Maria Luisa, President
Graziani Grazia
Battaini Fiorenzo
Franzese Ornella

## CONTACTS

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PREREQUISITES: Previous knowledge and competence in the following subjects: Human anatomy<sup>1</sup>, Histology and Embryology, Biology and Genetics, Chemistry and Introductory Biochemistry.

The specific learning outcomes of the program are coherent with the general provisions of the Bologna Process and the specific provisions of EC Directive 2005/36/EC. They lie within the European Qualifications Framework (Dublin Descriptors) as follows:

### 1. **Knowledge and Understanding**

- Provide a comprehensive study of the fundamentals of Pharmacology and uses of the major classes of clinically important drugs currently used in medical practice.
- Learn basic scientific concepts and principles that will serve as the foundation for understanding the pharmacology of specific drugs, such as the pharmacokinetics, metabolism, dosing, toxicity.
- Understand the scientific basis underlying how two different drugs can interact within the body and can have undesirable effects either on drug concentrations or drug clinical effects
- Understand the Pharmacology and clinical use of the major class of clinically important drugs, focusing on indication, mechanism of action, pharmacokinetic, adverse effects, contraindications and drug interaction.
- Assess pathogenesis of diseases, interventions for effective treatment, and mechanisms of health maintenance to prevent disease.

### 2. **Applying Knowledge and Understanding**

- Apply the theoretic knowledge to the clinical and laboratory setting, being able to recognize the general diagnostic aspects of diseases and specific therapeutic possibilities.
- Become familiar with procedures for performing and reporting laboratory experiments
- Demonstrate capacity for problem-solving about the patient responsiveness to therapy and assess the available alternatives.
- Provide a differential diagnosis based on given specific clinical data and hypothesize the therapeutic approaches available on the market..

### 3. **Making Judgements**

- Recognize the importance of an in-depth knowledge of the topics consistent with a proper medical education.
- Identify the benefits and adverse effects of any diagnostic and therapeutic intervention.
- Identify the fundamental role of a proper theoretic knowledge of the subject in the clinical practice.

### 4. **Communication Skills**

- Present the topics orally in an organized and consistent manner.
- Use of proper scientific language coherent with the topic of discussion.

5. **Learning Skills**

- Identify the possible use of the acknowledged skills in the future career.
- Assess the importance of the acquired knowledge in the overall medical education process.