האוניברסיטה העברית בירושלים
THE HEBREW UNIVERSITY OF JERUSALEM

The Hebrew University of Jerusalem

Syllabus

Pharmacology A - 64660

Last update 31-10-2024

HU Credits: *4*

Degree/Cycle: *1st degree (Bachelor)*

Responsible Department: *School of Pharmacy*

Academic year: *0*

Semester:

Teaching Languages: *Hebrew*

Campus: *Ein Karem*

Course/Module Coordinator: *Gilad Noy*

Coordinator Email: *gilad.noy@mail.huji.ac.il*

Coordinator Office Hours:

Teaching Staff:

Mr. Gilad Noy

Course/Module description:

• Pharmacokinetics- the ADME concept, drug distribution, absorption, bioavailability, volume of distribution (V), excretion of drugs, renal excretion, glomerular filtration, tubular secretion, clearance (CL), Half-life (t1/2), compliance.
• Pharmacodynamics- mechanism of action, drug-receptor interactions, drug target families, discovery, principles of receptor purification, cloning a receptor, biophase, affinity, efficacy, potency, toxicity, pharmacophore, agonists types, antagonists types, partial agonists, binding curve, dose- response curve, two state model, receptor coupling and spare receptors, tachyphylaxis.
• Signal transduction- second messengers, cAMP activity, receptors superfamilies, GPCRs; classes, ligand interactions, families, signal amplification, rigid body model, activation cycle, allosteric properties, GPCR tachyphylaxis, Biochemical tools to study GPCRs- bacterial toxins, G- proteins, cGMP, PLC activity, PLA2, channel activation, features of ion channels, regulation on intracellular calcium levels, calcium extrusion and release mechanisms, muscle contraction, smooth muscle contraction, kinase linked- receptors, RTK, MAPK pathway, modes for pharmacological intervention, TK inhibitors, JAK/STAT pathway.
• Drug metabolism- Xenobiotics, Phase I and phase II metabolism, Non CYP450 phase I metabolism, phase II enzymes, glucoronidation, sulfation, glutathione conjugation, CYP450 cycle, reactions catalyzed by CYPs, CYP3A inhibition, CYP3A4, mechanism of and screening for CYP3A4 induction, induction of CYPs, drug-drug interactions due to metabolism, alcohol dehydrogenases and aldehyde dehydrogenases, MAO, FMO, genetic polymorphism in drug metabolism, diet and environmental factors, prodrugs, the first pass effect, metabolism by bacterial flora.

• Transporters- SLC transporters, ABC transporters, MDR1, MRP1/2, vectorial transport, epithelial ion transport, hepatic vectorial transport, renal vectorial transport, excretion of hydrophilic organic cations and anions, the BBB.
• Bioactive peptides- function, biosynthesis and regulation, neuropeptides, vasoactive peptides, angiotensin, angiotensinogen, angiotensin I, converting enzyme, renin, actions of angiotensin II, pharmacological intervention in the Renin-Angiotensin system, ACE inhibitors, AT1 antagonists, endothelins, kinins.
• Nitric oxide (NO)- pharmacology of NO, synthesis, activation and deactivation, biological roles of NO, Viagra and NO, NO in the nervous system, circulatory system, muscular system, immune system, digestive system, NO inhibitors.
• Autonomic pharmacology- the nervous system, somatic nervous system, autonomic nervous system, parasympathetic, sympathetic, major neurotransmitters in ANS, enteric nervous system, synaptic transmission, cholinergic synapse, Na+-choline antiporter, biosynthesis of catecholamines, adrenergic synapse, metabolism of catecholamines, autonomic receptor types, cholinergic receptor types, muscarinic receptor types, nicotinic receptor types, adrenergic receptor types, comparison between Parasympathetic and Sympathetic systems, Integration of cardiovascular function, presynaptic and postsynaptic regulation mechanisms in the

ANS, pharmacologic modifications of autonomic function, multiple ANS action in the Eye.
• Cholinomimetic drugs – spectrum of action, subtypes and characteristics of cholinoceptors, cholinomimetic drugs, direct-acting cholinoceptors stimulants, pharmacological actions of cholinergic agonists, muscarinic agonists in the Eye, activation of muscarinic receptors in the Urinary bladder, indirect cholinomimetics, cholinesterase inhibitors, organophosphates, therapeutic sses of AChE Inhibitors, major therapeutic use of cholinomimetics.
• Cholinoceptor Blocking drugs- subclass of cholinergic antagonists, muscarinic antagonists, pharmacokinetics of muscarinic receptor antagonists, pharmacological characterization of Major muscarinic antagonists, CNS effects of anti-muscarinic drugs, antimuscarinic drugs used in ophthalmology, effects of antimuscarinic drugs on the cardiovascular system, respiratory system, gastrointestinal (GI) tract, genitourinary tract, physiological effects of muscarinic antagonists, muscarinic antagonists used in clinical applications, muscarinic antagonists for cholinergic poisoning, nicotinic antagonists, ganglion-blocking drugs, Neuromuscular blocking drugs (Skeletal Muscle Relaxants), Clinical importance of neuromuscular blocking dugs, Neuromuscular Junction (NMJ) – nicotinic modulation, non-depolarizing antagonists, depolarizing antagonist, non-depolarizing block of nicotinic cholinergic receptor, depolarizing block of nicotinic cholinergic receptor,
Assessment of neuromuscular transmission (following anesthesia), reversal of nondepolarizing neuromuscular blockade, spasmolytic drugs.
• Adrenoceptor activating drugs- sympathomimetic drugs, adrenoceptors subtypes, relative selectivity of adrenoceptors agonists, Dopamine receptors, distribution of adrenoceptors, receptor regulation, catecholamines, non–catecholamines, direct- vs indirect- acting adrenergic agonists, adrenoceptors action, effects of epinephrine on pace-maker potentials, effects of sympathomimetics on the cardiovascular system, dopamine pathways in the brain, loss of dopamine neurons in Parkinson's disease, effects of sympathomimetics on the eye, respiratory tract.
direct sympathomimetics (α) and (β), indirect sympathomimetics,
drug abuse dopamine effect, mixed sympathomimetics.
• Adrenoceptor antagonist drugs- α - receptor antagonists, reflex mechanisms for maintaining normal arterial pressure, reversible vs irreversible α receptor antagonists, cardiovascular effect of α receptor antagonists, α receptor nonselective antagonists, pheochromocytoma, α receptor selective antagonists, α selective vs nonselective antagonists, β - receptor antagonists, cardiovascular effect of β receptor non-selective antagonists, glaucoma.

<u>Course/Module aims:</u>
To acquire basic concepts in pharmacology.

<u>Learning outcomes - On successful completion of this module, students should be able to:</u>

Read a textbook in pharmacology or a scientific manuscript in the field of pharmacology

Attendance requirements(%):

Teaching arrangement and method of instruction: zoom meetings + recorded lectures

Course/Module Content:

basic concepts in pharmacology and pharmacokinetics, signal transduction and drug mechanisms of action, drug metabolism, autonomic nervous system, peptidic drugs.

Required Reading:

Katzung's - Basic and Clinical Pharmacology 15th edition

Additional Reading Material:

Grading Scheme:

Written / Oral / Practical Exam 100 %

Additional information: